# 100% Construction Documents

# Revision #1

## County of Solano

## SB 1022 Classroom and Vocational Training Center

## JANUARY 20, 2017

Kitchell CEM
2750 Gateway Oaks Drive, Suite 300
Sacramento, CA 95833

OFFICE OF THE STATE FIRE MARSHAL
APPROVED FIRE AND PANIC ONLY
Reviewed by: _____
Chris Fowler, DSFM III Specialist

JAN 20 2017

Approval of this plan does not authorize or approve any omission or deviation from applicable regulations. Final approval is subject to field inspection. One set of approved plans shall be available on the project site at all times.

# 100% Construction Documents

## Permit Set

## County of Solano

## SB 1022 Classroom and Vocational Training Center

## November 9, 2016

Kitchell CEM
2450 Venture Oaks Way, Suite 500
Sacramento, CA 95833

OFFICE OF THE STATE FIRE MARSHAL
APPROVED FIRE AND PANIC ONLY
Reviewed by: _____
Chris Fowler, DSFM III Specialist

DEC 11 2016

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The technical specifications contained herein have been prepared by or under the direction of the following registered persons.

## ARCHITECT

I hereby certify that certain of the Specifications contained herein were prepared by me or under my direct supervision and responsible charge.



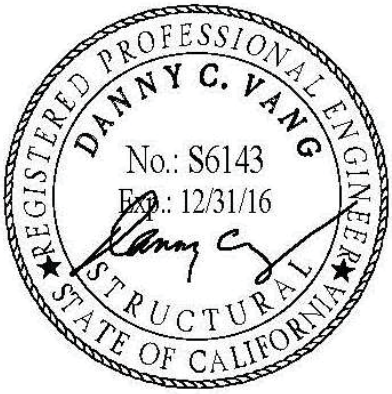

Name: Gordon Rogers

Firm: Kitchell CEM

Reg. No.: C22679 Exp. Date: 01/31/2017

## STRUCTURAL

I hereby certify that certain of the Specifications contained herein were prepared by me or under my direct supervision and responsible charge.




Name: Danny Vang

Firm: Kitchell CEM

Reg. No.: S6143 Exp. Date: 12/31/2016

**ELECTRICAL**

I hereby certify that certain of the Specifications contained herein were prepared by me or under my direct supervision and responsible charge.




Name: Gerald Neuffer

Firm: Kitchell CEM

Reg. No.: E14881 Exp. Date: 06/07/2017

**MECHANICAL-PLUMBING**

I hereby certify that certain of the Specifications contained herein were prepared by me or under my direct supervision and responsible charge.




Name: Sergio Rodriguez

Firm: Kitchell CEM

Reg. No.: M35271 Exp. Date: 03/31/2017

**CIVIL**

I hereby certify that certain of the Specifications contained herein were prepared by me or under my direct supervision and responsible charge.




Name: Joshua Dey

Firm: Kitchell CEM

Reg. No.: C74970 Exp. Date: _____

**CIVIL – STORM WATER**

I hereby certify that certain of the Specifications contained herein were prepared by me or under my direct supervision and responsible charge.




Name: Peter Carlino

Firm: Lea & Braze Engineering, Inc

Reg. No.: C79555 Exp. Date: _____

**SECURITY ELECTRONICS**

I hereby certify that certain of the Specifications contained herein were prepared by me or under my direct supervision and responsible charge.




Name: Frank Niedzwiedz

Firm: R&N System Design, Inc

Reg. No.: 18008 Exp. Date: 12-31-16

**FIRE PROTECTION**

I hereby certify that certain of the Specifications contained herein were prepared by me or under my direct supervision and responsible charge.




Name: Donald Wulbers

Firm: American Automatic Fire Protection, Inc

Reg. No.: 1033 Exp. Date: 12-31-2016

SECTION 00 11 00 - NOTICE TO BIDDERS

NOTICE IS GIVEN THAT SOLANO COUNTY, CALIFORNIA, will receive bids for the furnishing of all labor, materials, coordination, transportation, and services necessary for the completion of the:

**SB1022 Classroom and Vocational Training Center Project**
**At 2456 Claybank Road, Fairfield, CA**

I. Each bid must be in accordance with the bid documents, construction drawings and specifications. The bid documents may be obtained at bidder's expense from the printing company where the documents are on file. The printing companies are as follows:

BPXPRESS Reprographics
Attn: David Clark, phone- (707) 745-3593
4740 E. 2nd St., #29
Benicia, CA 94510

ARC-Pacheco
Attn: David Lieban, phone (925) 682-6930
5753 Pacheco Blvd
Pacheco, CA 94553

Bidders may view copies of the Drawings and Specifications at one of the Builders Exchanges where the documents are on file. The builder's exchanges are as follows:

SACRAMENTO REGIONAL
BUILDERS EXCHANGE
www.srbx.org
Phone (916) 442-8991

NORTH COAST BUILDERS EXCHANGE
www.ncbeonline.com
Phone: (707) 542-9502

THE BAY AREA
BUILDERS EXCHANGE
www.bayareabx.com
Phone (925) 685-8630

THE BUILDERS EXCHANGE
OF STOCKTON
www.besonline.com
Phone (209) 478-1000

II. Sealed bid will be accepted until **2:00pm,** local time, **February 24, 2017**, at the Solano County General Services Department, Capital Projects Management Division, 675 Texas Street, Suite 2500, Fairfield, California 94533. Proposals received after 2:00pm will not be considered responsive and will be returned to bidder unopened. Telephone and fax bids will not be accepted.

III. All prequalified General Building Contractors must attend the Sub-Contractor Outreach Meeting and will convene at the Solano County Administration Center's Ground Floor Multi-Purpose Rooms 1600/1610 at 675 Texas Street, Fairfield, CA, from 3-6pm on February 7, 2017. All interested subcontractors and suppliers are encouraged to participate in this Outreach meeting.

IV. All inquiries regarding the project shall be directed to Solano County using the form provided in the project specifications. Contact person is Orlie Coronel-Mangune, Project Manager, 707-784-7908 (phone), 707-784-7912 (fax), ucoronel-mangune@solanocounty.com (e-mail). Only requests for information received in writing or fax or email by close of business on February 14, 2017 will be responded to.

V. Contractor must possess a current A or B Contractor's License from the State of California and the required classification(s) of Contractor's License at the time the Bid is submitted (per Business and Professions Code §7028.15).

Only the General Building Contractors who have been pre-qualified by Solano County specifically for this Project can submit bids. All sub-Contractors, suppliers and vendors are to contact the listed General Building Contractors for interest in bidding on this Project.

The pre-qualified General Building Contractors are:

a. DPR Construction, 2480 Natomas Park Dr., Suite 100 Sacramento, CA 95833
   Aaron Schwartz, Aarons@dpr.com, wp 916-568-3434
b. Hensel Phelps Construction Co., 545 Jefferson Blvd, Suite 13 West Sacramento, CA 95605
   James Pappas Jr., jpappas@henselphelps.com, wp 408-452-1800
c. Otto Construction, 1717 2nd St. Sacramento, CA 95811
   Allison Otto, aotto@ottoconstruction.com, wp 916-441-6870
d. Overaa Construction, 200 Parr Blvd. Richmond, CA 94801
   Carl Overaa, carl@overaa.com, wp 510-34-0926

VI. Solano County forms are provided in the specifications and shall be used for all proposals. Bidders shall read and review the bid documents carefully, and shall familiarize themselves thoroughly with all requirements.

VII. A bid bond or certified check in the amount of 10% of the bid is required.

VIII. Within five (5) days after issuance of the Notice to Proceed, the successful bidder shall be required to furnish a Labor and Materials Payment Bond and Performance Bond in an amount equal to 100% of the Contract amount.

IX. Due to State funding requirements, all bids shall remain valid for a period of 95 days from bid opening.

X. Wage rates and restrictions on working days and times shall meet all requirements of the Labor Code of the State of California for public contracts. The bidder may contact the Director of the Department of Industrial Relations, phone number (415) 703-4774, to obtain a schedule of the general prevailing wages applicable to the location and work to be done. The contractor and the contractor's subcontractor are responsible for compliance with the requirements of Section 1777.5 and 1777.6 of the Labor Code of the State of California regarding employment of apprentices.

XI. All Contractors and subcontractors must be registered with the California Department of Industrial Relations (DIR) at the time of contract award pursuant to Cal. Labor Code Section 1725.5.

XII. The County will make a bid selection based on the "'Best Value" where the selected bidder may be selected on the basis of objective criteria for evaluating the qualifications of bidders with the resulting selection representing the best combination of price and qualifications, project approach and enhancements offered.

SECTION 00 21 00 - INSTRUCTIONS TO PROPOSERS/BIDDERS

1.00 Best Value bid proposals must comply with these Instructions to Bidders to be considered responsive.

1.01 DOCUMENTS

A. Bidders may obtain copies of the Drawings and Specifications at bidder's expense from one of the following printing companies where the documents are on file. The printing companies are as follows:

1. BPXPRESS Reprographics
   Attn: David Clark
   4740 E. 2nd St., #29
   Benicia, CA 94510

2. ARC Concord
   Attn: David Lieban
   5753 Pacheco Blvd.
   Concord, CA 94553

1.02 EXAMINATION

A. Before submitting a bid, bidders shall carefully examine the Drawings and Specifications, and related documents, visit the site of the work and fully inform themselves as to all existing conditions and limitations, and shall include in the bid a sum to cover the cost of all items included in the work.

B. A Sub-Contractor Outreach Meeting will be held on February 7, 2017, beginning at 3:00pm, local time (P.S.T.), at Solano County Administration Center's Ground Floor Multi-Purpose Rooms 1600/1610, 675 Texas Street, Fairfield, California 94533. **All Pre-Qualified Contractors must attend the Outreach Meeting.** All interested subcontractors and suppliers are encouraged to participate in this Outreach meeting.

1.03 INTERPRETATIONS, ADDENDA

A. Should a bidder find discrepancies, inconsistencies or omissions from, the Drawings and Specifications and Related Documents, or should a bidder be in doubt as to their meaning, they shall at once notify Orlie Coronel-Mangune (use attached form), by fax 707-784-7912 or by email ucoronel-mangune@solanocounty.com. Request for Information will be received until close of business of February 14, 2017. Thereafter inquiries will not be responded to. An addendum, answering questions received during the allotted time, will be issued. Addenda containing material changes in the Contract Documents will not be issued **less than 72 hours before the bid opening unless the bid opening is extended by at least 72 hours.**

B. Any Addenda issued by the County during the time of bidding are to be considered in the Bid, and will become a part of the Agreement Between Contractor and County. Bidders shall acknowledge receipt of all Addenda on the Bid Form in the space provided. Addenda will be made available at the printing companies noted in 1.01A of this specification section and posted on the County website link at http://www.solanocounty.com/depts/genserv/cpm/notices.asp

1.04 SUBSTITUTION OF MATERIALS

A. Materials other than those specified shall be approved by Addenda issued by the Architect prior to bid opening; otherwise the bidder assumes the risk that the Architect may not approve the desired substitution.

1.05 BIDS

A. Bids must be made upon the "Bid Form" included in these Specifications, or a copy thereof, all blank spaces filled, the signature shall be in longhand, and the completed form shall be without alterations or erasures. All amounts must be in words as well as in figures. Any discrepancy between the words and figures shall be resolved using the amount stated in words. The "Bid Form" must be filled out in ink or be typewritten. Where the bidder is a corporation, the "Bid Form" must be signed using the name of the corporation followed by the name of the state of incorporation and the signatures of an officer authorized to bind the corporation to a Contract. A bid that is incomplete, incorrect or non-conforming may be disregarded, at the sole discretion of the County.

B. Bids will be accepted until February 24, 2017, 2:00pm, local time, shall be addressed and delivered to:

Solano County Department of General Services
Capital Projects Management Division
675 Texas Street, Suite 2500
Fairfield, CA 94533

C. Each bid shall be delivered in separate envelope bearing on the outside, the name of the bidder, his address and the name of the Project. Bids will be accepted until the date and time stated in the Advertisement for Bid, or in any notification extending that date and time. Also, to be included in each envelope shall be:

1. A certified Bid Bond or certified check for 10% of the bid amount referring to the Project bid upon.

2. No bid will be valid without the complete listing of all subcontractors **with the signature of the prime contractor submitting the bid in the space indicated.** Lists submitted by unsuccessful bidders will be returned.

3. A completed, notarized Non-Collusion Affidavit referring to the Project bid.

D. Due to State funding requirements, all bids shall remain valid for a period of 95 days from bid opening.

E. Bids may not be modified after the designated or extended time for bid opening. Upon presentation of satisfactory identification, bidders may withdraw and resubmit bids at any time prior to the designated or extended bid opening. No bid may be withdrawn until ninety five (95) calendar days after the bid opening.

F. County will determine at its own discretion whether a bidder is responsive and responsible, and County's determination will be final.

G. The Bidder will be selected on the basis of the Best Value to the County. A Selection Committee appointed by the County shall evaluate, score and rank the bidders based solely upon the criteria set forth in the solicitation documents.

H. County reserves the sole discretion to reject any or all bids or to waive informalities and minor irregularities in the Bid Form or the Bid process.

I. Bids expressing exceptions or qualifications on Technical Specifications may be disregarded, in the sole discretion of the County.

J. In accordance with the General Conditions, include in the Bid, all costs for full performance of the work.

1.06 BID SECURITY

A. Each bidder shall submit with their bid, a certified or cashiers check upon a solvent bank, or a Bid Bond in an amount equal to 10% of the Base Bid made payable to County. This bid security shall be given as a guarantee that the bidder will enter into the Agreement if awarded to him and will produce the required bonds and certificates of insurance coverage, and **shall be retained as liquidated damages if he refuses to enter into said Agreement** upon request to do so by County. Bid security will be returned to all unsuccessful bidders, and to each successful bidder upon the County's receipt of a satisfactory Performance Bond, Payment Bond, Certificate of Insurance, Worker's Compensation Insurance Certificate, Automobile Insurance Certificate executed Agreement and all other document required by the Contract Documents prior to the execution of the Agreement by the County. Bid Bonds shall be executed on the form included in these specifications or a copy thereof.

1.07 NON-COLLUSION AFFIDAVIT

A. Each bidder shall submit to County with their bid, a Non-Collusion Affidavit covering the bidder and all sub-contractors. The Non-Collusion Affidavit shall be executed on the form included in Section 004519 of these Specifications or a facsimile thereof.

1.08 FORM OF AGREEMENT

A. The Agreement which the successful bidder, as Contractor, will be required to be executed in three (3) originals, will be in the form of the Agreement Between County and Contractor included in these Specifications.

1.09 PERFORMANCE BOND, PAYMENT BOND

A. The successful bidder shall file with County, a 100% Performance and Payment-Bond.

The Payment and Performance Bonds required by these specifications will neither be

accepted nor approved by the County unless the bonds are underwritten by a California admitted surety, and the requirements of California Code of Civil Procedure section 995.630 are met. Bonds shall be executed in 3 (three) originals, on the form included in these Specifications or facsimile thereof.

1.10 CONTRACTOR'S LICENSE

A. The successful bidder shall possess a valid and current Contractor's License, classification **'A' or 'B', General Contractor,** and the required classification (s) of contractor's license issued by the State of California in order to perform the work described in the Contract Documents.

B. All Contractors and subcontractors must be registered with the California Department of Industrial Relations (DIR) at the time of contract award pursuant to Cal. Labor Code Section 1725.5.

C. This Project is subject to compliance monitoring and enforcement by the California Department of Industrial Relations.

1.11 CONTRACTOR'S INSURANCE

A. Coverage: Contractor shall maintain for the duration of the work and warranty period required under the Agreement, all Insurance in the minimum amounts, and with all certificates and endorsements, required by Article 11 of the "GENERAL CONDITIONS." It is highly recommended that Bidders confer with their respective insurance carriers or brokers to determine in advance of bid submission the availability of the insurance certificates and endorsements required. A bidder, who is awarded a contract and thereafter fails to comply strictly with the insurance requirements, will be deemed to be in default of its obligations.

**END OF SECTION 00 21 00**

RFI FORM FOLLOWS

**PROJECT NAME: SB1022 Classroom and Vocational Training Center**
**REQUEST FOR INFORMATION ON BID DOCUMENTS (RFI)**
**SEPARATE FORM FOR EACH QUESTION**

TO: Solano County Capital Projects Management

Attention: Orlie Coronel-Mangune

| | | | |
|---|---|---|---|
| From: | | | |
| Firm: | | | |
| Date: | | | |
| Tel: | | Fax: | |
| Email: | | | |

| |
|---|
| RFI No. |
| Rec'd: |
| Date: |
| Adden. Req'd: ( ) Yes ____ #: |
| To All Bidders ( ) Yes ____ __/__/02 |

Type of Question:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Contract/General Conditions | | Select Demo & Haz.Mat | | Structural | | Architectural | | Electrical |
| | Mechanical | | Other _____ | | | | | | |

| | | | |
|---|---|---|---|
| Spec Section: | | Page/Article/Paragraph(s): | |
| Drawing: | | Details: | |
| Question Requested: | | | |
| | | | |
| | | | |
| | | | |

◯ Mark this circle if the RFI can be answered by Bidder's review of the documents.

| | |
|---|---|
| Reply | |
| | |
| | |
| | |
| | |

**By:** **Firm:** **Date:**

The reply is an answer to Bidder's questions. The reply does not change the bid Documents unless it is issued in an Addendum. The question and reply may be returned to the questioner and distributed to all bidding Contractors for informational purposes at the sole discretion of the County.

SECTION 00 31 26 - INVESTIGATION REPORT

PART I – REPORTS

1.1 GEOTECHNICAL INVESTIGATION REPORT

A. The following geotechnical and soils report prepared for this Project, is posted on the County website link at http://www.solanocounty.com/depts/genserv/cpm/notices.asp

1. Geotechnical Investigation, February 8, 2015, by Miller Pacific Engineering Group.

B. The geotechnical investigation reports are not a part of the Contract Documents; it is made available for information only. The Contractor should review and be familiar with the total contents of the geotechnical and soils report. Contractor shall direct any questions or comments concerning the report to the author of said report, in writing, with copies to the Project Manager.

C. County's Disclaimer:

1. The County assumes no responsibility for the completeness or accuracy of the geotechnical investigations, the reports compiled there from, or the interpretations contained in any subsequent report.

2. The geotechnical investigation was performed for the purposes of study and design, and there is no expressed or implied guarantee that the conditions indicated in the report are representative of those existing throughout the site; conditions differing substantially from those indicated may be encountered.

D. Differing Conditions

If, during the course of construction operations, conditions differing substantially from those indicated in the geotechnical and soils report are encountered, Contractor shall promptly notify and Project Manager in writing, and not disturb such conditions until directed by County or Project Manager.

The Project Manager will promptly request that the County's Soils Consultant investigate such conditions, and, if he determines that the conditions do differ substantially from those that reasonable would have been anticipated from information contained in the geotechnical and soils report and from examination of the site, and that such conditions will necessitate a change in the Work and/or adjustment of the cost and/or time for performing the Work, the Project Manager will approve a Change Order authorized by the County, as provided in the General Conditions, to provide for the changes and adjustments.

1.2 EXISTING TOPOGRAPHIC SURVEY

A. The following Existing Topographic Survey, prepared for this Project, is posted on the County website link at: http://www.solanocounty.com/depts/genserv/cpm/notices.asp

1. Existing Topographic Survey dated 11/25/14 by Solano County Resource Management-Survey

B. The Existing Topographic Survey is **not a part of the Contract Documents;** it is made available for information only. The Contractor should review and be familiar with the total contents of the Existing Topographic Survey. Contractor shall direct any questions or comments concerning the report to the Project Manager and copies will be directed to the author of said survey.

C. County's Disclaimer:

1. The County assumes no responsibility for the completeness or accuracy of the Existing Topographic Survey, the information compiled there from, or the interpretations contained in any subsequent report.

2 The Existing Topographic Survey report was performed for the purposes of study and design, and there is no expressed or implied guarantee that the conditions indicated in the survey are representative of those existing throughout the site; condition differing substantially from those indicated may be encountered.

D. Differing Conditions:

1. If, during the course of construction operations, conditions differing substantially from those indicated in Existing Topographic Survey are encountered. Contractor shall promptly notify the Project Manager in wiring, and not disturb such conditions until directed by County or Project Manager.

2. The Project Manager will promptly request that the County's Surveying staff investigate such conditions, and if he determines that the conditions do differ substantially from those that reasonable would have been anticipated from information contained in the Existing topographic Survey and from examination of the site and that such conditions will necessitate a change in the Work and/or adjustment of the cost and/or time for performing the Work, the Project Manager will approve a Change Order authorized by the County, as provided in the General Conditions, to provide for the changes and adjustments.

1.4. RECORD DRAWINGS

Record drawings of the existing Stanton Detention Facility can be accessed by appointment with the Department of General Services, Capital Projects Management Division, Solano County.

**END OF SECTION 00 31 26**

SECTION 00 41 00 - BID FORM

1.1 GENERAL BID INFORMATION

Bid for: SB1022 CLASSROOM AND VOCATIONAL TRAINING CENTER
2456 Claybank Road
Fairfield, Solano County, California 94533

Construction Manager: Gilbane Building Company
1798 Technology Drive, San Jose, CA 95110

Architect: KITCHELL CEM
2450 Venture Oaks Way, Suite 500
Sacramento, CA 95833

A. We, the undersigned, having familiarized ourselves with the local conditions, the Advertisement for Bids, Instructions to Bidders, General Conditions, Bid Form, Supplement to Bid Form, Agreement Between County and Contractor, the Drawings and Specifications and Addenda issued by the Architect and Solano County, do hereby propose to furnish all labor, materials, necessary tools, expendables, equipment, utility and transportation services, including State of California and local sales or use taxes, license, necessary to complete the Work required for the above Project in strict accordance with the contract documents, including all Addenda.

B. Undersigned declares that the cost of a Performance Bond and Payment Bond in the full amount of the Agreement, and a one (1) year Warranty Bond for 10% of the Final Contract Amount, is included in this bid.

C. Undersigned agrees to enter into and execute an Agreement, if awarded on the basis of this Bid, and to furnish Bonds and Insurance in accordance with Contract Documents, within five (5) calendar days after date of receipt of Notice to Proceed.

D. **Liquidated Damages for Failure to Enter into the Agreement**:
Enclosed is Certified Check or Bid Bond, made payable to the County, which is not less than 10% of the total amount of the Base Bid. Should Contractor's bid be accepted and Contractor thereafter fail to enter into the Agreement on the basis of this bid, IT IS UNDERSTOOD AND AGREED that it is, and will be, difficult or impossible to determine the actual damage which County will sustain in the event of, and by reason of, such failure to enter into the Agreement. Undersigned further agrees that said check or Bid Bond shall be forfeited as liquidated damages (not as a penalty), if undersigned fails to enter into an Agreement on the basis of this bid, after receiving Notice of Award.

E. Undersigned acknowledges receipt of the following Addenda:

1. Addendum No.____ Dated_____

2. Addendum No.____ Dated_____



**Addendim 6**

3. Addendum No.____ Dated_____

4. Addendum No.____ Dated_____

5. Addendum No.____ Dated_____

6. Addendum No.____ Dated_____

F. This Bid is valid for ninety five (95) calendar days following the date for receiving Bids.

G. Undersigned proposes to enter into a contract for the following amounts:

H. **Stipulated Sum** for work included in this Contract necessary to complete the SB1022 Classroom and Vocational Training Center, Fairfield, California as shown in the drawings and specifications. Contractor shall substantially complete the Project within 395 calendar days from the Notice to Proceed. The undersigned is aware the Agreement includes provisions for Liquidated Damages as specified in section 00 73 00 of the Bidding and Contract Requirements if the Project is not completed within the agreed time of completion.

1.2 STIPULATED SUM ACKNOWLEDGEMENT (INCLUDING ALL ADDENDUMS)
By submitting this proposal, we acknowledge that the Project can be completed for the Stipulated Sum Of:

| Eighteen Million Five Hundred Thousand Dollars | $ 18,500,000 |
|---|---|
| Amount in Words | Numbers |

1.3 Bid Alternate No. 1
Owner Controlled Insurance Program (OCIP)
Credit $_____

Bid submitted by:

Type of Organization: _____
(Individual, Partnership, Corporation, Etc.)

Company's Name: _____

Partner's Names: _____
(If Partnership)

Seal (If Corporation):

(Date)

By: _____
(Signature of Contractor)

_____
(Type Name of Contractor)

_____
(Address)

_____
(Telephone)

**Contractor License:**

Class: _____ Number:_____ Expiration Date: _____

Attachments:
- Bid Bond
- Sub-Contractor List
- Non-Collusion Affidavit

SECTION 00 43 15 - SUBCONTRACTOR LIST FORM

This attachment to the Bid Form shall be submitted with the Bid Form, in a separate envelope. If no subcontractors are to be involved, and work is to be performed by the Contractor, so state.

Subcontractor List Forms submitted by unsuccessful contractors will be returned unopened.

Pursuant to the provision of Section 4100 to 4113, inclusive, of the Public Contract Code of the State of California, every Bidder shall set forth the name and location of the place of business of each subcontractor who will perform work or labor in or about the construction of the work or improvement in an amount in excess of one-half (1/2) of one percent (1%) of the Bidder's total bid. If the Bidder fails to specify a subcontractor for any portion of the work in excess of one-half (1/2) of one percent (1%) of the Bidder's total bid, he agrees to perform that portion himself. The following is the required list of subcontractors:

**BIDDER'S LIST OF SUBCONTRACTORS**
(Use other side & extra sheets if necessary)

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Subcontractor Cost** | | | | | | | | |
| **DIR Registration No.** | | | | | | | | |
| **License Type** | | | | | | | | |
| **License No.** | | | | | | | | |
| **Name and Address of Subcontractor** | | | | | | | | |
| **Type of Work** | | | | | | | | |

(Subcontractor List continued)

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Subcontractor Cost | | | | | | | | |
| DIR Registration No. | | | | | | | | |
| License Type | | | | | | | | |
| License No. | | | | | | | | |
| Name and Address of Subcontractor | | | | | | | | |
| Type of Work | | | | | | | | |

Date: _____ Contractor's Signature: _____

**END OF SECTION 00 43 15**

SECTION 00 43 43 - STATE WAGE DETERMINATION

1.1 INSTRUCTIONS:

A. THE GENERAL CONTRACTOR IS REQUIRED TO POST THE STATE WAGE DETERMINATION ON THE JOB SITE FOR THE PROJECT IN A CONSPICUOUS LOCATION AVAILABLE TO ALL WORKERS.

**END OF SECTION 00 43 43**

SECTION 00 45 19 - NON-COLLUSION DECLARATION

Title 23 United States Code Section 112
And
Public Contract Code Section 7106

The undersigned declares:

I am the _____ of _____, the party making the foregoing bid.

The bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation. The bid is genuine and not collusive or sham. The bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid. The bidder has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or to refrain from bidding. The bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder. All statements contained in the bid are true. The bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, to any corporation, partnership, company association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid, and has not paid, and will not pay, any person or entity for such purpose.

Any person executing this declaration on behalf of a bidder that is a corporation, partnership, joint venture, limited liability company, limited liability partnership, or any other entity, represents that he or she has full power to execute, and does execute, this declaration on behalf of the bidder.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that this declaration is executed on _____[Date], at _____[City], _____[State].

**END OF SECTION 00 45 19**

SECTION 00 45 26 - CERTIFICATION CONCERNING WORKER'S COMPENSATION

STATE OF CALIFORNIA, SOLANO COUNTY

The undersigned is aware of the provisions of Section 3700 of the Labor Code of the State of California which require every employer to be insured against liability of worker's compensation or to undertake self-insurance in accordance with the provisions of that code, and the undersigned will comply with such provisions, and will require all subcontractors to comply with such provisions, before commencing the performance of the work of this Contract.

Date: _____

Contractor Signature: _____

**END OF SECTION 00 45 26**

SECTION 00 45 46 - PAYROLL INFORMATION

1.1 INSTRUCTIONS:

A. UPON REQUEST THE GENERAL CONTRACTOR WILL PROVIDE THE COUNTY OR PROJECT MANAGER ANY RECORDS REQUESTED FOR PAYROLL ON THISPROJECT WITHIN 48 HOURS INCLUDING BUT NOT LIMITED TO:

1. Name, Address, Social Security Number and Ethnic Code of Employee or Employees

2. Number of withholding exemptions

3. Work classification

4. Day, Date and Hours Worked

5. Total Hours

6. Rate of Pay

7. Gross Pay

8. Deductions

9. Net Wages Paid

**END OF SECTION 00 45 46**

SECTION 00 50 10 - BID BOND

BIDDER'S BOND TO ACCOMPANY PROPOSAL
(Penalty of this Bond must be 10% of the Bid Amount)

KNOW ALL MEN BY THESE PRESENTS:

That we, _____, as principal _____ and _____ , as surety, are held and firmly bound unto Solano County in the sum of _____ dollars, ($_____), to be paid to the said County or its certain attorney, its successors and assigns; for which payment, well and truly to be made, we bind ourselves, our heirs, executors and administrators, successors or assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that if the certain proposal of the above bounden for _____ dated _____ is accepted by Solano County and if the above bounden _____, his heirs, executors, administrators, successors and assigns, shall duly enter into, execute and deliver a signed Agreement for such construction, and shall execute and deliver the required performance bond, payment bond, liability insurance certificate and worker's compensation certificate, within seven calendar days from the date of the receipt of a Notice of Award to the above bounden _____ from Solano County, then this obligation shall become null and void; otherwise it shall be and remain in full force and virtue.

Witness our hands this _____day of _____, 2017.

_____
Principal Seal

_____
By

_____
Surety Seal

_____
By

_____
Agency of Record

**END OF SECTION 00 50 10**

# SECTION 00 52 00 AGREEMENT BETWEEN OWNER AND CONTRACTOR

**THIS AGREEMENT** is made as of the ___ day of _____, 2017 between the COUNTY OF SOLANO, a political subdivision of the State of California, (referred to as 'Owner') and CONTRACTOR NAME. (referred to as "Contractor") for the following Project:

The Project: **SB1022 CLASSROOM AND VOCATIONAL TRAINING CENTER PROJECT**

Architect/Engineer: Kitchell CEM
2450 Venture Oaks Way, Suite 500
Sacramento, CA 95833

The Owner and the Contractor agree as set forth below.

## ARTICLE 1
## THE CONTRACT DOCUMENTS

The Contract documents consist of this Agreement, the General Conditions and those documents enumerated in Sub-paragraph 1.1.1 of the General Conditions, which documents are incorporated into and made a part of this Agreement

## ARTICLE 2
## THE WORK

The Contractor shall perform all the Work required by the Contract Documents for
**SB1022 CLASSROOM AND VOCATIONAL TRAINING CENTER PROJECT, Fairfield, CA.**

## ARTICLE 3
## TIME OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

The Work to be performed under this Contract shall commence no later than five (5) calendar days after the Notice to Proceed is issued to the Contractor, and shall be carried out and completed according to the schedule set forth in Document 00 73 00/ Supplementary Conditions, Section 00 11 00/ Notice to Bidders and Section 01 32 16/ Construction Progress Schedules and Reports.

The Contractor agrees that the Work will be substantially completed in 395 calendar days from the Notice to Proceed. The Contractor agrees that the County will suffer economic damages, which may be difficult to quantify, in the event that the Work is not completed within this time period and therefore, Contractor agrees to pay the County liquidated damages in the amount outlined in Document 00 73 00/ Supplementary Conditions, Article 1.4, Liquidated Damages for each and every calendar day of delay beyond the 426 calendar days provided above.

## ARTICLE 4
## CONTRACT SUM

The County shall pay the Contractor for the performance of the Work, subject to additions and deductions by Change Order or as otherwise provided in the Contract Documents, a total Contract Sum of $_____ .

## ARTICLE 5
## PROGRESS PAYMENTS

Based upon Applications for Payment submitted to the Project Manager by the Contractor and Project Certificates for Payment issued by the Project Manager/Architect, the County shall make progress payments on account of the Contract Sum to the Contractor as provided in the Contract Documents as follows:

Progress Payments: The Contractor shall on or before the first day of each month, make an estimate of the work performed during the preceding month and submit same to the Project Manager for checking and approval. On or about the 20th day of the month following the month in which the work was performed, the County shall pay to the Contractor ninety-five (95%) percent of the value of said work in place, as checked and approved by the Project Manager. The balance of five (5%) percent of the estimate shall be retained by the County until the time of final acceptance of said work.

The remaining retention would be held until 35 days after the Notice of Completion is filed with the Solano County Recorder's Office and completed according to Section 01 77 00/ Contract Closeout Procedures.

## ARTICLE 6
## FINAL PAYMENT

Final payment, constituting the entire unpaid balance of the Contract Sum, shall be paid by the County to the Contractor when the Work has been completed, the Contract fully performed, the Architect has issued a Project Certificate for Payment which approves the final payment due the Contractor, Board of Supervisors of Solano County has formally accepted the project as complete by Resolution and Notice of Completion filed by the County Recorder's Office.

## ARTICLE 7
## MISCELLANEOUS PROVISIONS

7.1 **Terms**. Terms used in this Agreement, which are defined in the Document 00 72 00/ General Conditions of the Contract for Construction, shall have the meanings designated in those Conditions.

7.2 **Notices**. Notices shall be addressed as follow:

OWNER:
**COUNTY OF SOLANO**
**Birgitta E. Corsello, County Administrator**
675 Texas Street, Suite 2500
Fairfield, CA 94533

CONTRACTOR:
**CONTRACTOR**
**Contact name**
Address

7.3 **Prevailing Wages**. The Contractor agrees that State Prevailing Wages apply to this Project and that the Contractor will pay the rates for each trade or craft and shall require the subcontractors on the project to pay the rates for each trade and craft. The Payroll Submittal Information attached as Section 00 45 46 - Payroll Information is incorporated as if set forth in full and is a part of this Contract. The Contractor agrees to repay the County any and all amounts paid to any subcontractor in violation of Public Contract Code Section 6109.

7.4 **Execution of Contract in Counterparts.** This Contract may be executed in two or more counterparts, each of which together shall be deemed an original, but all of which together shall constitute one and the same instrument, it being understood that all parties need not sign the same counterpart. In the event that any signature is delivered by facsimile or electronic transmission (e.g., by e-mail delivery of a ".pdf" format data file), such signature shall create a valid and binding obligation of the party executing (or on whose behalf such signature is executed) with the same force and effect as if such facsimile or electronic signature page were an original signature.

## ARTICLE 8
## EXECUTION OF AGREEMENT

The parties have executed this Agreement as of the day and year first above written.

COUNTY:

By: _____
Birgitta E. Corsello, County Administrator

CONTRACTOR:

By: _____
Name
Contractor

APPROVED AS TO FORM:
County Counsel of Solano County, California

By: _____

NOTE: If the Contractor is a corporation, attach to this Contract a certified copy of the by-laws, resolutions, or excerpts of a meeting of the Board of Directors of the Corporation authorizing the person executing this Agreement to do so for the Corporation

**END OF SECTION 00 52 00**

SECTION 00 61 13 - STATUTORY PERFORMANCE BOND

STATUTORY PERFORMANCE BOND PURSUANT TO
California Public Contract Code
Section 20129
(Penalty of this bond must be 100% of the Contract Amount)

KNOW ALL MEN BY THESE PRESENTS:

That, _____ (Hereinafter called the Principal), as Principal and _____, a corporation organized and existing under the laws of the State of _____, with its principal office in the City of _____, (hereinafter called the Surety), as Surety, are held and firmly bound unto **SOLANO COUNTY**, (hereinafter called the obligee) in the amount of_____ Dollars ($_____), for the payment whereof, the said Principal and Surety bind themselves, and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written Agreement with the Obligee, dated the _____ day of _____, 2017, SB1022 Classroom and Vocational Training Center Project, 2456 Claybank Road Fairfield, CA, which Agreement is hereby referred to and made a part hereof as fully and to the same extent as if copied at length herein.

NOW, THEREFORE, THE CONDITION OF THE OBLIGATION IS SUCH, that if said Principal shall faithfully perform and fulfill all the undertakings, covenants, terms, and conditions of said Agreement during the original term of the Agreement and any extension thereof, with or without notice to the Surety, and during the life of any guarantee required under the contract, and shall also perform and fulfill all the undertakings, covenants, terms, conditions and agreements of any and all duly authorized extensions or modifications of said contract that may hereafter be made, notice of said extensions or modifications to the Surety being hereby waived; then the above obligation shall be void. Otherwise, said obligation shall remain in full force and effect.

That this bond is executed pursuant to the provisions of California Public Contract Code, section 20129 and all liabilities on this bond shall be determined in accordance with the provisions of Part 2, Title 14, Chapter 2 of California Code of Civil Procedure, which is incorporated in full herein. The prevailing party in a suit on this bond shall recover as a part of his judgment such reasonable attorney's fees as may be fixed by a judge any court of competent jurisdiction.

Witness our hands this _____ day of _____, 2017.

_____
Principal Seal

_____
By

_____
Surety Seal

_____
By

_____
Agency of Record

**END OF SECTION 00 61 13**

SECTION 00 61 14 - STATUTORY PAYMENT BOND

STATUTORY PAYMENT BOND PURSUANT TO
California Civil Code
Sections 3247 through 3252
(Penalty of this bond must be 100% of the Contract amount)

KNOW ALL THESE MEN BY THESE PRESENTS:

That, _____(hereinafter called the Principal), as Principal, and _____, a corporation organized and existing under the laws of the State of _____, with its principal office in the City of _____ (hereinafter called the Surety), as Surety, are held and firmly bound unto SOLANO COUNTY (hereinafter called the Obligee), in the amount of _____Dollars ($_____)for the payment whereof, the said Principal and Surety bind themselves, and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written contract with the Obligee, dated the_____ day of _____, 2017, to the SB1022 Classroom and Vocational Training Center Project, 2456 Claybank Road, Fairfield, CA, which contract is hereby referred to and made a part hereof as fully and to the same extent as if copies at length herein.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the said Principal shall promptly pay all moneys due to all persons supplying labor or materials to him or his subcontractors in the prosecution of the work provided for in said contract, then this obligation shall be void, otherwise to remain in full force and effect;

PROVIDED, HOWEVER, that this bond having been required or the said Principal in order to comply with the provisions of California Civil Code, sections 3247 through 3252, all rights and remedies on this bond shall inure solely to such persons and shall be determined in accordance with the provisions, conditions and limitations of said Statutory Provisions to the same extent as if they were copied at length herein.

The prevailing party in a suit on this bond shall recover as a part of his judgment such reasonable attorney's fees as may be fixed by a judge of the Court.

Witness our hands this _____ day of _____, 2017.

_____
Principal Seal

_____
By

_____
Surety Seal

**END OF SECTION 00 61 14**

# SECTION 00 65 19 - WAIVER AND RELEASE SUBMITTAL INFORMATION

## 1.1 INSTRUCTIONS FOR WAIVER AND RELEASE (LIEN WAIVER) SUBMITTALS

### A. GENERAL INSTRUCTIONS

1. Waiver and Releases must be submitted on forms provided by Solano County. Copies of said forms comply with Civil Code § 3262 are at the end of this Section.

2. Comply with General Conditions Section 9.3.7.

3. Waiver and Release submittal sequence.

   a) Upon initial submittal for progress payment, submit for each subcontractor, material or equipment supplier a "**CONDITIONAL WAIVER AND RELEASE UPON PROGRESS PAYMENT**". If initial submittal is also a final submittal for any or all subcontractors, material or equipment suppliers, submit a "**CONDITIONAL WAIVER AND RELEASE UPON FINAL PAYMENT**".

   b) Upon each subsequent submittal for progress payment, submit for each subcontractor, material or equipment supplier a "**CONDITIONAL WAIVER AND RELEASE UPON PROGRESS PAYMENT**" for a total amount reflecting the current progress payment. Also submit an "**UNCONDITIONAL WAIVER AND RELEASE UPON PROGRESS PAYMENT**" reflecting the previous progress payment aggregate sum.

   c) Upon final submittal for progress payment, submit for each subcontractor, material or equipment supplier a "**CONDITIONAL WAIVER AND RELEASE UPON FINAL PAYMENT**". Also submit an "**UNCONDITIONAL WAIVER AND RELEASE UPON PROGRESS PAYMENT**" reflecting the previous progress payment aggregate sum.

   d) Prior to Final Completion and Final Payment, submit for each subcontractor, material or equipment supplier a "**UNCONDITIONAL WAIVER AND RELEASE UPON FINAL PAYMENT**".

4. Comply with General Conditions Section 9.8.2.

## CONDITIONAL WAIVER AND RELEASE UPON PROGRESS PAYMENT

Upon receipt by the undersigned of a check from _____
(Maker of Check)

in the sum of $_____ payable to _____
(Amount of Check) (Payee or Payees of Check)

and when the check has been properly endorsed and has been paid by the bank upon which it is drawn, this document shall become effective to release any mechanic's lien, stop notice, or bond right the undersigned has on the job of

Solano County located at SB1022 CLASSROOM A ND VOCATIONAL TRAINING CENTER
(Owner) (Job Description)

to the following extent. This release covers a progress payment for labor, services, equipment, or material furnished to

_____ through _____
(Your Customer) (Date)

only and does not cover any retentions retained before or after the release date; extras furnished before the release date for which payment has not been received; extras or items furnished after the release date. Rights based upon work performed or items furnished under a written change order which has been fully executed by the parties prior to the release date are covered by this release unless specifically reserved by the claimant in this release. This release of any mechanic's lien, stop notice, or bond right shall not otherwise affect the contract right, including rights between parties to the contract based upon the rescission, abandonment, or breach of the contract, or the right of the undersigned to recover compensation for furnished labor, services, equipment, or material covered by this release if that furnished labor, services, equipment, or material was not compensated by the progress payment. Before any recipient of the document relies on it, said party should verify evidence of payment to the undersigned.

Date:_____ Company Name: _____

By: _____ _____
(Signature) (Title)

## UNCONDITIONAL WAIVER AND RELEASE UPON PROGRESS PAYMENT

The undersigned has been paid and has received a progress payment in the sum of $ _____

for labor, services, equipment and/or material furnished to _____
(Your Customer)

on the job of Solano County located at SB1022 CLASSROOM AND VOCATIONAL TRAINING CENTER
(Owner) (Job Description)

and does hereby release any mechanic's lien, stop notice, or bond right that the undersigned has on the above referenced job to the following extent. This release covers a progress payment for labor, services, equipment and/or materials furnished to

_____through _____ only,
(Your Customer) (Date)

and does not cover any retentions retained before or after the release date; extras furnished before the release date for which payment has not been received; extras or items furnished after the release date. Rights based upon work performed or items furnished under a written change order which has been fully executed by the parties prior to the release date are covered by this release unless specifically reserved by the claimant in this release. This release of any mechanic's lien, stop notice, or bond right shall not otherwise affect the contract rights, including rights between parties to the contract based upon rescission, abandonment, or breach of the contract, or the right of the undersigned to recover compensation for furnished labor, services, equipment, or material covered by this release if that furnished labor, services, equipment, or material was not compensated by the progress payment.

Date: _____Company Name: _____

By: _____ _____
(Signature) (Title)

**NOTICE: THIS DOCUMENT WAIVES RIGHTS UNCONDITIONALLY AND STATES THAT YOU HAVE BEEN PAID FOR GIVING UP THOSE RIGHTS. THIS DOCUMENT IS ENFORCEABLE AGAINST YOU IF YOU SIGN IT, EVEN IF YOU HAVE NOT BEEN PAID. IF YOU HAVE NOT BEEN PAID, USE A CONDITIONAL RELEASE FORM.**

## CONDITIONAL WAIVER AND RELEASE UPON FINAL PAYMENT

Upon receipt by the undersigned of a check from _____
(Maker of Check)

in the sum of $_____ payable to _____
(Amount of Check) (Payee or Payees of Check)

and when the check has been properly endorsed and has been paid by the bank upon which it is drawn, this document shall become effective to release any mechanic's lien, stop notice, or bond right the undersigned has on the job of

Solano County located at SB1022 CLASSROOM AND VOCATIONAL TRAINING CENTER.
(Owner) (Job Description)

This release covers the final payment to the undersigned for all labor, services, equipment, or material furnished on the job, except for disputed claims for additional work in the amount of $_____. Before any recipient of this document relies on it, the party should verify evidence of payment to the undersigned.

Date: _____ Company Name: _____

By: _____ _____
(Signature) (Title)

## UNCONDITIONAL WAIVER AND RELEASE UPON FINAL PAYMENT

The under signed has been paid in full for all labor, services, equipment or material furnished to

_____ on the job of Solano County
(Your Customer) (Owner)

located at SB1022 CLASSROOM AND VOCATIONAL TRAINING CENTER and does hereby waive and release any right to a mechanic's lien, stop notice, or any right against a labor and material bond on the job, except for disputed claims for extra work in the amount of $ _____.

Date: _____ Company Name: _____

By: _____ _____
(Signature) (Title)

**NOTICE: THIS DOCUMENT WAIVES RIGHTS UNCONDITIONALLY AND STATES THAT YOU HAVE BEEN PAID FOR GIVING UP THOSE RIGHTS. THIS DOCUMENT IS ENFORCEABLE AGAINST YOU IF YOU SIGN IT, EVEN IF YOU HAVE NOT BEEN PAID. IF YOU HAVE NOT BEEN PAID, USE A CONDITIONAL RELEASE FORM.**

**END OF SECTION 00 65 19**

SECTION 00 72 00 GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

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## ARTICLE 1
## CONTRACT DOCUMENTS

1.1 DEFINITIONS

1.1.1 THE CONTRACT DOCUMENTS

The Contract Documents consist of the Owner-Contractor Agreement, the Conditions of the Contract (General and other Conditions), the Drawings, the Specifications, and all Addenda issued prior to and all Modifications issued after execution of the Agreement. A Modification is (1) a written amendment to the Agreement signed by both parties, (2) a Change Order, (3) a written interpretation issued by the Project Manager pursuant to Sub-paragraph 2.2.7 and 2.2.8, or (4) a written order for a minor change in the Work issued by the Project Manager pursuant to Paragraph 12.4. The Contract Documents shall also include, the Notice to Bidders, Instructions to Bidders, accepted Bid Form, the Payment Bond, Performance Bond, Warranty Bond, Insurance Certificates and Notice to Proceed.

1.1.2 THE CONTRACT

The Contract Documents form the Contract for Construction. This Contract represents the entire and integrated agreement between the parties hereto and supersedes all prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification as defined in Subparagraph 1.1.1. The Contract Documents shall not be construed to create any contractual relationship of any kind between the Project Manager and the Contractor, but the Project Manager shall be entitled to performance of the obligations of the Contractor intended for their benefit and to enforcement thereof. Nothing contained in the Contract Documents shall create any contractual relationship between the County, the Project Manager and any Subcontractor or Sub-subcontractor.

1.1.3 THE WORK

The Work comprises the completed construction required of the Contractor by the Contract Documents, and includes all labor, materials, equipment and services necessary to produce such construction, and all materials, other permits (see article 4.7.1) and equipment incorporated or to be incorporated in such construction.

1.1.4 THE PROJECT

The Project, as defined in the Owner-Contractor Agreement, is the total construction of which the Work performed under the Contract Documents is a part.

1.1.5 PROJECT LABOR AGREEMENT

It is in the best interest of the Project for the Contractor to avoid labor disputes, strikes, lockouts, work slow-downs, and work stoppage that would result in the delay of the construction progress. As a mitigation factor in avoiding or preventing such events, the Contractor agrees to be bound by the Project Labor Agreement (PLA) between the building trade organizations whose members would be part of the labor force for the Project and the County of Solano, approved by the Solano County Board of Supervisors on January 10, 2017. Copy of the PLA is posted on the County website link: http://www.solanocounty.com/depts/genserv/cpm/notices.asp

1.2 EXECUTION, CORRELATION AND INTENT

1.2.1 The Contract Documents shall be signed in not less than three (3) original copies by the County and the Contractor.

1.2.2 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become familiar with the local conditions under which the Work is to be performed, and has correlated personal observations with the requirements of the Contract Documents.

1.2.3 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work. The Contract Documents are complementary, and what is required by any one shall be as binding as if required by all. Work not covered in the Contract Documents will not be required unless it is consistent therewith and is reasonably inferable as being necessary to produce the intended results. Words and abbreviations that have well-known technical or trade meanings are used in the Contract Documents in accordance with such recognized meanings.

1.2.4 If the Contractor observes any errors, discrepancies or omissions in the Contract Documents, he shall promptly notify the Project Manager requesting clarification. If the Contractor proceeds with work affected by such errors, discrepancies or omissions, without having received such clarification, he does so at his own risk. Any adjustments involving such circumstances made by the Contractor, prior to approval by the Project Manager, shall be at the Contractor's risk and the settlement of any complications or disputes arising shall be at the Contractor's sole expense and Contractor shall indemnify, hold harmless and defend County, and Project Manager from any liability or loss with respect to said adjustments.

1.2.5 Subject to Article 15.10.1, in cases of discrepancy concerning dimension, quantity and location, the Drawings shall take precedence over the Specifications. Explanatory notes on the Drawings shall take precedence over conflicting drawn indications. Large Scale details shall take precedence over smaller scale details and figured dimensions shall take precedence over scaled measurement. Where figures are not shown, scale measurements may be

followed but shall in all cases be verified by measuring actual conditions of Work already in place. In cases of discrepancy concerning quality and application of materials and non-technical requirements over materials, the specifications shall take precedence over Drawings. In the case of discrepancy between the General Conditions and the Division 1 - General Requirements, the Division 1 - General Requirements shall take precedence.

1.2.6 All work and material shall be the best of the respective kinds specified or indicated. Should any workmanship or materials be required which are not directly or indirectly called for in the Specifications and/or shown on the Drawings but which are necessary for proper fulfillment of the obvious intent thereof, said workmanship or materials shall be the same for similar parts that are detailed, indicated or specified, and the Contractor shall understand the same to be implied and provide for it in his tender as if it were particularly described or delineated.

1.3 OWNERSHIP AND USE OF DOCUMENTS

1.3.1 All Drawings, Specifications and copies thereof furnished shall remain the property of the County. With the exception of one contract set for each party to the Contract, such documents are to be returned by Contractor or suitably accounted for to the County on request at the completion of the work. Submission or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's common law copyright or other reserved rights. The County's use of the documents will not increase the Architect's design liability beyond the Project and the site for which the design was originally intended. Contractor is entitled to make copies of drawings, specifications and other Contract Documents in connection with the Project but shall not distribute any copies of plans and details to other parties for use other than related to this Project. Architect retains all common law copyrights for documents prepared by the Architect.

## ARTICLE 2
## ADMINISTRATION OF THE CONTRACT

2.1 THE COUNTY CAPITAL PROJECTS DIVISION MANAGER

2.1.1 The County Capital Projects Management (CPM) Division Manager represents Solano County for all purposes relevant for this Project.

2.2 THE PROJECT MANAGER

2.2.1 The "Project Manager" is the Capital Projects Management Division’s consultant Construction Manager. The Project Manager reports to the County’s Department of General Services Capital Projects Division Manager. All communications from and to the Contractor

will be channeled through the Project Manager. However, the Project Manager does not have the authority to bind the County in matters affecting adjustments to the time or cost of the project as defined in the Owner – Contractor Agreement.

2.2.2 The Project Manager will be the County's representatives during construction and warranty periods, and until final payment to all contractors is due. The Project Manager will advise and consult with the County. All instructions to the Contractor shall be forwarded through the Project Manager. The Project Manager will have authority to act on behalf of the County only to the extent provided in the Contract Documents, unless otherwise modified by written instrument in accordance with Subparagraph 2.2.16.

2.2.3 The Project Manager will determine in general whether the Work of the Contractor is being performed in accordance with the Contract Documents, and will endeavor to guard the County against defects and deficiencies in the Work of the Contractor.

2.2.4 The Project Manager will be on site during construction to monitor the progress and quality of the Work and to determine in general if the Work is proceeding in accordance with the Contract Documents. On the basis of on-site observations and communication with the Contractor, the Project Manager will keep the County informed of the progress of the Work, and will endeavor to guard the County against defects and deficiencies in the Work of the Contractor.

2.2.5 The Project Manager shall at all times have access to the Work wherever it is in preparation and progress. The Contractor shall provide facilities for such access so that the Project Manager may perform their functions under the Contract Documents.

2.2.6 Based on the Project Manager's observations, and an evaluation of the Contractor's Application for Payment, the Project Manager will determine the amount owing to the Contractor and will issue to the County Certificates for Payment incorporating such amount, as provided in Paragraph 9.4.

2.2.7 The Project Manager will render interpretations necessary for the proper execution or progress of the Work, with reasonable promptness and in accordance with agreed upon time limits.

2.2.9 Claims, disputes and other matters in question between the Contractor and the Project Manager relating to the execution or progress of the Work or the interpretation of the Contract Documents shall be referred to the CPM Division Manager of Solano County (or his/her designee).

2.2.10 All interpretations and decisions of the Project Manager shall be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in graphic form.

2.2.11 The Project Manager will have the authority to reject, and or recommend to the County the rejection of, Work that does not conform to the Contract Documents. Whenever, in the Project Manager's opinion, it is considered necessary or advisable for the implementation of the intent of the Contract Documents, the Project Manager will have authority to require special inspection or testing of the Work in accordance with Subparagraph 7.7.2 whether or not such Work be then fabricated, installed or completed.

2.2.12 The Project Manager will receive from the Contractor and review-required Shop Drawings, Product Data and Samples, and forward same to Architect and County for review and approval. Non-specified submittals, product data and samples may be reviewed or returned un-reviewed.

2.2.13 Following consultation with the County, the Project Manager will take appropriate action on Change Orders in accordance with Article 12, and will have authority to order minor changes in the Work as provided in Subparagraph 12.4.1.

2.2.14 The Project Manager will conduct inspections to determine the date of Substantial Completion and Final Completion, and will receive and forward to the County, for the County's review, written warranties and related documents required by the Contract and assembled by the Contractor. The Project Manager will issue a final Project Certificate for Payment upon compliance with the requirements of Paragraph 9.8. The Project Manager will monitor all warranties for a period of one year after final completion, unless otherwise specified as a longer term.

2.2.15 The duties, responsibilities and limitations of authority of the Project Manager, as the County's representatives during construction as set forth in the Contract Documents, will not be modified or extended without written consent of the County, the Contractor and the Project Manager, which consent shall not be unreasonably withheld. Failure of the Contractor to respond within ten days to a written request shall constitute consent by the Contractor.

2.2.16 In case of the termination of the employment of the Project Manager, the County shall appoint a Project Manager, whose status under the Contract Documents shall be that of the former Project Manager, respectively.

2.3 THE PROJECT ARCHITECT

2.3.1 The "Project Architect" is the architect or firm engaged as an independent contractor by the County to design the Project, and all sub-consultants or joint ventures of the Project Architect, identified as such in the Owner-Contractor Agreement. The authority of the Project Architect to bind the County is limited to that authority specified in the Contract Documents and Agreement between County and Architect, no additional authority has been

granted, nor shall be inferred. The Project Architect includes all engineering sub-consultants and other consultants or sub-contractors employed by the Project Architect or an entity lawfully practicing architecture.

2.3.2 The Project Architect advises the Project Manager in all aspects of the construction phase of the Project, including the correct interpretation and application of the Contract Documents. However, the Project Manager is the County's representative on the Project, not the Project Architect. The Project Architect is not authorized independently to issue Addenda, Clarifications, Field Orders, Work Authorizations, or Change Orders, or in any other way to bind the County in discussions with the Contractor. The Project Architect reports to the Project Manager.

2.3.2 The Project Architect shall at all times have access to the Work wherever it is in preparation and progress. The Contractor shall provide facilities for such access so that the Project Architect may perform their functions under the Contract Documents.

2.3.3 The Contractor shall deliver all correspondence relating to the proper execution of the Work to the Project Manager, with a copy delivered to the Project Architect. The Project Manager reserves the right to consult with the Project Architect and County prior to responding to the Contractor's correspondence.

2.3.5 When discussions between the Contractor and the Project Manager occur either on the site or elsewhere, but the Project Architect is not present, the Project Manager reserves the right to consult with the Project Architect and County prior to issuing his/her final decision or instruction.

2.3.6 The Project Architect will review or take other appropriate action upon the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for conformance with the design concept of the Work and the information given in the Contract Documents. Such action shall generally be taken within fifteen (15) working days, however under certain circumstances such as very complex submittals or if large number of submittals are submitted at one time, such review may take longer. In such situations, the Contractor will be notified and given the opportunity to advise the Project Manager and Architect of priorities. The Architect's review of a specific item shall not indicate approval of an assembly of which the item is a component.

2.4 THE COUNTY INSPECTOR OF RECORD

2.4.1 The County’s Inspector of Record observes the Work for compliance with the Contract Documents, and reports the results of those inspections to the Project Manager and County. The County’s Inspector of Record reports to the Project Manager.

2.4.2 The County's Inspector of Record is the person or firms engaged by Solano County to perform contract compliance and building code inspections.

2.4.3 The County's Inspector of Record is not authorized to issue addenda, clarifications, field orders, work authorizations, or change orders, or otherwise to bind the County in discussions with the Contractor.

2.4.4 The Contractor nor his subcontractors shall not attempt to influence the County's Inspector of Record in the performance of their duties, nor request the County's Inspector of Record to exceed their authority.

2.5 ADDITIONAL PERSONNEL OR CHANGE IN PERSONNEL

2.5.1 The County reserves the right to assign additional persons to the positions set forth in Section 3.1, or change the personnel assigned to the positions so set forth.

2.5.2 The Contractor shall be notified in writing by the County CPM Division Manager of any personnel changes.

2.5.3 In all cases, the County CPM Division Manager reserves the right to obtain assistance from other County personnel, independent contractors or other consultants employed by the County.

## ARTICLE 3
## COUNTY

3.1 DEFINITION

3.1.1 The County is the person or entity identified as such in the Owner-Contractor Agreement. The term County means the County or the County's authorized representative for this project.

3.2 INFORMATION AND SERVICES REQUIRED OF THE COUNTY

3.2.1 Except as provided in Subparagraph 4.7.1, the County shall secure and pay for necessary approvals, easements, assessments and charges required for the construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

3.2.2 Information or services under the County's control shall be furnished by the County with reasonable promptness to avoid delay in the orderly progress of the Work.

3.2.3 The Contractor will be furnished not more than **FIVE (5)** copies of the Drawings and Specifications, free of charge. The Contractor, at Contractor's expense of reproduction, may

obtain additional copies over this number.

3.2.4 The County shall forward all instructions to the Contractor through the Project Manager.

3.2.5 The foregoing is in addition to other duties and responsibilities of the County enumerated herein and especially those in respect to Work by County or by Separate Contractors, Payments and Completion, and Insurance in Articles 6, 9 and 11, respectively.

3.3 COUNTY'S RIGHT TO STOP THE WORK

3.3.1 If the Contractor fails to correct defective Work as required by Paragraph 13.2, or persistently fails to carry out the Work in accordance with the Contract Documents, the County, by a written order signed personally or by an agent specifically so empowered by the County in writing, may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of the County to stop the Work shall not give rise to any duty on the part of the County to exercise this right for the benefit of any Contractor or any other person or entity, except to the extent required by Subparagraph 6.1.3.

3.4 COUNTY'S RIGHT TO CARRY OUT THE WORK

3.4.1 If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents, and fails after written notice from the County to correct such default or neglect with diligence and promptness, the County may, after an additional written notice and without prejudice to any other remedy the County may have, make good such deficiencies. In such case an appropriate Change Order shall be issued deducting from the payments then or thereafter due the Contractor the cost of correcting such deficiencies, including compensation for the additional services of the Project Manager, Architect or other Professionals made necessary by such default, neglect or failure. Such action by the County and the amount charged to the Contractor are both subject to the prior approval of the Project Manager. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the County, or County may call performance or warranty bonds.

## ARTICLE 4
## CONTRACTOR

4.1 DEFINITION

4.1.1 The Contractor is the person or entity identified as such in the Owner-Contractor Agreement. The term Contractor means the Contractor or the Contractor's authorized representative.

## 4.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS

4.2.1 The Contractor shall carefully study and compare the Contract Documents and shall at once report to the Project Manager any error, inconsistency or omission that may be discovered. The Contractor shall not be liable to the County or the Project Manager for any damage resulting from any such errors, inconsistencies or omissions in the Contract Documents unless the Contractor recognized such error, inconsistencies or omissions and knowingly failed to report it to the Project Manager. The Contractor shall perform no portion of the Work at any time unless authorized by the Contract Documents or, where required, approved Shop Drawings, Product Data or Samples for such portion of the Work.

4.2.2 Neither the County nor the Project Manager or Architect assume any responsibility for an understanding or representation made by any of their agents or representation prior to the execution of the Agreement unless (1) such understanding or representations are expressly stated in the Agreement, and (2) the Agreement expressly provides that responsibility therefore is assumed by the County.

4.2.3 Failure by the Contractor to acquaint himself with all available information will not relieve him from responsibility for estimating properly the difficulty or cost of successfully performing the Work.

4.2.4 The Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing activities. Errors, inconsistencies or omissions discovered shall be reported to the Project Manager within one (1) calendar day of discovery.

4.2.5 Before submitting any Request for Information (RFI), or other Contractor initiated request for information the Contractor shall determine that the information requested is not clearly provided in the Contract Documents. RFI's shall be submitted to the Project Manager only from the Contractor, or County, and not from any subcontractor, supplier or other vendor, and shall be on a form approved by the Project Manager and County. The Contractor shall provide a revised and updated RFI Priority Schedule on a weekly basis. The RFI Priority Schedule shall rank RFI's in order of priority and include a brief statement of reason for priority. County initiated RFI's will not be listed on the contractor's RFI Priority Schedule. The County will provide the Project Manager a separate list of County initiated RFI's upon request of the Project Manager. The Project Manager will endeavor to respect the order of priorities as requested by the Contractor or County for the overall benefit of the Project. The RFI process is for information and clarification only and may not be utilized to obtain approval for changes in the work.

## 4.3 SUPERVISION AND CONSTRUCTION PROCEDURES

4.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for all construction means, methods, techniques, sequences, procedures, or safety procedures at the project site; and shall coordinate all portions of the Work under the Contract.

4.3.2 The Contractor shall be responsible to the County for the acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and any other persons performing any of the Work under a contract with the Contractor.

4.3.3 The Contractor shall not be relieved from the Contractor's obligations to perform the Work in accordance with the Contract Documents either by the activities or duties of the Project Manager in the administration of the Contract, or by inspections, tests or approvals required or performed under Paragraph 7.7 by persons other than the Contractor.

## 4.4 LABOR AND MATERIALS

4.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for the proper execution and completion of the work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

4.4.2 The Contractor shall at all times enforce strict discipline and good order among the Contractor's employees and shall not employ on the Work any unfit person or anyone not skilled in the task assigned them.

4.4.3 The Contractor shall deliver to the Project Manager, prior to final acceptance of the work as a whole, signed certificates from suppliers of materials and manufactured items stating that such items conform to the Contract Documents.

4.4.4 The Contractor, immediately upon Notice to Proceed (or where shop drawings, samples, etc., are required, immediately upon receipt of approval thereof) shall place orders for all materials, work fabrication, and/or equipment to be employed by Contractor for that portion of the work contracted. The Contractor shall keep all materials, work fabrications and/or equipment specified and shall advise the Project Manager promptly, in writing, of all orders placed and of such materials, work available in a timely manner for the purposes of the Contract.

4.4.5 Anyone employed by Contractor or its Subcontractors whose work is unsatisfactory to the County or the Project Manager, or is considered by the County or Project Manager to be

careless, incompetent, unskilled or otherwise unfit shall be dismissed from work under the Contract upon written request to the Contractor from the County or the Project Manager.

4.5 WARRANTY

4.5.1 The Contractor warrants to the County that all materials and equipment furnished under this Contract will be new unless otherwise specified, and that all Work will be of good quality, free from faults and defects and in conformance with the Contract Documents. All Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. If required by the Project Manager, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. This warranty is not limited by the provisions of Paragraph 13.2.

4.6 TAXES

4.6.1 The Contractor shall pay all sales, consumer, use and other similar taxes for the work or portions thereof provided by the Contractor which are legally enacted at the time bids are opened, whether or not yet effective, up to final completion of the project.

4.7 PERMITS, FEES, AND NOTICES

4.7.1 Unless otherwise provided in the Contract Documents, the County shall secure the building permit, and permanent utility connection fees. The Contractor shall secure and pay for temporary construction utilities, and all other permits and governmental fees, licenses and inspections necessary for the proper execution and completion of the Work which are customarily secured after execution of the Contract and which are legally required at the time bids are opened.

4.7.2 The Contractor shall give all notices and comply with all laws, ordinances, rules, regulations and lawful orders of any public authority bearing on the performance of the Work.

4.7.3 It is not the responsibility of the Contractor to make certain that the Contract Documents are in accordance with applicable laws, statutes, building codes and regulations. If the Contractor observes that any of the Contract Documents are at variance in any respect, the Contractor shall promptly notify the Project Manager in writing, and any necessary changes shall be accomplished by appropriate modification.

4.7.4 If the Contractor performs any Work knowing it to be contrary to any laws, ordinances, rules and regulations, without notice to the Project Manager, the Contractor shall assume full responsibility therefore and shall bear all costs attributable as a result.

4.7.5 Any reference in the Specifications text to codes, standard specifications or manufacturer's instructions shall mean the latest printed edition of each in effect at the time the plans and

specifications are approved by the County Building Department.

4.8 ALLOWANCES

4.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by these allowances shall be supplied for such amounts and by such persons as the Project Manager may direct, but the Contractor will not be required to employ persons against whom the Contractor makes a reasonable objection.

4.8.2 Unless otherwise provided in the Contract Documents:

.1 these allowances shall cover the cost to the Contractor, less any applicable trade discount, of the materials and equipment required by the allowance, delivered at the site, and all applicable taxes;

.2 the Contractor's costs for unloading and handling on the site, labor, installation costs, overhead, profit and other expenses contemplated for the original allowance shall be included in the Contract Sum and not in the allowance;

.3 whenever the cost is more or less than the allowance, the Contract Sum shall be adjusted accordingly by Change Order, the amount of which will recognize changes, if any, in handling costs on the site, labor, installation costs, overhead, profit and other expenses.

4.9 PROJECT MANAGER AND SUPERINTENDENT

4.9.1 The Contractor shall employ a competent project manager, superintendent and necessary assistants who shall be in attendance at the Project site at all times during the progress of the Work. The project manager and the superintendent shall represent the Contractor and all communications given to the project manager and superintendent shall be as binding as if given to the Contractor. Important communications shall be confirmed in writing. Other communications shall be so confirmed upon written request in each case.

4.9.2 The Project Manager and Superintendent who begin the Project shall remain on the Project until the Project is completed, as long as the Contractor employs that person. The Project Manager and Superintendent shall not be replaced without the prior approval of the County.

4.10 CONTRACTOR'S CONSTRUCTION SCHEDULE

4.10.1 Within 30 calendar days after receipt of Notice to Proceed, the Contractor shall submit a Construction Schedule in CPM (Critical Path Method) form to the Project Manager for approval. The Construction Schedule shall be sufficiently detailed to accurately depict all the work required by the contract and include all features per specifications section 01 32 16,

Construction Progress Schedules. CPM Construction Schedule shall reflect shop drawings; submittals due and return dates, fabrication and delivery times, crew mix, and equipment loading data. The Contractor shall thereafter adhere to the Project Construction Schedule, as regularly updated, including any revisions therein made by the County during the course of construction. "Slack" or "float" time on the CPM Construction Schedule is not for the sole benefit of the County or Contractor and shall be apportioned according to the needs of the project and as accepted by the County.

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4.10.2 Within ~~14~~ 30 calendar days after the pre-construction conference, the Contractor shall provide a Submittal and Procurement Schedule indicating time periods for review of Shop Drawings, Data, Samples, and procurement of material and equipment required for the Work, per specifications section 01 33 00, Submittal Procedures. All items that require approval by the Project Manager and/or are not readily available from stock and requiring more than 35 days' lead time shall be included in the Submittal and Procurement Schedule. Items listed in the Submittal and Procurement Schedule shall also be identified as activities on the CPM Construction Schedule.

4.10.3 The working day to calendar date correlation shall be based upon the Contractor's proposed work week with adequate allowance for legal holidays, days lost due to weather, and any special requirements of the project.

4.10.4 The Construction Schedule and Submittal and Procurement Schedule shall be prepared and maintained by the Contractor.

4.10.5 The County, Project Manager, Contractor and other Contractor(s) shall jointly review the progress of the work weekly. Should this review, in the opinion of the Project Manager, indicate that the work is behind the schedule established by currently approved Construction Schedule, the Contractor shall either 1) provide a plan to the Project Manager indicating the steps the Contractor intends to take in order to recover the time behind schedule and conform to the approved Construction Schedule and Submittal and Procurement Schedule; or 2) submit a revised Construction Schedule and Submittal and Procurement Schedule for completion of the work, remaining within the contract completion time, to the Project Manager for approval by the next weekly meeting.

4.10.6 The Contractor shall deliver copies of the daily job logs to the Project Manager and County on a daily basis, no later than close of business each day. Failure to comply may result in progress payment withholdings.

4.10.7 The Contractor will schedule and coordinate the Work of all sub-contractors on the Project using the critical path method of scheduling. The Contractor will keep the Sub-contractors informed of the Project Construction Schedule to enable the Contractor to plan and perform the Work properly.

## 4.11 RECORDS, DOCUMENTS AND SAMPLES AT THE SITE

4.11.1 The Contractor shall maintain all records of required City, County or State inspections and shall promptly notify the Project Manager of the results of any inspection. Copies of all such records shall be provided to the County upon request.

4.11.2 The Contractor shall secure and maintain required certificates of inspection, testing or approval and shall promptly deliver them to the Project Manager.

4.11.3 The Contractor shall maintain at the Project site, on a current basis, one record copy of all Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to record all changes made during construction, and approved Shop Drawings, Product Data and Samples. These shall be available to the Project Manager and the County, and shall be delivered to the Project Manager for forwarding to the County upon completion of the Project. The Contractor shall advise the Project Manager on a current basis of all changes in the Work made during construction.

4.11.4 Prior to approval of the monthly payment application, Contractor shall review above referenced documents with the Construction Manager to assure compliance. Approval of payment application is contingent upon above referenced records being current.

4.11.5 If the Contractor requests and receives from the Architect electronic copies and/or specifications, Contractor shall provide Record As-built in electronic form at the close of the Project, in the same format as was provided by the Architect to the Contractor.

## 4.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

4.12.1 Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or any Subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

4.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate a material, product or system for some portion of the Work.

4.12.3 Samples are physical examples that illustrate materials, equipment or workmanship, and establish standards by which the work will be judged.

4.12.4 The Contractor shall prepare, review, approve and submit to the Project Manager, with reasonable promptness (not to exceed 90 days from pre-construction conference) and in such sequence as to cause no delay in the Work or in the work of the County or any separate contractor, required Shop Drawings, Product Data and Samples required by the Contract Documents.

4.12.5 By preparing, approving and submitting Shop Drawings, Product Data and Samples, the Contractor represents that the Contractor has determined and verified all materials, field measurements and field construction criteria related thereto, or will do so with reasonable promptness, and has checked and coordinated the information contained within such submittals with the requirements of the Work, the Project and the Contract Documents.

4.12.6 The Contractor shall not be relieved of responsibility for any deviation from the requirements of the Contract Documents by the Architect's review of Shop Drawings, Product Data or Samples under Subparagraph 2.1.6, unless the Contractor has specifically informed the Project Manager in writing of such deviation at the time of submission and the Architect has given written approval to the specific deviation. The Contractor shall not be relieved from responsibility for errors or omissions in the Shop Drawings, Product Data or Samples by the Architect's approval of them.

4.12.7 When professional certification of performance criteria of materials, systems or equipment is required by the Contract Documents, the Architect shall be entitled to rely upon the accuracy and completeness of such calculations and certifications. The cost of such certifications shall be borne by the Contractor. County may elect to have an independent certification performed at its own expense. The County shall have final approving authority for performance-based items.

4.12.8 The Contractor shall direct specific attention, in writing or on resubmitted Shop drawings, Product Data, or Samples, to revisions other than those requested by the Architect on previous submittals.

4.12.9 No portion of the work requiring submission of a Shop Drawing, Product Data or Sample shall be commenced until the submittal has been reviewed by the Architect as provided in Section 013300. All such portions of the Work shall be in accordance with reviewed submittals.

4.12.10 Submission of Shop Drawings and Samples to the Project Manager is required for only those items specifically mentioned in the Specification Sections. If Contractor submits Shop Drawings for items other than the above, the Project Manager will not be obligated to distribute or review them. Contractor shall be responsible for the procuring of Shop Drawings for his own use as he may require for the progress of the Work.

4.12.11 The term "Shop Drawings" as used here also includes but is not limited to fabrication, erection, layout and setting drawings, manufacturer's standard drawings, descriptive literature, catalogs, brochures, performance and test data, wiring and control diagrams, all other drawings and descriptive data pertaining to materials, equipment, piping, duct and conduit systems, and methods of construction as may be required to show that the materials, equipment or systems and the positions and layout of each conform to the Contract

requirements. As used herein the term "manufactured" applies to standard units usually mass-produced and "fabricated" means items specifically assembled or made out of selected materials to meet individual design requirements. Shop Drawings shall establish the actual detail of all manufactured or fabricated items; indicate proper relation to adjoining Work; amplify design details of mechanical and electrical equipment in proper relation to physical spaces in the structure; and incorporate minor changes of design or construction to suit actual conditions.

4.12.12 Drawings: Following Contractor's review and approval, Contractor shall submit to the Project Manager a minimum of four (4) prints of each drawing for approval. The Project Manager will check the submittal to see if it is complete. If complete, the Project Manager will forward the drawings to the Architect. The Architect will check the drawings and affix a stamp to the drawings, a minimum of three (3) prints, indicating the status of acceptance, and will return same to the Contractor, each retaining prints for his records. Comments, if any, will be noted directly on the drawings. The Contractor shall then print and distribute the appropriate number of copies to his subcontractors and job personnel as required. If a drawing is stamped "Rejected", the Contractor shall correct and resubmit as outlined above. When stamped "Implement Exception Noted", or similar instructions, the Contractor shall correct and resubmit for record only, two prints of each drawing.

4.12.13 Samples: Following Contractor's review and approval, Contractor shall submit to the Project Manager, two samples of all materials in quantities and sizes as specified herein. Submittals shall be given to the Project Manager at a time determined by the Contractor, which allows for any necessary re-submittal and which will not cause any delay in the work. Samples will be forwarded to the Architect. If a sample is rejected, one sample noted so will be returned to the Contractor. If a sample is marked "Implement Exceptions Noted", one sample so noted will be returned. Corrected samples shall be resubmitted for approval as per the original submittal.

4.12.14 Brochures: Following Contractor's review and approval, Contractor shall submit to the Project Manager, six (6) copies of all manufacturer's catalogs or brochures as required. Brochures will be forwarded to the Architect for review. If a brochure is stamped "No

Exception Taken", two (2) copies will be returned to the Contractor. If stamped "Rejected", one marked copy and two (2) unmarked copies will be returned. Corrected copies shall be resubmitted for approval as per the original submittal.

4.12.15 Manufacturer's Instructions: Where any item or work is required by Specifications to be furnished, installed or performed in accordance with a specified product manufacturer's instructions, Contractor shall procure and distribute six (6) copies of such instructions to the Project Manager.

4.12.16 When professional certification of performance criteria of materials, systems or equipment is

required by the Contract Documents, and the Architect has no information creating doubt as to the reliability of such certification, the Architect shall be entitled to rely upon the accuracy and completeness of such calculations and certifications. The County shall have final approving authority for performance based items.

4.13 USE OF SITE

4.13.1 The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents, and shall not unreasonably encumber the site with any materials or equipment. The Contractor shall be liable for any and all damage caused by him to County's premises. The Contractor shall hold and save the County, its agents, representatives, and consultant Project Manager and Project Architect, free and harmless and defend them from liability of any nature or kind arising from any use, trespass, or damage occasioned by his operations on premises or third persons.

4.13.2 The Contractor shall coordinate all of the Contractor's operations with, and secure approval from, the Project Manager before using any portion of the site.

4.14 CUTTING AND PATCHING OF WORK

4.14.1 The Contractor shall be responsible for all cutting, fitting or patching that may be required to complete the Work or to make its several parts fit together properly.

4.14.2 The Contractor shall not damage or endanger any portion of the Work or the work of the County or any separate contractors by cutting, patching or otherwise altering any work, or by excavation. The Contractor shall not cut or otherwise alter the work of the County or any separate contractor except with the written consent of the County and of such separate contractor. The Contractor shall not unreasonably withhold from the County or any separate contractor consent to cutting or otherwise altering the Work.

4.14.3 In all cases Contractor shall exercise extreme care in cutting operations, and perform such operations under adequate supervision by competent mechanics skilled in the applicable trade. Openings shall be neatly cut and shall be kept as small as possible to avoid unnecessary damage. Careless and/or avoidable cutting damage, etc., will not be tolerated, and the Contractor will be held responsible for such avoidable or willful damage.

4.14.4 All replacing, patching and repairing of all materials and surfaces cut or damaged in the execution of the Work shall be performed by experienced mechanics of the several trades involved. Such replacing, repairing or patching shall be done with the applicable materials, in such a manner that all surfaces so replaced, etc., will, upon completion of the Work, match the surrounding similar surfaces.

4.14.5 The Contractor is to provide notification to the County of impending work near all existing

facilities, including site work and renovation work in the existing facility if applicable. This will be noted as part of the Contractor's three week look ahead schedule submitted at weekly progress meetings with the County.

4.15 CLEANING UP

4.15.1 The Contractor shall at all times keep the premises free from accumulation of waste materials or rubbish caused by the Contractor's operations. At the completion of the Work, the Contractor shall remove all of Contractor's waste materials and rubbish from and about the Project as well as all the Contractor's tools, construction equipment, machinery and surplus materials.

4.15.2 If the Contractor fails to clean up at the completion of the Work, the County may do so as provided in Paragraph 3.4 and the cost thereof shall be paid by the Contractor.

4.16 ROYALTIES AND PATENTS

4.16.1 The Contractor shall pay all royalties and license fees, shall defend all suits or claims for infringement of any patent rights and shall defend and save the County harmless from loss on account thereof, except that the County shall be responsible for all such loss when a particular design, process or the product of a particular manufacturer or manufacturers is selected by the Project Manager. If the Contractor has reason to believe that the design, process or product selected is an infringement of a patent, that party shall be responsible for such loss unless such information is promptly given to the others.

4.17 INDEMNIFICATION

4.17.1 To the fullest extent permitted by law, the Contractor shall indemnify, hold harmless and defend the County, its agents, employees, Architect and the Architect's Consultants, and Project Manager from and against all claims, damages, losses and expenses arising out of or resulting from the performance of the Work, provided that any such claim, damage, loss or expense (1) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property, including the loss of use resulting therefrom, and (2) is caused in whole or in part by any act or omission of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable. Such obligation shall not be construed to negate, abridge or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any party or person described in this Paragraph 4.17.

4.17.2 In any and all claims against the County, the Project Manager and Architect and the Architect's Consultants, or any of their agents or employees by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under this

Paragraph 4.17 shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under workers' or workmen's compensation acts, disability benefit acts or other employee benefit acts.

4.17.3 The obligations of the Contractor under this Paragraph 4.17 shall not extend to the liability of the Project Manager or Architect, their agents or employees, arising out of (1) the preparation or approval of maps, drawings, opinions, reports, surveys, Change Orders, designs or specifications, or (2) the giving of or the failure to give directions or instructions by the Project Manager, their agents or employees, provided such giving or failure to give directions is the primary cause of the injury or damage.

4.18 NONDISCRIMINATION CLAUSE

4.18.1 During the performance of this work, Contractor and its Subcontractors shall not deny benefits to any person on the basis of religion, color, ethnic group identification, sex, age, physical or mental disability, nor shall they unlawfully discriminate, harass or allow harassment, against any employee or applicant for employment because of sex, race, color, ancestry, religious creed, national origin, disability (including HIV and AIDS), medical condition (cancer), age (over 40), marital status, or other protected status, nor deny family care leave and or pregnancy disability leave in connection with any program or activity funded in whole or in part by Federal and/or State funds provided through this work.

4.18.2 Contractor and its Subcontractor shall insure that the evaluation and treatment of their employees and applicants for employment are free from such discrimination and harassment. Contractor and all Subcontractors shall comply with the provisions of the California Fair Employment and Housing Act (Government Code section 12990 et seq.) and the applicable regulations promulgated thereunder.

4.18.3 The applicable regulation of the Fair Employment and Housing Commission implementing Government Code section 12990, set forth in Chapter 5 of Division 4 of Title 2 of the California Code of Regulation are incorporated into this contract by reference and made a part hereof as if set forth in full. Contractor and its Subcontractors shall give written notice of their obligations under this clause to labor organizations with which they have a collective bargaining or other agreement.

4.18.4 Contractor shall comply with all applicable nondiscrimination laws and regulations.

4.18.5 The Contractor and its Subcontractor shall include the nondiscrimination and compliance provisions of this clause in all contractors and subcontracts to perform work under this contract.

## ARTICLE 5
## SUBCONTRACTORS

5.1 DEFINITION

5.1.1 A Subcontractor is a person or entity that has a direct contract with the Contractor to perform any of the Work at the site. The term Subcontractor means a Subcontractor or a Subcontractor's authorized representative. The term Subcontractor does not include any separate contractor or any separate contractor's subcontractors.

5.1.2 A subcontractor is a person or entity that has a direct or indirect contract with a subcontractor to perform any of the work at the site. The term subcontractor means a subcontractor or an authorized representative thereof.

5.2 AWARDS OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

5.2.1 The Contractor shall only use subcontractors included in its sealed bid unless a substitution is first approved by the County pursuant to statute.

5.2.2 The Contractor shall not use any subcontractor who is ineligible to perform work on a Public Works Project pursuant to section 1777.1 or 1777.7 of the Labor Code.

5.3 SUBCONTRACTUAL RELATIONS

5.3.1 By an appropriate agreement, written where legally required for enforceability, the Contractor shall require each Subcontractor, to the extent of the work to be performed by the Subcontractor, to be bound to the Contractor by the terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities which the Contractor, by these Documents, assumes toward the County and the Project Manager. Said agreement shall preserve and protect the rights of the County and the Project Manager under the Contract Documents with respect to the work to be performed by the Subcontractor so that the subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the Contractor-Subcontractor Agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by these Documents, has against the County. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with their Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the Subcontract, copies of the Contract Documents to which the Subcontractor will be bound by this Paragraph 5.3, and identify to the Subcontractor any terms and conditions of the proposed Subcontract which may be at variance with the Contract Documents. Each Subcontractor shall similarly make copies of such Documents available to their Sub-subcontractors. Nothing contained herein shall be

deemed to create an agency relationship between the County and any Subcontractor or material supplier.

5.3.2 The submission or addition of Subcontractors shall be permitted only as authorized by Public Contracts Code Section 4100, et. seq. The Subcontractors employed by the Contractor shall be appropriately licensed in conformity with the laws of the State of California.

5.3.3 Nothing contained in this Contract shall create any contractual relationship between any Subcontractor and the County nor create any contractual relationship between any Subcontractor and the Project Manager or the Project Architect.

5.3.4 Jurisdictional disputes between Subcontractors or between Contractor and Subcontractor shall not be mediated or decided by the County, Architect or the Project Manager. The Contractor shall be responsible for the resolution of all such disputes based upon his contractual relationship with his Subcontractors.

## ARTICLE 6
## WORK BY COUNTY OR BY SEPARATE CONTRACTORS

6.1 COUNTY'S RIGHT TO PERFORM WORK AND TO AWARD SEPARATE CONTRACTS

6.1.1 The County reserves the right to perform work related to the Project with the County's own forces, and to award separate contracts in connection with other portions of the Project or other work on the site under these or similar Conditions of the Contract. If the Contractor claims that delay, damage or additional cost is involved because of such action by the County, the Contractor shall make such claim as provided elsewhere in the Contract Documents.

6.1.2 When separate contracts are awarded for different portions of the Project or other work on the site, the term Contractor in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

6.1.3 The County shall provide for coordination of the activities of the County's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the County in reviewing their construction schedules when directed to do so. The Contractor shall make any revisions to the construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the County until subsequently revised.

6.1.4 Unless otherwise provided in the Contract Documents, when the County performs construction or operations related to the Project with the County's own forces, the County shall be deemed to be subject to the same obligations and to have the same rights which apply to the Contractor under the Conditions of the Contract including, without excluding others, those stated in Article 4, this Article 6 and Articles 10, 11 and 13.

6.2 MUTUAL RESPONSIBILITY

6.2.1 The Contractor shall afford the County and separate contractor's reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

6.2.2 When any part of the Contractor's Work depends for proper execution or results upon the work of the County or any separate contractor, the Contractor shall, prior to proceeding with the Work, promptly report to the Project Manager any apparent discrepancies or defects in such other work that render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acceptance of the County's or separate contractor's work as fit and proper to receive the Work, except as to defects that may subsequently become apparent in such work by others.

6.2.3 If, following the reporting of any discrepancy or defect as required in subparagraph 6.2.2 above, the Contractor suffers damage due to disruption or delay caused by the separate contractor, without fault by the County, the Contractor's remedy shall be limited to seeking recovery from the separate contractor.

6.2.4 Any costs caused by defective or ill-timed work shall be borne by the Contractor responsible therefore.

6.2.5 Should the Contractor cause damage to the work or property of the County, or to other work or property on the site, the Contractor shall promptly remedy such damage as provided in Subparagraph 10.2.5.

6.2.6 Should the Contractor wrongfully delay or cause damage to the work or property of any separate contractor, the Contractor shall, upon due notice, promptly attempt to settle with such other contractor by agreement, or otherwise to resolve the dispute. If such separate contractor sues the County on account of any delay or damage alleged to have been caused by the Contractor, the County shall notify the Contractor who shall defend such proceedings, and if any judgment or award against the County arises, the Contractor shall pay or satisfy it and shall reimburse the County for all costs which the County has incurred.

6.3 COUNTY'S RIGHT TO CLEAN UP

6.3.1 If a dispute arises between the Contractor and separate contractors as to their responsibility for cleaning up as required by Paragraph 4.15, the County may clean up and the contractor responsible therefore shall pay County such portions of the cost thereof as the Project Manager shall determine to be just.

## ARTICLE 7
## MISCELLANEOUS PROVISIONS

7.1 GOVERNING LAW

7.1.1 The Contract shall be governed by the law of the State of California.

7.2 SUCCESSORS AND ASSIGNS

7.2.1 The County and the Contractor, respectively, bind themselves, their partners, successors, assigns and legal representatives to the other party and to the partners, successors, assigns and legal representatives of such other party with respect to all covenants, agreements and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract or sublet it as a whole without the written consent of the other

7.3 WRITTEN NOTICE

7.3.1 Written notice shall be deemed to have been duly served if delivered in person to the individual or member of the firm or entity or to an officer of the corporation for whom it was intended, or if delivered at or sent by registered or certified mail to the person and address shown in Article 7 of the Agreement.

7.4 CLAIMS AND DISPUTES RESOLUTION

7.4.1 A Claim is a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension of time, arising out of or relating to the Contract or a request for equitable adjustment or Change Order which cannot be resolved per provisions of Article 12. Any Claim shall be reduced to writing and filed with the CPM Division Manager, Solano County (or his/her designee), within twenty calendar days after the Contractor has notice of the condition giving rise to the Claim, and final action per Article 12 procedures has taken place or has been declared as such in writing, by either party. Such twenty-day notice of an asserted claim is in addition to the requirement for prompt notice required per Paragraph 12.3.

7.4.2 The Contractor shall not claim or recover any overhead cost administrative or otherwise, particularly 'Home Office' expenses, 'Extended site overhead', or any other overhead cost on the basis of any 'Home Office' damages formula, 'Eichleay' formula, 'Total Cost' recovery formula or any other such formula.

7.4.3 The Contractor shall have no claim for damages or compensation for any delay or hindrance. Contractor shall make any claims in writing within the time set forth above, for any unreasonable delay or hindrance caused by County, and specifying the cause thereof as required in **7.4.4 below.**

7.4.4 REQUIREMENTS FOR FILING A CLAIM: Claims must be filed within the time specified in 7.4.1 above, but in no event later than the date of final payment. Claims shall be submitted to the CPM Division Manager, Solano County (or his/her designee). The claim shall be in writing and shall be sum certain if known. If unknown, Contractor shall specify the basis for establishing the sum certain. Claim shall include a statement of the reasons for the asserted entitlement, and include the documents necessary to substantiate the claim. Such documents may include but are not limited to payroll records, purchase orders, quotations, invoices, estimates, subcontracts, daily logs, supplier contracts, subcontract billings, bid takeoffs, equipment rental invoices, ledgers, journals, daily reports, job diaries, and any documentation related to the requirements of Article 12. In the case of a continuing delay, only one claim is necessary. If adverse weather conditions are the basis for a claim for additional time, such claim shall be documented by data substantiating that weather conditions were abnormal for the period of time and could not have been reasonably anticipated, and that weather conditions had an adverse effect on the critical activities on the construction schedule. The Contractor shall certify, at the time of submission of a claim, as follows:

> "I certify under penalty of perjury under the laws of the State of California, that the foregoing claim is made in good faith, that the supporting data are accurate, and in my opinion, justify the contract adjustments requested.
>
> By:_____
>
> (Contractor's signature)

Nothing in this subdivision is intended to extend the time limit or supersede notice requirements otherwise provided by contract for the filing of claims. For any claim subject to this Article 7.4, the following requirements apply:

.1 For claims of less than fifty thousand dollars ($50,000), the County's CPM Division Manager shall review the facts pertinent to the claim, obtain additional information deemed necessary for a decision (if any), review recommendations of the Project Manager, coordinate with the contract administrator (if any) and secure assistance

from legal and other advisors, and render a written decision on the claim within 45 days of receipt of the claim. If additional information is thereafter required, it shall be requested and provided pursuant to this subdivision, upon mutual agreement of the CPM Division Manager and claimant. The CPM Division Manager's written response to the claim, as further documented, shall be submitted to the claimant within 15 days after receipt of the further documentation or within a period of time no greater than that taken by the claimant in producing the additional information, whichever is greater.

.2 For claims of over fifty thousand dollars ($50,000) and less than or equal to three hundred seventy-five thousand dollars ($375,000), the CPM Division Manager shall review the facts pertinent to the claim, obtain additional information deemed necessary for a decision (if any), review recommendations of the Project Manager, coordinate with the contract administrator (if any) and secure assistance from legal and other advisors, and render a written decision on the claim within 60 days of receipt of the claim, or may request, in writing, within 30 days of receipt of the claim, any additional documentation supporting the claim or relating to defenses or claims the County may have against the claimant. If additional information is thereafter required, it shall be requested and provided pursuant to this subdivision, upon mutual agreement of the County, Project Manager, and the claimant. The CPM Division Manager's written response to the claim, as further documented, shall be submitted to the claimant within 30 days after receipt of the further documents, or a period of time no greater than that taken by the claimant in producing the additional information or requested documentation, whichever is greater.

.3 If the claimant disputes the written response of the CPM Division Manager, or fails to respond within the time prescribed, the claimant may so notify the County Administrative Officer, in writing, either within 15 days of receipt of the CPM Division Manager's response or within 15 days of the CPM Division Manager's failure to respond within the time prescribed, respectively, and demand an informal conference to meet and confer for settlement of the issues in dispute. Upon a demand, the CPM Division Manager (or his/her designee) shall schedule a meet and confer conference within 30 days for settlement of the dispute.

.4 Within 10 business days following the meet and confer conference, County shall provide a written statement identifying the portion of the claim that remains in dispute. Any payment due on the undisputed portion of the claim will be made within 60 days of the meet and confer conference.

.5 Following the meet and confer conference, if a portion remains in dispute, the disputed portion, as identified by the Contractor in writing, shall be submitted to nonbinding mediation, with the costs of the nonbinding mediation shared equally by Contractor and County. County and Contractor shall mutually agree to a mediator within 10 business days after the disputed portion of the claim has been identified in

writing. If the parties cannot agree upon a mediator, each party shall select a mediator and those mediators shall select a qualified neutral third party to mediate the disputed portion of the claim. Each party shall bear the fees and costs charged by its respective mediator in connection with the selection of the neutral mediator.

.6 If the mediation is unsuccessful and the claim or any portion remains in dispute, the claimant may file a claim pursuant to Chapter 1 (commencing with Section 900) and Chapter 2 (commencing with Section 910) of Part 3 of Division 3.6 of Title 1 of the Government Code. For purposes of those provisions, the running of the period of time within which a claim must be filed shall be tolled from the time the claimant submits his or her written claim pursuant to subdivision (a) until the time the claim is denied, including any period of time utilized by the meet and confer conference.

7.4.5 CLAIMS AND DISPUTES EXEMPT FROM FILING REQUIREMENTS: The procedures and remedies provided in this Article 7.4 do not apply to:

.1 Any claims by the County;

.2 Any claim for or respecting personal injury or death or reimbursement or other compensation arising out of or resulting from liability for personal injury or death;

.3 Any claim or dispute relating to stop payment requests or stop notices; and

.4 Any claim related to the approval, refusal to approve, or substitution of subcontractors, regardless of tier, and suppliers.

7.4.6 PAYMENT OF UNDISPUTED PORTION OF CLAIM: County shall pay claimant such portion of a claim that is undisputed except as otherwise provided in the contract.

7.4.7 CONTINUE WORK DURING DISPUTE: In the event of any dispute between the County and the Contractor, the Contractor will not stop work but will prosecute the work diligently to completion in his manner directed by the County, and the dispute shall be resolved by a court of law after completion of the Work. However, Contractor must submit all disputes in accordance with the provisions of Article 7.4.

7.4.8 SUIT IN SOLANO COUNTY ONLY: Any litigation arising out of this Contract shall be brought in Solano County and Contractor waives the removal provisions of California Code of Civil Procedure section 394.

## 7.5 PERFORMANCE BOND, LABOR AND MATERIAL PAYMENT BOND AND WARRANTY BOND

7.5.1 The Contractor shall furnish Performance Bond in the amount of 100% of the Contract amount, Payment Bond in the amount of 100% of the Contract amount and One Year Warranty Bond in the Amount of 10% of the final Contract Amount.

7.5.2 All bonds required, whether Bid bonds, Performance, Payment, Warranty or other bonds, shall be issued by an admitted surety insurer. **The Bid Bond, Performance Bond, Payment Bond, and Warranty Bond must be issued by the same admitted surety insurer.** The payment, performance and warranty bonds required by these specifications will neither be accepted nor approved by the County unless the bonds are underwritten by an admitted surety and the requirements of California Code of Civil Procedure section 995.630 are met. The County further reserves the right to satisfy itself as to the acceptability of the surety and the form of bond. Upon request of the County, the bidder must submit the following documents:

.1 The original, or a certified copy, of the unrevoked appointment, power of attorney, bylaws, or other instrument authorizing the person who executed the bond to do so.

.2 A certified copy of the certificate of authority of the insurer issued by the California Insurance Commissioner.

.3 A certificate from the county clerk that the certificate of authority has not been surrendered, revoked, canceled, annulled, or suspended, or in the event that it has, that renewed authority has been granted.

.4 A financial statement of the assets and liabilities of the insurer to the end of the quarter calendar year prior to 30 days next preceding the date of the execution of the bond, in the form of an officers' certificate as defined in Corporations Code § 173.

## 7.6 RIGHTS AND REMEDIES

7.6.1 The duties and obligations imposed by the Contract Documents and the rights and remedies available shall be in addition to, and not a limitation of, any duties, obligations, rights and remedies otherwise imposed or available by law.

7.6.2 No action or failure to act by the County, the Project Manager, the Architect or the Contractor shall constitute a waiver of any right or duty afforded any of them under the contract, nor shall any such action or failure to act constitute an approval of or acquiescence in any breach, except as may be specifically agreed in writing.

7.7 TESTS AND INSPECTION

7.7.1 Any public authority having jurisdiction over the Project or funds used for the Project shall at all times have access for the purpose of observation to all parts of the Work and to all shops wherein the work is in preparation. The Contractor shall cooperate and furnish such facilities and assistance as needed for the County and County's agents.

7.7.2 Where the Contract Documents, instructions by the County, laws, ordinances, or any public authority having jurisdiction, requires Work to be inspected, tested or approved before work proceeds, such Work shall not proceed, nor shall it be covered up without inspection.

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7.7.3 The Contractor shall give notice to the Project Manager and County a minimum of two (2) days in advance of the readiness for any Contract compliance inspection by the County Inspector of Record or any other inspector required by statute. The Contractor shall give notice as required by all other inspecting and testing agencies of jurisdiction for Code and regular compliance inspection. In all cases, the Contractor shall schedule inspections so as not to delay the Work.

7.7.4 If the Project Manager determines that any Work requires special inspection, testing or approval which Subparagraph 7.7.1 does not include, the Project Manager will, upon written authorization from the County, instruct the Contractor to order such special inspection, testing or approval, and the Contractor shall give notice as provided in Subparagraph 7.7.3. If such special inspection or testing reveals a failure of the Work to comply with the requirements of the Contract Documents, the Contractor shall bear all costs thereof, including compensation for the Project Manager's additional services, testing or inspections made necessary by such failure; otherwise the County shall bear such costs, and an appropriate Change Order shall be issued.

7.7.5 Required certificates of inspection, testing or approval shall be secured by the Contractor and the Contractor shall promptly deliver them to the Project Manager.

7.7.6 If the Project Manager wishes to observe the inspections, tests or approvals required by the Contract Documents, Project Manager will do so promptly and, where practicable, at the source of supply.

## ARTICLE 8
## TIME

8.1 DEFINITIONS

8.1.1 Unless otherwise provided, the Contract Time is the period of time allotted in the Contract Documents for Substantial Completion of the Work as defined in Subparagraph 8.1.3, including authorized adjustments to it.

8.1.2 The date of commencement of the Work is the date established in a Notice to Proceed. If there is no Notice to Proceed, it shall be such other date as may be established in the Owner-Contractor Agreement or elsewhere in the Contract Documents.

8.1.3 The Date of Substantial Completion of the Work or designated portion thereof is the Date certified by the Project Manager when construction is sufficiently complete, in accordance with the Contract Documents, so that the County or separate contractors can occupy or utilize the Work or a designated portion thereof for the use for which it is intended.

8.1.4 The term “day” as used in the Contract Documents shall mean calendar day unless specifically designated otherwise.

8.2 PROGRESS AND COMPLETION

8.2.1 All time limits stated in the Contract Documents are of the essence of the Contract.

8.2.2 The Contractor shall begin the Work on the date of commencement as defined in Subparagraph 8.1.2.

8.2.3 The Contractor shall carry the Work forward expeditiously with adequate forces and shall achieve Substantial Completion of the Work within the Contract Time.

8.3 DELAYS AND EXTENSIONS OF TIME

The Contractor shall not be granted a Contract Time extension except on the issuance of a Change Order by the CPM Division Manager and County Administrative Officer, or the Board of Supervisors, upon a finding that the delay in completion was unavoidable.

Delays in prosecution of parts or classes of the Work that are not demonstrated to prevent or delay completion of the entire Project or specific milestones within the Contract Time are not "unavoidable delays" for purposes of this section.

In all cases, the time authorized for extension of the Contract Time shall be no greater than the number of days directly attributable to the unavoidable delay which cause delay in the completion of the Project. Contractor shall be entitled, in the case of unavoidable delays, to an extension in the Contract time, but not the Contract price. "Unavoidable delay" for this purpose shall be defined as follows:

A. Unavailable Materials. That materials or articles called for in the Contract Documents are not obtainable within the time required for timely completion; provided that such materials or articles were listed by the Contractor in the schedule required by Section 4.10.2 and Division 1 - General Requirements Section 01 60 00/ Materials and Equipment hereinabove;

that the Contractor demonstrates that the unavailability of the materials is in fact the cause for the delay, and could not have been procured by adjusting the Construction Schedule; and that the unavailability of such materials is due to circumstances beyond the Contractor's control. If good cause for delay is demonstrated pursuant to this subsection, the County, at its sole discretion, may grant a time extension.

B. Force Majeure. That delays in construction have resulted from circumstances beyond the control of the Contractor and which the Contractor could not have provided against by the exercise of reasonable care, prudence, foresight, and diligence. Unavoidable delays within the meaning of this subparagraph shall be those caused by the acts of God, war, insurrection, civil disorder, fire, floods, epidemic, or strikes.

C. Unseasonable Weather. An extension of time may be granted due to weather which is unsuitable for the Work currently in progress, upon the findings that the weather conditions in fact caused the delay in completion of the Project and that such weather conditions were not, and could not in the exercise of reasonable diligence, have been foreseen by the Contractor. Seasonable weather that, in the exercise of reasonable foresight and diligence, should be expected in the area at the time of year in question is not cause for an extension of time.

D. Time Extensions Due to Change Orders or Work Authorizations. A time extension may be granted due to additional work that results in a delay in the Project caused by the approval by the County of a Change Order or Work Authorization. The Contractor shall be entitled to a time extension Change Order only when the extra Work is demonstrated by the Contractor to have caused a delay in the Project.

E. County Caused Delays. In the event that the Project is delayed by acts of the County, not authorized by the Contract Documents, which the Contractor demonstrates will or have caused an unavoidable delay as defined in Subparagraph B, the Contractor shall be entitled to a Contract Time Change Order to offset the extra time incurred by the Contractor. The Contractor will not be entitled to adjustments in the contract price. Extra time shall be limited to that which is directly identified as critical by the delay.

The Contractor specifically agrees that a time extension as provided herein is its sole remedy for County-caused delays, and agrees to make no claim or demand for additional damages, nor claim an acceleration of the time for performance.

The Contractor shall not be entitled to any Contract Time extension nor Contract Price adjustment for alleged County delays if the County has acted within the time limits specified by the Contract Documents.

8.3.1 NOTICE OF DELAYS

Whenever the Contractor foresees any delay in the prosecution of the Work, and in any event immediately upon the occurrence of any delay which the Contractor regards as grounds for an extension, the Contractor shall notify the Project Manager in writing of the delay. Such notification shall specify with detail the cause asserted by the Contractor to constitute grounds for an extension. Failure of the Contractor to submit such a notice within ten (10) days after the initial occurrence of the event-giving rise to the delay shall constitute a waiver by the Contractor of any request for a time extension, **and no extension shall be granted as a consequence of such delay.**

With its request for time extension, the Contractor shall submit evidence to demonstrate that the delay in prosecution in the Work will result in an unavoidable delay in completion of the entire Project. Such evidence shall include a demonstration that the delayed portion of the Work will affect the Critical Path Scheduling of the entire Project. The Contractor shall also submit a proposed revised Project Schedule, which accounts for the delay in completion of the entire Project caused by the delay in progression of part of the Project, and includes a revised Critical Path demonstrating how the Project will be completed within the proposed revised Contract Time.

8.3.2 INVESTIGATION; PROCEDURE

Upon receipt of a request for Contract Time extension, the Project Manager shall conduct an investigation of the facts asserted by the Contractor to constitute grounds for an extension. The results of this investigation shall be reported by the Project Manager to the Contractor and shall indicate whether he/she will recommend for or against such extension to the County's representative. The performance of this investigation by the Project Manager shall not be construed in any way as direction or recommendation to the Contractor regarding scheduling of the work. Scheduling this work is the sole responsibility of the Contractor.

The Project Manager may, in his/her sole discretion, defer this recommendation to allow the accumulation of time extensions due to Work Authorizations into a periodic or final Change Order request.

Upon receiving the Project Manager's recommendation to the CPM Division Manager regarding the Contractor's request for a time extension, the Contractor may either withdraw its application for extension or request that it be scheduled for action by the Board of Supervisors, or the CPM Division Manager and County Administrative Officer. If the Board of Supervisors or CPM Division Manager and the County Administrative Officer disallow the request, there shall be no allowance made for the time during which the request was pending, and the Contractor shall remain obligated to complete the Work in the time specified.

If the Board of Supervisors or the CPM Division Manager and County Administrative Officer approves the time extension Change Order, the new Progress Schedule submitted by the Contractor and approved by the County shall be deemed to amend the original Progress Schedule approved by the County; thereafter, the amended Progress Schedule shall have the same force and effect as the originally approved Progress Schedule.

The revised progress schedule must be submitted within seven (7) calendar days of when the Board of Supervisors or CPM Division Manager and the County Administrative Officer approves the change.

The Contractor agrees that the determination of the Board of Supervisors or the CPM Division Manager and the County Administrative Officer as to whether grounds for an extension exist, and if so, the duration of the extension shall be final and binding upon both County of Solano and Contractor.

8.3.3 DISCRETIONARY TIME EXTENSION FOR BEST INTEREST OF COUNTY

The County reserves the right to extend the Contract Time for completion of the Work if the Board of Supervisors determines that such extension is in the best interest of the County.

In the event that such discretionary extension is made at the request of the Contractor, the County shall have the right to charge to the Contractor all or any part, as the Board may deem proper, of the actual cost to the County for engineering, inspection, supervision, contract administration, incidental and other overhead expenses that accrue during period of such extension, and to deduct all or any portion of such amounts from the final payment for the Work.

In the event such extension is ordered over the objection of the Contractor, the Contractor shall be entitled to a Change Order adjusting the price paid to reflect the actual costs incurred by the Contractor as a direct and proximate result of the delay, upon his written application, accompanied by such verification of costs as the Project Manager requires. Only additional direct costs incurred at the site will be reimbursable by Change Order.

8.3.4 LIQUIDATED DAMAGES

Revised per ADD3

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If the Work is not completed by Contractor in the time specified in Article 3 of the Agreement for Construction 00 52 00 or within any period of extension authorized pursuant to this Article, the Contractor acknowledges and admits that the County will suffer damage, and that it is impracticable and infeasible to fix the amount of actual damages. Therefore, it is agreed by and between the Contractor and the County that the Contractor shall pay to the County as fixed and liquidated damages, and not as a penalty,

Revised per ADD3

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the sum specified in Section 00 73 00 Supplementary Conditions for each calendar day of delay until the Work is completed and accepted, and that both the Contractor and the Contractor's surety shall be liable for the total amount, and that the County may deduct said sums from any monies due or that may become due to the Contractor.

This liquidated damages provision shall apply to all delays of any nature whatsoever, save and except only unavoidable delays approved by the Board of Supervisors or the CPM Division Manager and the County Administrative Officer pursuant to Section 8.3, or discretionary time extensions approved by the Board of Supervisors or the CPM Division Manager and the County Administrative Officer pursuant to Section 8.3.3.

8.3.5 EXTENSION OF TIME NOT A WAIVER

Any extension of the Contract Time granted pursuant to this Article shall not constitute a waiver by the County, nor a release of the Contractor, from his obligations to perform this Contract in the Contract Time.

Granting of a time extension due to one circumstance on one request shall not constitute a granting by the County of an extension of time for any other circumstance or the same circumstance occurring at some other time, and shall not be interpreted as a precedent for any other request for extension.

## ARTICLE 9
## PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

9.1.1 The Contract Sum is stated in the Owner-Contractor Agreement and, including authorized adjustments to it, is the total amount payable by the County to the Contractor for the performance of the Work under the Contract Documents.

9.2 SCHEDULE OF VALUES

9.2.1 Before the first Application for Payment, and within fifteen days of the Notice to Proceed, the Contractor shall submit to the Project Manager a Schedule of Values allocated to the various portions of the Work, prepared in such form and supported by such data to substantiate its accuracy as the Project Manager may require. This schedule, unless objected to by the Project Manager, shall be used only as a basis for the Contractor's Applications for Payment.

9.3 APPLICATIONS FOR PAYMENT

9.3.1 At least fifteen working days before the date for each progress payment established in the Owner-Contractor Agreement, the Contractor shall submit to the Project Manager an itemized Application for Payment, notarized if required, supported by such data substantiating the Contractor's right to payment as the County or the Project Manager may require, and reflecting retainage, if any, as provided elsewhere in the Contract Documents. AIA Documents G702, Application and Certificate for Payment and G703/CMA, Continuation Sheet, or other substitute form supplied and required by the County shall be used. Payment is expressly conditioned upon submission by the Contractor of conditional waivers and release of lien rights upon progress payment as the County or the Project Manager may require. Waiver and Release forms must be submitted on forms provided or approved by the County of Solano. Copies of said forms shall comply with Civil Code § 8132 et seq.

9.3.2 Unless otherwise provided in the Contract Documents, payments may be made on account of materials or equipment not incorporated in the Work but delivered and suitably stored at the site and, if approved in advance by the County, payments may similarly be made for materials or equipment suitably stored at some other location agreed upon in writing. Payments for materials or equipment stored on or off the site shall be conditioned upon submission by the Contractor of bills of sale or such other procedures satisfactory to the County to establish the County's title to such materials or equipment or otherwise protect the County's interest, including applicable insurance and transportation to the site for those materials and equipment stored off the site.

9.3.3 The Contractor warrants that title to all Work, materials and equipment covered by an Application for Payment will pass to the County either by incorporation in the construction or upon receipt of payment by the Contractor, whichever occurs first, free and clear of all liens, stop notices, claims, security interest or encumbrances, hereinafter referred to in this Article 9 as "liens"; and that no Work, materials or equipment covered by an Application for Payment will have been acquired by the Contractor, or by any other person performing Work at the site or furnishing materials and equipment for the Project, subject to an agreement under which an interest or an encumbrance is retained by the seller or otherwise imposed by the Contractor or such other person.

9.3.4 Progress Payments: The Contractor shall, on or before the first day of each month, make an estimate of the work performed during the preceding month and submit an itemized Application for Payment, notarized if required, supported by such data substantiating the Contractor's right to payment as the County or the Project Manager may require, including appropriate updates to the CPM Construction Schedule, and reflecting retainage, if any, as provided elsewhere in the Contract Documents. The Contractor will assemble the Application and forward it to the Project Manager within seven days for checking and

approval. On or about the 20th day of the month following the month in which the work was performed, the County shall pay to the Contractor ninety-five (95%) percent of the value of said work in place, as checked and approved by the Project Manager. The balance of five (5%) percent of the estimate shall be retained by the County until the time of final acceptance of said work. In lieu of the five (5%) percent retainage, the Contractor may substitute securities as provided in Article 9.3.5 below. The Contractor may apply to reduce said rate of retainage as set forth in Article 5 of the Owner-Contractor Agreement.

.1 If the County does not pay the Contractor within thirty days after receipt of an undisputed and properly submitted payment request for a progress payment, excluding that portion of the final payment designated by the contract as retention earnings, then the County shall pay interest to the Contractor as provided by Public Contract Code § 20104.50. Said interest penalty is the sole recourse of Contractor and Contractor shall have no right to stop the Work until payment of the amount owing has been received, nor shall the Contract Time be extended, nor shall the Contract Sum be increased in any way, including by reason of any costs incurred by Contractor, except to the extent of said interest payment.

.2 Pursuant to Public Contract Code § 7107, in the event of a dispute between the County and Contractor, the County may withhold from the final payment an amount not to exceed 150 percent of the disputed amount. Except as so provided, the County shall release the retention withheld within 60 days after the date of completion of the work of improvement, as "completion" is defined in Public Contract Code § 7107. In the event that retention payments are not made within the time periods required by Public Contract Code § 7107, the County may be subject to the interest provisions of Public Contract Code § 7107.

9.3.5 Security Substitutions and Escrow for Moneys Withheld to Insure Contractor's Performance: Pursuant to Public Contract Code section 22300, the Contractor may deposit in an escrow, equivalent securities for any moneys withheld to insure performance and have said moneys paid directly to Contractor, or, in the alternative, have the County deposit such moneys directly into an escrow. Upon the closing of any such escrow, Contractor shall pay to each subcontractor, not later than 20 days after receipt of the closing payment, the respective amount of interest earned, net of costs attributed to retention withheld from each subcontractor, on the amount of retention withheld to insure the performance of the Contractor. Any escrow established pursuant to this article shall be with a state or federally chartered bank, shall be at the sole expense of the Contractor, and shall be established using an escrow agreement in substantially the following form:

**ESCROW AGREEMENT FOR**
**SECURITY DEPOSITS IN LIEU OF RETENTION**

This Escrow Agreement is made and entered into by and between the County of Solano, (hereinafter called "County"), _____ (hereinafter called "Contractor"); and _____, a state or federally chartered bank in California, (hereinafter called "Escrow Agent").

For the consideration hereinafter set forth, the County, Contractor, and Escrow Agent agree as follows:

1. Pursuant to Section 22300 of the Public Contract Code of the State of California, Contractor has the option to deposit securities with Escrow Agent as a substitute for retention earnings required to be withheld by County pursuant to the Construction Contract entered into between the County and Contractor for _____ in the amount of $_____, and dated _____ (hereinafter referred to as the "Contract"). Alternatively, on written request of the contractor, the County shall make payments of the retention earnings directly to the Escrow Agent. When Contractor deposits the securities as a substitute for Contract earnings, the Escrow Agent shall notify the County within ten (10) days of the deposit. The market value of the securities at the time of the substitution, as valued by the County, shall be at least equal to the cumulative total cash amount then required to be withheld as retention under the terms of the contract between County and Contractor. If the County determines that the securities are not adequate it will notify Contractor and Escrow Agent, and Contractor shall deposit additional security as further determined by the County. Securities shall be held in the name of the County and shall designate the Contractor as the beneficial owner.

2. Upon the deposit of adequate securities, County shall make progress payments to the Contractor for such funds which otherwise would be withheld from progress payments pursuant to the Contract provisions, provided that the Escrow Agent holds securities in the form and amount specified above.

3. When the County, at Contractor's written request, makes payment of retentions earned directly to the Escrow Agent, the Escrow Agent shall hold them for the benefit of the contractor until such time as the escrow created under this contract is terminated. The Contractor may direct the investment of the payments into securities. All terms and conditions of this agreement and the rights and responsibilities of the parties shall be equally applicable and binding when the County pays the Escrow Agent directly.

4. Contractor shall be responsible for paying all fees for the expenses incurred by Escrow Agent in administering the Escrow Account and all expenses of the County. The County, Contractor and Escrow Agent shall determine these expenses and payment terms.

5. The interest earned on the securities or the money market accounts held in escrow and all interest earned on that interest shall be for the sole account of Contractor and shall be subject to withdrawal by Contractor at any time and from time to time without notice to the County.

6. Contractor shall have the right to withdraw all or any part of the principal in the Escrow Account only by written notice to Escrow Agent accompanied by written authorization from County to the Escrow Agent that County consents to the withdrawal of the amount sought to be withdrawn by Contractor.

7. The County shall have the right to draw upon the securities or any amount paid directly to Escrow Agent in the event of default by the Contractor. Upon seven (7) days written notice to the Escrow Agent from the County of the default, the Escrow Agent shall immediately convert the securities to cash and shall distribute the cash, including any amounts paid directly to Escrow Agent, as instructed by the County.

8. Upon receipt of written notification from the County certifying that the Contract is final and complete, and that the Contractor has complied with all requirements and procedures applicable to the Contract, Escrow Agent shall release to Contractor all securities and interest on deposit less escrow fees and charges of the Escrow Account. The escrow shall be closed immediately upon disbursement of all moneys and securities on deposit and payment of fees and charges.

9. Escrow Agent shall rely on the written notifications from the County and Contractor pursuant to Sections (5) to (8), inclusive of this Agreement and the County and Contractor shall hold Escrow Agent harmless from Escrow Agent's release and disbursement of the securities and interest as set forth above.

10. The names of the persons who are authorized to give written notice or to receive written notice on behalf of the County and on behalf of Contractor in connection with the foregoing, and exemplars of their respective signatures are as follows:

**On behalf of County:**

Title: CPM Division Manager
Name: Mark A. Hummel
Signature: _____
Address: 675 Texas Street, Suite 2500
Fairfield, CA 94533

**On behalf of Contractor:**

Title: _____
Name: _____
Signature: _____
Address: _____

**On behalf of Escrow Agent:**

Title: _____
Name: _____
Signature: _____
Address: _____

At the time the Escrow Account is opened, the County and Contractor shall deliver to the Escrow Agent a fully executed counterpart of this Agreement.

IN WITNESS WHEREOF, the parties have executed this Agreement by their proper officers on the date first set forth above.

**On behalf of County:**

Title: CPM Division Manager
Name: Mark A. Hummel
Signature: _____
Address: 675 Texas Street, Suite 2500
Fairfield, CA 94533

**On behalf of Contractor:**

Title: _____
Name: _____
Signature: _____
Address: _____

**On behalf of Escrow Agent:**

Title: _____
Name: _____
Signature: _____
Address: _____

9.3.6 Itemized Breakdown: The Contractor shall submit a financial breakdown of the work, itemized by crafts or sections as designated by the Project Manager. The Contractor's payment shall be based upon the monthly percentage of completion of these items.

9.3.7 Lien Waivers: The County or Project Manager will require the Contractor to submit, along with the progress payment request, notarized lien waivers from each subcontractor, materials or equipment supplier. Lien waivers shall comply with Civil Code § 8132 et seq. The aggregate sum of which shall reflect previous progress payments.

9.4 CERTIFICATES FOR PAYMENT

9.4.1 The Project Manager will, within seven days after the receipt of the Project Application for Payment, review the Project Application for Payment and either issue a Project Certificate for Payment to the County for such amounts as the Project Manager determines are properly due, or notify the Contractor in writing of the reasons for withholding a Certificate as provided in Subparagraph 9.6.1. The application for payment shall be made on AIA Documents G702 and G703 of the latest edition, in triplicate.

9.4.2 The issuance of a Project Certificate for Payment will constitute a representation by the Project Manager to the County that, based on the Project Manager's observations at the site as provided in Subparagraph 2.2.4 and the data comprising the Project Application for Payment, the Work has progressed to the point indicated; that, to the best of the Project Manager's knowledge, information and belief, the quality and timeliness of the Work is in accordance with the Contract Documents (subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion of the Work, to the results of any subsequent tests required by or performed under the Contract Documents, to minor deviations from the Contract Documents correctable prior to completion, and to any specific qualifications stated in the Certificate); and that the Contractor is entitled to payment in the amount certified. However, by issuing a Project Certificate for Payment, the Project Manager shall not thereby be deemed to represent that the Project Manager has made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, has reviewed the construction means, methods, techniques, sequences or procedures, or has made any examination to ascertain how or for what purpose the Contractor has used the monies previously paid on account of the Contract Sum.

9.5 PROGRESS PAYMENTS

9.5.1 After the Project Manager has issued a Project Certificate for Payment; the County shall make payment in the manner and within the time provided in the Contract Documents.

9.5.2 The Contractor shall promptly pay each Subcontractor upon receipt of payment from the

County, out of the amount paid to the Contractor on account of such Subcontractor's Work, the amount to which Subcontractor is entitled, reflecting the percentage actually retained, if any, from payments to the Contract on account of such Subcontractor's Work. The Contractor shall, by an appropriate agreement with each Subcontractor, require each Subcontractor to make payments to their Sub-subcontractors in similar manner.

9.5.3 The Project Manager may on request, at the Project Manager's discretion, furnish to any Subcontractor, if practicable, information regarding the percentages of completion or the amounts applied for by the Contractor and the action taken by the Project Manager on account of Work done by such Subcontractor.

9.5.4 Neither the County nor the Project Manager shall have any obligation to pay or to see to the payment of any monies to any Subcontractor or Material Suppliers except as may otherwise be required by law.

9.5.5 Neither certification of a progress payment, delivery of a progress payment, nor partial or entire use or occupancy of the Project by the County, shall constitute an acceptance of any Work not in accordance with the Contract Documents.

9.6 PAYMENTS WITHHELD

9.6.1 The Project Manager may decline to certify payment and may withhold the Certificate in whole or in part to the extent necessary to reasonably protect the County, if, in the Project Manager's opinion, the Project Manager is unable to make representations to the County as provided in Subparagraph 9.4.2. If the Project Manager is unable to make representations to the County as provided in Subparagraph 9.4.2, and to certify payment in the amount of the Project Application, the Project Manager will notify the Contractor as provided in Subparagraph 9.4.1. If the Contractor and the Project Manager cannot agree on a revised amount, the Project Manager will promptly issue a Project Certificate for Payment for the amount for which the Project Manager is able to make such representations to the County. The Project Manager may also decline to certify payment or, because of subsequently discovered evidence or subsequent observations, the Project Manager may nullify the whole or any part of any Project Certificate for Payment previously issued to such extent as may be necessary, in the Project Manager's opinion, to protect the County from loss because of:

.1 defective Work not remedied;

.2 third party claims filed or reasonable evidence indicating probable filing of such claims, including claims by separate contractors;

.3 failure of the Contractor to make payments properly to Subcontractors, or for labor, materials or equipment;

.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

.5 damage to the County or another contractor;

.6 reasonable evidence that the Work will not be accomplished in compliance with the Contract Time;

.7 persistent failures to carry out the Work in accordance with the Contract Documents; or

.8 stop notice served upon the County.

9.6.2 When the grounds in Subparagraph 9.6.1 above are removed, payment shall be made for amounts withheld because of them.

9.7 SUBSTANTIAL COMPLETION

9.7.1 When the Contractor considers that the Work, or a designated portion of work, is substantially complete as defined in Subparagraph 8.1.3, the Contractor shall prepare for the Project Manager a list of items to be completed or corrected. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. When the Project Manager, on the basis of inspection, determines that the Work or designated portion thereof is substantially complete, the Project Manager will then prepare a Certificate of Substantial Completion of the Work, said time to be within the Contract time unless extended pursuant to paragraph 8.3 of the Work, shall state the responsibilities of the County and the Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall complete the items listed therein. AIA Document G704, Certificate of Substantial Completion, or other substitute form supplied and required by the County shall be used. The Certificate of Substantial Completion of the Work shall be submitted to the County and the Contractor for their written acceptance of the responsibilities assigned to them in such Certificate.

9.7.2 Upon Substantial Completion of the work or designated portion thereof, and upon application by the Contractor and certification by the Project Manager, the County shall make payment, reflecting adjustments in retainage, if any, for such Work or portion thereof as provided in the Contract Documents.

9.7.3 When the Project Manager, on the basis of inspections, determines that the Project or designated portion thereof is substantially complete, the Project Manager will then prepare a Certificate of Substantial Completion of the Project which shall establish the Date of Substantial Completion of the Project and fix the time within which the Contractor shall

complete any uncompleted items of the Certificate of Substantial Completion of the Work.

9.7.4 Warranties required by the Contract Documents shall commence on the date of Beneficial Occupancy by the County if prior to Final Completion, otherwise Warranty commencement date shall be that of the recording of the Notice of Completion on the Project.

9.8 FINAL COMPLETION AND FINAL PAYMENT

9.8.1 Following the Project Manager's issuance of the Certificate of Substantial Completion of the Work or designated portion thereof, and the Contractor's completion of the Work, the Contractor shall forward to the Project Manager a written notice that the Work is ready for final inspection and acceptance, and shall also forward to the Project Manager a final Application for Payment. Upon receipt, the Project Manager will promptly make such inspection. When the Project Manager finds the Work acceptable under the Contract documents and the Contract fully performed, the Project Manager will issue a Project Certificate for Payment that will approve the final payment due the Contractor. This approval will constitute a representation that, to the best of the Project Manager's knowledge, information and belief, and on the basis of observations and inspections, the Work has been completed in accordance with the Terms and Conditions of the Contract Documents and that the entire balance found to be due the Contractor, and noted in said Certificate, is due and payable. The Project Manager's approval of said Project Certificate for Payment will constitute a further representation that the conditions precedent to the Contractor's being entitled to final payment as set forth in Subparagraph 9.8.2 have been fulfilled.

9.8.2 Neither the final payment nor the remaining retainage shall become due until the Contractor submits to the Project Manager (1) an affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the County or the County's property might in any way be responsible, have been paid or otherwise satisfied, (2) consent of surety, if any, to final payment, and (3) other data establishing payment or satisfaction of all such obligations, such as receipts, releases and waivers of liens arising out of the Contract, to the extent and in such form as may be designated by the County. AIA Documents G706, Contractor's Affidavit of Payment of Debts and Claims, and G706-a, Contractor's Affidavit Release of Liens, shall be used. If any Subcontractor refuses to furnish a release or waiver required by the County, the Contractor may furnish a bond satisfactory to the County to indemnify the County against any such lien. If any such lien remains unsatisfied after all payments are made, the Contractor shall refund to the County all monies that the latter may be compelled to pay in discharging such lien.

9.8.3 If, after Substantial Completion of the Work, final completion is materially delayed through no fault of the Contractor or by the issuance of Change Orders affecting final completion, and the Project Manager so confirms, the County shall, upon application by the Contractor and certification by the Project Manager and without terminating the Contract, make

payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than the retainage stipulated in the Contract Documents, and if bonds have been furnished as provided in Paragraph 7.5, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Project Manager prior to certification of such payment. Such payment shall be made under the Terms and Conditions governing final payments, except that it shall not constitute a waiver of claims. AIA Documents G707, Consent of Surety Company to Final Payment or if appropriate G707-A, Consent of Surety to Reduction in or Partial Release of Retainage, shall be used.

9.8.4 The making of final payment shall not constitute a waiver of any claims by the County.

9.8.5 The acceptance of final payment shall, after the Date of Substantial Completion of the Project, constitute a waiver of all claims by the Contractor.

9.8.6 All provisions of this Agreement, including without limitation those establishing obligations and procedures, shall remain in full force and effect notwithstanding the making or acceptance of final payment.

9.8.7 Final payment will be released within 35 days after Notice of Completion is Filed with the County Recorder's Office

## ARTICLE 10
## PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS

10.1.1 The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work.

10.2 SAFETY OF PERSONS AND PROPERTY

10.2.1 The Contractor shall take all reasonable precautions for the safety of, and shall provide all reasonable protection to prevent damage, injury or loss to:

.1 all employees on the Work and all other persons who may be affected thereby;

.2 all the work and all materials and equipment to be incorporated therein, whether in storage or off the site, under the care, custody or control of the Contractor or any of the Contractor's Subcontractors or Sub-subcontractors;

.3 other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction; and

.4 the work of the County or other separate contractors.

10.2.2 The Contractor shall give all notices and comply with all applicable laws, ordinances, rules, regulations and lawful orders of any public authority bearing on the safety of persons or property or their protection from damage, injury or loss.

10.2.3 The Contractor shall erect and maintain, as required by existing conditions and the progress of the Work, all reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying County's and users of adjacent facilities.

10.2.4 When the use or storage of explosives or other hazardous materials or equipment is necessary for the execution of the Work, the Contractor shall exercise the utmost care and shall carry on such activities under the supervision of properly qualified personnel.

10.2.5 The Contractor shall promptly remedy all damage or loss to any property referred to in Clauses 10.2.1.2. and 10.2.1.3 caused in whole or in part by the Contractor, any Subcontractor, any Sub-subcontractor, anyone directly or indirectly employed by any of them, or any one for whose acts any of them may be liable, and for which the Contractor is responsible under Clauses 10.2.1.2 and 10.2.1.3, except damage or loss attributable solely to the acts or omissions of the County, the Project Manager, or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Paragraph 4.17.

10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the County and the Project Manager.

10.2.7 The Contractor shall not load or permit any part of the Work to be loaded so as to endanger its safety.

10.3 EMERGENCIES

10.3.1 In any emergency affecting the safety of persons or property the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Any additional compensation or extension of time claimed by the Contractor on account of emergency work shall be determined as provided in Article 12 for Changes in the Work.

## ARTICLE 11
## INSURANCE

11.1 CONTRACTOR'S INSURANCE

Bidders' attention is directed to the insurance requirements below. It is highly recommended that Bidders confer with their respective insurance carriers or brokers to determine in advance of bid submission the availability of the insurance certificates and endorsements required below. A bidder, who is awarded a contract and thereafter fails to comply strictly with the insurance requirements, will be deemed to be in default of its obligations.

Contractor shall procure and maintain, for the duration of the contract, insurance against claims for injuries to persons or damages to property that may arise from or in connection with the performance of the Work by the Contractor, his agents, representatives, employees or subcontractors. The cost of such insurance shall be included in the Contractor's bid.

No later than (10) calendar days following the Award of the Contract, and prior to execution of the Agreement for Construction by the County, the Contractor shall submit certificates of insurance, signed by an authorized agent of the insurer, attesting to insurance coverage of the Contractor as required by this Article.

11.1.1 Minimum Scope of Insurance: Coverage shall be at least as broad as:

.1 Insurance Services Office Commercial General Liability coverage ("occurrence" form CG0001 1188) or Insurance Services Office form number GL 0002 (Ed. 1/73) covering Comprehensive General Liability and Insurance Services Office form number GL 0404 covering Broad Form Comprehensive General Liability.

.2 Insurance Services Office Business Auto Coverage form number CA 0001 0187 covering Automobile Liability, code 1 "any auto".

.3 Worker's Compensation insurance as required by the Labor Code of the State of California and Employers Liability insurance.

11.1.2 Minimum Limits of Insurance: Contractor shall maintain limits no less than:

.1 General Liability: $5,000,000 per occurrence for bodily injury, personal injury and property damage and $50,000,000 general aggregate limit.

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.2 Automobile Liability Insurance coverage to all owned, non-owned, and hires automobiles, trucks, and trailers with a combines single limit of not less than $2,000,000 for bodily injury, $2,000,000 for property damage, and with a $1,000,000 policy limit.

.3 Workers' Compensation and Employers Liability: Workers' compensation limits as

required by Cal. Labor Code and Employers Liability limits of $2,000,000 per accident.

11.1.3 Deductibles and Self-Insured Retentions: Any deductibles or self-insured retentions must be declared to and approved by the County. At the option of the County, either: the insurer shall reduce or eliminate such deductibles or self-insured retentions as respects the County, its officers, officials, employees and volunteers; or the Contractor shall procure a bond guaranteeing payment of losses and related investigations, claim administration and defense expense.

11.1.4 Other Insurance Provisions: The policies are to contain, or be endorsed to contain, the following provisions:

.1 General Liability and Automobile Liability Coverage's.

a. The County of Solano, its officers, officials, employees, agents, including Consulting Project Managers while performing contract administration services, and volunteers are to be covered as insured's as respects: liability arising out of activities performed by or on behalf of the Contractor, including the insured's general supervision of the Contractor; products and completed operations of the Contractor; premises owned, occupied or used by the Contractor; or automobile owned, leased, hired or borrowed by the Contractor. The coverage shall contain no special limitations on the scope of protection afforded to the County, its officers, officials, employees or volunteers.

b. The Contractor's insurance coverage shall be primary insurance as respects the County, its officers, officials, employees, agents, Consulting Project Managers, and volunteers. Any insurance or self-insurance maintained by the County, its officers, officials, employees, agents, Consulting Project Managers, or volunteers shall be excess of the Contractor's insurance and shall not contribute with it.

c. Any failure to comply with reporting provisions of the policies shall not affect coverage provided to the County, its officers, officials, employees, agents, Project Managers, Consulting Project Managers, or volunteers.

d. The Contractor's insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability.

.2 Worker's Compensation and Employers Liability Coverage.
The insurer shall agree to waive all rights of subrogation against the County, its

officers, officials, employees and volunteers for losses arising from work performed by the Contractor for the County.

.3 The County shall secure "All Risk" type Builder's Risk Insurance for work to be performed. The amount of such insurance shall not be less than the Contract Price totaled in the bid. The policy shall cover not less than the losses due to fire, explosion, vehicle damage, theft, flood, earthquake and civil commotion.

.4 All Coverage's:
Each insurance policy required by this clause shall be endorsed to state that coverage shall not be suspended, voided, canceled by either party, reduced in coverage or in limits except after thirty (30) days' prior written notice has been given to the County.

4 .5 The General Contractor shall be Responsible for paying all deductibles for this policy which are $5,000 per occurrence
See attached OCIP Contractors Insurance Program Manual APPENDIX E Section 5.5.4 for the Builders' Risk Insurance Coverage

11.1.5 Acceptability of Insurers: Insurance is to be paid with insurers with a Best's rating of no less than A: VI.

11.1.6 Verification of Coverage: Contractor shall furnish the County with certificates of effecting coverage required by this clause. The certificates for each insurance policy are to be signed by a person authorized by that insurer to bind coverage on its behalf. All certificates are to be received and approved by the County before work commences. The County reserves the right to require complete, certified copies of all required insurance policies, at any time.

11.1.7 Subcontractors: Contractor shall include all subcontractors as insured's under its policies or shall furnish separate certificates and endorsements for each subcontractor. All coverages for subcontractors shall be subject to all of the requirements stated herein.

Minimum Limits of Insurance: Subcontractors shall maintain limits no less than:

1. General Liability: $2,000,000
2. Automobile Liability: $2,000,000
3. Worker's Compensation and Employer's Liability: As required by the State of California Labor Code and Employers Liability

4 11.1.8 Engineers providing professional services for the design of the Pre-Engineers Metal Building and field engineering shall provide Professional Liability Insurance. See attached OCIP Contractor Insurance Program manual APPENDIX E Section 6.5 for Professional Liability Insurance Coverage.

## ARTICLE 12
## CHANGES IN THE WORK

CHANGE ORDERS

12.1.1 Definition: A Change Order is a written order to the Contractor signed to show the approval of the Project Manager and the authorization of the County, issued after execution of the Contract, authorizing a change in the Work or an adjustment in the contract Sum or the Contract Time. The Contract Sum and the Contract Time shall be changed only by Change

Order. A Change Order signed by the Contractor indicates the Contractor's agreement therewith, including the adjustment in the Contract Sum or the Contract Time, for full and final settlement of all costs (direct, indirect and overhead) related to the Work authorized by the Change Order.

12.1.2 The County, without invalidating the Contract, may order changes in the Work within the general scope of the Contract consisting of additions, deletion or other revisions, the Contract Sum and Contract Time being adjusted accordingly. All such changes in the Work shall be authorized by Change Order, and shall be performed under the applicable conditions of the Contract Documents.

12.1.3 Costs mean an itemized breakdown of all labor (by crafts), materials, sales taxes, equipment rentals, etc., for each portion of the Work which comprises the change order including any subcontractors itemized breakdown, plus not more than 15 percent (refer to specification section 01020 for exact percentage amounts) to cover all profits, overhead and administration. The cost or credit to the County resulting from a change in the Work shall be determined in one or more of the following ways:

.1 by mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation.
.2 by unit prices stated in the Contract Documents or subsequently agreed upon;
.3 by cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
.4 by the method provided in Subparagraph 12.1.4.1 and 12.1.4.2.

12.1.4.1 If none of the methods set forth in Clauses 12.1.3.1, 12.1.3.2, or 12.1.3.3 is agreed upon, the Contractor, provided that a written order signed by the County is received, shall promptly proceed with the Work involved. The cost of such Work shall then be determined by the Project Manager, on the basis of reasonable expenditures or savings of those performing the Work attributable to the change, including, in the case of an increase in the Contract Sum, a reasonable allowance for overhead and profit. In such case, and also under Clause 12.1.3.3 above, the Contractor shall keep and present, in such form as the County or the Project Manager may prescribe, an itemized accounting of actual cost together with appropriate supporting data for inclusion in a Change Order. Unless otherwise provided in the Contract Documents, cost shall be limited to the following: cost of materials, including sales tax and cost of delivery; cost of labor including social security, old age and unemployment insurance and fringe benefits required by agreement or custom; workers' or workmen's compensation insurance; bond premiums; rental value of equipment and machinery; and the additional costs of supervision and field personnel directly attributable to the change. Upon determination of cost by the Project Manager, payments to the Contractor may be made based on the Project Manager's approval of a Project Certificate for Payment. If the Contractor disputes the Project Manager's cost determination, the Contractor may initiate a claim in compliance with the claims and

disputes resolution provisions of Paragraph 7.4.

12.1.4.2 The amount or credit to be allowed by the Contractor to the County, as confirmed by the Project Manager, for any deletion or change that results in a decrease in the Contract Sum will be the amount of the actual cost including reasonable overhead. When both additions and credits covering related Work or substitutions are involved in any one change, the allowance for overhead and profit shall be figured in the basis of the new increase, if any, with respect to that change.

12.1.5 Variation in Estimated Quantities: If unit prices are stated in the Contract Documents or subsequently agreed upon, and if the quantities originally contemplated as so changed in a proposed Change Order, that application or the agreed unit prices to the quantities of Work proposed will cause substantial inequity to the County or the Contractor, the applicable unit prices shall be equitably adjusted.

12.2 SITE CONDITIONS

12.2.1 Where investigations have been conducted by the County of existing conditions on the Site, including subsurface conditions, such investigations are made for the purpose of design only and for the information of bidders. The results of such investigations represent only the statement by the County as to the circumstance and character of materials actually encountered by the County during the investigations. The County makes no guarantee or warranty, express or implied, that the conditions indicated are representative of conditions existing throughout the Site of the Project or any part of it, or that unanticipated conditions might not occur.

All excavation work shall be performed on an "unclassified basis"; that is, shall include the removal of all material encountered including earth or rock formations, regardless of the type or hardness thereof, or groundwater conditions in the excavation, the cost of such excavations being included in the Contract Price at the time of bidding. Unclassified excavation Work includes drilling or blasting operations.

If site conditions are discovered that materially differ from previous information that the Contractor has received, and that could not have been discovered by the Contractor through prudent and reasonable investigation prior to pricing his bid for the work, the Contractor shall be compensated for additional costs incurred in working with the unknown site conditions, but only to the extent that such previously unknown and undiscoverable site conditions cause the Contractor to incur costs in addition to the bid price for that portion of the work. The Contractor must be able to clearly demonstrate the original bid price for that portion of the work (plus any approved change orders applicable to that portion of the work) and the additional costs incurred as a direct result of the unknown site conditions.

12.3 REQUEST FOR EQUITABLE ADJUSTMENT

12.3.1 If the Contractor considers a Request for Equitable Adjustment is justified for an increase in the Contract Time, the Contractor shall promptly, upon first observance of the condition giving rise to the request, provide the Project Manager and County written notice of such condition and circumstance. This notice shall be given by the Contractor before proceeding to execute the Work, except in emergency endangering life or property in which case the Contractor shall proceed in accordance with Paragraph 10.3. No such request shall be valid unless so made. Any change in the Contract Time resulting from such request for equitable adjustment shall be authorized by Change Order.

12.3.2 If the Contractor requests that additional cost or time is involved because of, but not limited to, (1) any written interpretation pursuant to Subparagraph 2.2.8, (2) any order by the County to stop the Work pursuant to Paragraph 3.3 where the Contractor was not at fault, or any such order by the Project Manager as the County's agent, (3) any written order for a minor change in the Work issued pursuant to Paragraph 12.4, the Contractor shall make such request for equitable adjustment as provided in Subparagraph 12.3.1.

12.4 MINOR CHANGES IN THE WORK

12.4.1 The Project Manager will have authority to order minor changes in the Work not involving an adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes shall be enacted by written order issued through the Project Manager, and shall be binding on the County and the Contractor. AIA Document G710, Architect's Supplemental Instructions, or other substitute form supplied and required by the County shall be used. The Contractor shall carry out such written orders promptly.

## ARTICLE 13
## UNCOVERING AND CORRECTION OF WORK

13.1 UNCOVERING WORK

13.1.1 If any portion of the Work should be covered contrary to the request of the Project Manager, County, public authority having jurisdiction, or to requirements specifically expressed in the Contract Documents, it must, if required in writing by the Project Manager, be uncovered for their observation and shall be replaced at the contractor’s expense.

13.1.2 If any other portion of the Work has been covered which the Project Manager, County or public authority having jurisdiction has not specifically requested to observe prior to its being covered, the Project Manager may request to see such Work and it shall be

uncovered by the contractor. If such Work be found in accordance with the Contract Documents, the cost of uncovering and replacement shall, by appropriate Change Order, be charges to the County. If such Work be found not in accordance with the Contract Documents, the Contractor shall pay such costs unless it be found that this condition was caused by the County or a separate contractor as provided in Article 6 in which event the County shall be responsible for the payment of such costs.

13.2 CORRECTION OF WORK

13.2.1 The Contractor shall promptly correct all Work rejected by the Project Manager as defective or as failing to conform to the Contract Documents whether observed before or after Substantial Completion of the Work and whether or not fabricated, installed or completed. The Contractor shall bear all costs of correcting such rejected Work, including compensation for the Project Manager's additional services made necessary thereby.

13.2.2 If, within one year after the recordation of the Notice of Completion of the Work or designated portion, or within one year after acceptance by the County of designated equipment, or within such longer period of time as may be prescribed by the terms of any applicable special warranty required by the Contract Documents, any of the Work to be found to be defective or not in accordance with the Contract Documents, the Contractor shall correct it promptly after receipt of a written notice from the County to do so unless the County had notice of the defect and had previously given the Contractor a written acceptance of such defective condition. This obligation shall survive both final payment for the Work or designated portion thereof and termination of the Contract. The County shall give such notice promptly after discovery of the condition.

13.2.3 The Contractor shall, at his sole expense, remove from the site all portions of the Work that are defective or nonconforming and which have not been corrected under Subparagraphs 4.5.1, 13.2.1 and 13.2.2, unless removal is waived by the County.

13.2.4 If the Contractor fails to correct defective or nonconforming Work as provided in Subparagraphs 4.5.1, 13.2.1 and 13.2.2, the County may correct it in accordance with Paragraph 3.4.

13.2.5 If the Contractor does not proceed with the correction of such defective or nonconforming Work within a reasonable time fixed by written notice from the Project Manager, the County may remove it and may store the materials or equipment at the expense of the Contractor. If the Contractor does not pay the cost of such removal and storage within ten days thereafter, the County may, upon ten additional days' written notice, sell such Work at auction or at private sale and shall account for the proceeds thereof, after deducting all the costs that should have been borne by the Contractor, including compensation for the Project Manager, or other Professional's additional services made necessary thereby. If such proceeds of sale do not cover all costs, which the Contractor should have borne, the

difference shall be charged to the Contractor and an appropriate Change Order shall be issued. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the County.

13.2.6 The Contractor shall bear the cost of making good all work of the County or separate contractors destroyed or damaged by such correction or removal.

13.2.7 Nothing contained in this Paragraph 13.2 shall be construed to establish a period of limitation with respect to any other obligation, which the Contractor might have under the Contract Documents, including Paragraph 4.5 hereof. The establishment of the time periods noted in Subparagraph 13.2.2, or such longer period of time as may be prescribed by law or by the terms of any warranty required by the Contract Documents, relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the Contractor's obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

13.3 ACCEPTANCE OF DEFECTIVE OR NONCONFORMING WORK

13.3.1 If the County prefers to accept defective or nonconforming Work, the County may do so instead of requiring its removal and correction, in which case a Change Order will be issued to reflect a reduction in the Contract Sum where appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

## ARTICLE 14
## TERMINATION OF THE CONTRACT

14.1 TERMINATION BY THE CONTRACTOR

14.1.1 If the Work is stopped for a period of thirty days under an order of any court or other public authority having jurisdiction, or as a result of an act of government such as a declaration of a national emergency making materials unavailable, through no act or fault of Contractor or a Subcontractor or any agents or employees or any other persons performing any of the Work under a contract with the Contractor, then the Contractor may, upon thirty additional days' written notice to the County and the Project Manager, terminate the Contract and recover from the County payment for all work executed and for any proven loss sustained upon any materials, equipment, tools, construction equipment and machinery, including reasonable profit.

14.2 TERMINATION BY THE COUNTY

14.2.1 If the Contractor is adjudged bankrupt, or makes a general assignment for the benefit of

creditors, or if a receiver is appointed on account of the Contractor's insolvency, or stop notices are served upon the County, or if the Contractor persistently or repeatedly refuses or fails, except in cases for which extension of time is provided, to supply enough properly skilled workers or proper materials, or fails to make prompt payment to Subcontractors or for materials or labor, or persistently disregards laws, ordinances, rules, regulations or orders of having any public authority having jurisdiction , or otherwise is guilty of a substantial violation of a provision of the Contract Documents, and fails after written notice to commence and continue correction of such default, neglect or violation with diligence and promptness, the County upon certification by the Project Manager that sufficient cause exists to justify such action, may, after an additional written notice and without prejudice to any other remedy the County may have, terminate the Contract and take possession of all materials, equipment, tools, construction equipment and machinery owned by the Contractor and may finish the Work by whatever methods the County may deem expedient. In such case the Contractor shall not be entitled to receive any further payment until the Work is finished.

14.2.2 If the unpaid balance of the Contract Sum exceeds the costs of finishing the Work, including compensation for the Project Manager's and Architect's additional services made necessary thereby, Contractor will only be paid for his actual unpaid costs from such excess. If such costs exceed the unpaid balance, the Contractor shall pay the difference to the County. The amount to be paid to the Contractor or to the County, as the case may be, shall be certified by the Project Manager, upon application, in the manner provided in Paragraph 9.4 and this obligation for payment shall survive the termination of the Contract.

## ARTICLE 15
## ADDITIONAL INSTRUCTIONS

15.1 SUBSTITUTION OF MATERIALS:

15.1.1 When a specific manufacturer, trade name or material is specified, or indicated, it is to establish a standard of quality and shall not be construed as limiting competition. If the Contractor desires to use material other than that specified, he shall request approval of such substitution, in writing, to the Project Manager. Requests for substitutions shall be in the hands of the Project Manager no later than thirty (30) calendar days after the Notice to Proceed.

15.1.2 Submittals for approval of substitute materials shall contain sufficient information, descriptive brochures, drawings, samples or other data as is necessary to provide direct comparison to the specified materials. Each submittal shall be well marked and identified as to types and kind of the items being submitted for approval, and will include the "Substitution Request" form exhibit attached to Section 01 25 13/ Product Substitution completely filled-out in accordance with the pertinent data found in Section 01 25 13. It is

the sole responsibility of the Contractor to submit complete descriptive and technical information so the Project Manager can make proper appraisal. Lack of proper information will be sufficient cause for rejection. Reference to catalogs that the Architect may or may not have will not be acceptable.

15.1.3 The Architect's review for approval is for quality of visual appearance. It is the Contractor's responsibility to confirm and correlate all quantities and dimensions and coordinate with all trades whose work may be affected by the requested substitution.

15.1.4 Contractor is responsible for all costs incurred by County's agent(s) to perform any additional research to validate the proposed substitution's suitability for the Project and any additional construction costs and markups due to changes or additional impacts caused by said substitution on other elements or parts of Project.

15.2 REFERENCE TO STANDARDS:

15.2.1 Reference to known standards shall mean and intend the latest edition or amendment published prior to date of these Specifications, unless specifically indicated otherwise, and to such portions of it that relate and apply directly to the material or installation called for on the project.

15.2.2 Where material is specified solely by reference to standard specifications, the Contractor shall, if requested by the Project Manager, submit to the Project Manager for his approval, data on all such material proposed to be incorporated into the Work of the Contractor listing the name and address of the vendor, the manufacturer or producer, and the trade or brand names of such materials.

15.3 SPECIFICATIONS:

15.3.1 The Specifications are organized into Divisions, Sections, and Trade headings based on the Construction Specifications Institute's Master Format – 2004 Edition, 48 - Division format/numbering system. This organization shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of the Work to be performed by any trade. The Contractor shall be responsible for examining all sections of the Specifications for interrelated items of the Work, and for furnishing each item identified or specified.

15.3.2 No responsibility will be assumed by the County, Architect or the Project Manager for omissions or duplications by the Contractor in the completion of the Contract due to any alleged error in the arrangement of the material in these Specifications nor shall any such segregation of work and materials operate to make the Project Manager an arbiter in defining the limits to the agreements between the Contractor and his subcontractors or suppliers.

15.3.3 The misplacement, addition or omission of any letter, word or punctuation mark shall in no way damage the true spirit, intent or meaning of these Specifications.

15.3.4 The words "shown", "indicated", "noted", "scheduled" or words of that effect shall be understood to mean that reference is made to the Drawings accompanying these Specifications.

15.3.5 Where reference herein is made to colors or finishes "as selected", the reference is to the Project Manager with concurrence by the County.

15.4 APPROVED APPLICATORS:

15.4.1 Where specific instruction in these Specifications require that a particular product and/or materials be installed and/or applied by an "approved applicator" of the manufacturer, it shall be the Contractor's responsibility to insure that any subcontractors used for such work be approved applicators.

15.5 DELIVERY AND STORAGE OF MATERIALS:

15.5.1 Contractor shall deliver all manufactured materials in the original packages, containers or bundles (with the seals intact) bearing the name or identification mark of all manufacturers.

15.5.2 Contractor shall deliver fabrications in as large assemblies as practicable and where specified to be shop-primed or shop-finished; they shall be packaged or crated as required to preserve such priming or finish intact and free from abrasion.

15.5.3 Contractor shall store all materials in such manner as necessary to properly protect it from damage, as materials or equipment damage by handling, weather, dirt or from any other cause will not be acceptable.

15.5.4 Contractor shall store materials so as to cause no obstructions which includes storing off sidewalks, roadways, and underground services. The Contractor shall be responsible for protecting all material and equipment furnished under the Contract.

15.6 WORKMANSHIP:

15.6.1 Where not more specifically described in any of the various Sections of these Specifications, workmanship shall conform to all of the methods and operations of best standards and accepted practices of the trade or trades involved, and shall include all items of fabrication, construction, or installation regularly furnished or required for completion (including any finish), and for successful operation as intended.

15.6.2 All work shall be executed by mechanics skilled in their respective lines of work.

15.6.3 When completed, all parts shall have been durably and substantially built and shall present a neat, workmanlike appearance.

15.7 FINAL GUARANTEE:

15.7.1 The Contractor shall be held responsible for, and must make good any defects through faulty, improper, or inferior workmanship or materials, arising or discovered in any part of his work or structure, piping and appurtenances, within one (1) year after the filing of the Notice of Completion. The Warranty Bond, furnished by the Contractor, shall cover such defects and protect the County against them.

15.7.2 Contractor guarantees that all materials and workmanship shall conform to the Contract Documents and agrees to replace, at his sole cost and expense, and in conformity with the Contract Documents, any defective material and any and all work defectively or improperly performed or installed within a period of one (1) year after final acceptance in accordance with paragraph 9.8 of the General Conditions. The Contractor shall, within a reasonable time, but in no case longer than fifteen (15) days after receipt of written notice thereof, commence to repair and/or replace any defect in materials or workmanship which may develop during said one-year period, and any damage to adjacent materials resulting from the repairing or replacing of such defects, at its own expense and without cost to County. In the event Contractor fails to remedy any such defect within a reasonable time, which shall not in any case be longer than thirty (30) days after receipt of such written notice (unless Contractor has commenced the repair and is diligently pursuing the repair to completion), County may proceed to have such defects remedied at Contractor's expense and Contractor shall pay the costs and charges incurred thereby. Neither acceptance nor payment nor any provision in these documents shall be deemed to be a waiver by County to relieve Contractor of any responsibility under this Contract.

15.8 HOURS OF WORK:

15.8.1 Eight (8) hours of labor shall constitute a legal day's work upon all work done hereunder, and it is expressly stipulated that no worker employed at any time by the Contractor, or by a subcontractor under this Contract, upon the work, shall be required or permitted to work thereon more than eight (8) hours in any one (1) calendar day and forty (40) hours in any one (1) calendar week, except as provided in Section 1810-1815 inclusive, of the Labor Code of the State of California, all the provisions whereof are deemed to be incorporated herein as if fully set out; and it is further expressly stipulated that for each and every violation of said last named stipulation, said contractor shall forfeit, as a penalty to the County, twenty-five dollars ($25.00) for each worker employed by the Contractor in the execution of this Contract, for each calendar day during which said worker is required or

permitted to labor more than eight (8) hours in any one (1) calendar day and forty (40) hours in any one (1) calendar week in violation of the provisions of said section of the Labor Code.

15.8.2 The Contractor and each subcontractor shall also keep or cause to be kept, an accurate record showing the names and actual hours worked each calendar day and each calendar week by each worker employed by him in connection with the work contemplated by this Agreement, which record shall be open at all reasonable hours to the inspection of the County or its officer or agents, and to the Division of Labor Law Enforcement of the Department of Industrial Relations, its deputies and agents.

15.8.3 Notwithstanding the above stipulations, pursuant to Section 1815 of the Labor Code, work performed by employees of contractors in excess of eight (8) hours per day and forty (40) hours during any one week shall be permitted upon the project upon compensation for all hours worked in excess of eight (8) hours per day at not less than one and one-half (1 1/2) times the basic rate of pay.

15.9 WAGE RATES:

15.9.1 Pursuant to Section 1770-1780 of the Labor Code of the State of California, the Director of the Department of Industrial Relations has determined the general prevailing rate of per diem wages and rates for legal holidays and overtime in the locality in which this work is to be performed, for each craft or type of worker or mechanic needed to execute this contract. Said wage rates pursuant to Section 1773.2.

15.9.2 It shall be mandatory upon the Contractor, and upon any subcontractor under him to pay not less than the said specified rates to all laborers, worker, and mechanics employed by them in the execution of the Contract, and to pay all laborers, workers and mechanics not less often than once weekly. Contractor shall post a copy of the determination of prevailing wages at the job site. The Contractor shall require all subcontractors to comply with Sections 1770-1780 of the Labor Code of the State of California and shall insert into every subcontract the requirements contained therein.

15.9.3 It is hereby further agreed that the Contractor shall forfeit to the County, as a penalty, twenty-five dollars ($25.00) for each laborer, worker, or mechanic employed for each calendar day or portion thereof, who is paid less than the said stipulated rates for any work done under the Contract, by him or by any subcontractor under him. The difference between said stipulated rates and the amount paid to each worker for each calendar day or portion thereof for which each worker was paid less than said stipulated rate shall be paid to each worker by the Contractor. The Contractor, and each subcontractor, shall keep or cause to be kept an accurate record showing the name, address, social security number, work classification, straight time and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker or other employee

employed by him or her in connection with the public work. The records shall be open at all reasonable hours to the inspection of the County, to its officers and agents, and to the Division of Labor Law Enforcement of the State Department of Industrial Relations, its deputies and agents.

15.9.4 In case it becomes necessary for the Contractor or any subcontractor to employ on the work under this Contract any person in a trade or occupation (except executive, supervisory, administrative, clerical or other non-manual workers as such) for which no minimum wage rate is specified, the Contractor shall immediately notify the County who will promptly thereafter determine the prevailing rate for such additional trade or occupation from the time of the initial employment of the person affected and during the continuance of such employment.

15.10 APPLICATION OF HIGHEST STANDARDS AND REQUIREMENTS:

15.10.1 Whenever two or more standards or requirements appear in these General Conditions or in any other part of the Contract Documents that form the Contract, the highest standard or requirement shall be applied and followed in the performance under this Contract.

15.11 NONDISCRIMINATION IN EMPLOYMENT:

15.11.1 Federal and State Laws prohibit discrimination in employment. The California Fair Employment Practices Act prohibits discrimination in employment on the basis of race, religion, color, sex, physical handicap, medical condition, marital status, age, national origin or ancestry, and applies to all employers, employment agencies and labor organizations.

15.11.2 Title VII of the Federal 1964 Civil Rights Act (42 U.S.C. Section 2000e - 2000e - 17) prohibits employment discrimination on the basis of race, color, sex, religion, or national origin, and applies to all employers that employ at least 15 workers during each working day in each of 20 or more calendars weeks in the current or preceding year.

15.11.3 In addition to these two laws of general application, there are other Federal and State laws that prohibit employment discrimination in particular cases.

15.11.4 The County of Solano is an Affirmative Action Employer and expects all of its contractors and suppliers to familiarize themselves with, and comply with, all applicable laws relating to employment discrimination.

15.11.5 To the extent required by law, the Contractor shall meet all requirements of law relating to the participation of minority, women, and disabled veteran business enterprise contracting goals, and shall comply with Public Contract Code § 10115 et seq. and all applicable regulations. Contractor further agrees that, when required, Contractor will ensure

compliance by all subcontractors and will complete all forms required by all agencies exercising jurisdiction over the project.

15.12 APPRENTICES

15.12.1 Pursuant to Sections 1770-1780 of the Labor Code of the State of California, the Director of the Department of Industrial Relations has determined the general prevailing rate of per diem wages in the locality for each craft or type of worker needed to execute the work. Said wage rates pursuant to Section 1773.2 of the Labor Code.

15.12.2 Pursuant to Section 1775 of the Labor Code of the State of California, nothing in this chapter shall prevent the employment of properly registered apprentices upon public works.

15.12.3 Every such apprentice shall be paid the standard wage paid to apprentices under the regulations of the craft or trade at which he is employed, and shall be employed only at the work of the craft or trade to which he/she is registered.

15.12.4 Only apprentices, as defined in Section 3077, who are in training under apprenticeship standards and written apprentice agreements under Chapter 4 (commencing at Section 3070), Division 3, of the Labor Code, are eligible to be employed on public works. The employment and training of each apprentice shall be in accordance with the provisions of the apprenticeship standards and apprentice agreements under which he/she is training.

15.13 PROVISIONS REQUIRED BY LAW DEEMED INSERTED

15.13.1 Every provision of law and clause required by law to be inserted in this contract shall be deemed to be inserted, and this contract shall be read and enforced as though it were included, and if through mistake or otherwise any provision is not inserted or is not correctly inserted, upon application of either party the contract shall be amended to make the insertion or correction.

15.14 DRUG FREE WORKPLACE CERTIFICATION

15.14.1 The Contractor shall comply with Government Code Section 8355 in matters relating to providing a drug-free workplace.

15.14.2 The Contractor shall publish a statement notifying employees that unlawful manufacture, distribution, dispensation, possession, or use of controlled substance is prohibited and specifying actions to be taken against employees for violations, as required by Government Code section 8355(a).

15.14.3 The Contractor shall establish a Drug-Free Awareness Program as required by Government Code section 8355(b), to inform employees about all of the following:

a. The dangers of drug abuse in the workplace,

b. The person's organization's policy in maintaining a drug-free workplace,

c. Any available counseling, rehabilitation and employee assistance programs,

d. Penalties that may be imposed upon employees for drug abuse violations.

15.14.4 Provide as required by Government Code 8355(c), that everyone who works on the proposed contract:

a. Will receive a copy of the company's drug-free policy statement, and

b. Will agree to abide by the terms of the company's statement as a condition of employment on the contract.

**END OF SECTION 00 72 61**

SECTION 00 73 00 SUPPLEMENTARY CONDITIONS

PART 1 – GENERAL

1.1 INSTRUCTIONS

A. Requirements included herein supplement Document 00 72 00/ GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION.

B. If any provision of this Section should conflict with any other provision of the Contract Documents, this section shall control.

1.2 ARTICLE 2 – ADMINISTRATION OF THE CONTRACT

PARAGRAPH - 2.2 THE PROJECT MANAGER

Add the following description to this paragraph to define the role of the Construction Manager and the interchangeable function and role with the Project Manager:

The term 'Project Manager' and 'Construction Manager' where used will mean the on-site Consultant Construction Manager, who is the person or organization on the Project site who coordinates and receives all communications from Contractors, Architect and County, and assists the County in the administration of the Contract. The County has retained a representative from Gilbane Company as the Construction Manager for this Project.

1.3 ARTICLE 8 – TIME

PARAGRAPH 8.1 – DEFINITIONS

Add the following Subparagraph 8.1.5:

8.1.5 CONTRACT TIME: The Contractor shall substantially complete the Work of the Contract within 395 CALENDAR DAYS from the NOTICE TO PROCEED.

ADD THE FOLLOWING LANGUAGE TO ESTABLISH MILESTONES FOR COMPLETION.

8.1.6 The Owner shall take beneficial occupancy of the new Training Center at Substantial Completion. Contractor shall cooperate with Owners occupancy while completing the work and punch lists.

8.1.7 Contractor shall achieve Final Completion of the project within thirty (30) calendar days of project Substantial Completion.

1.4 ARTICLE 8 – TIME

PARAGRAPH 8.3.4 – LIQUIDATED DAMAGES

REVISE the following Clauses to Subparagraph 8.3.4:

3

8.3.4.1 The Contractor shall pay the County the sum of $2,500 per calendar day for each every calendar day's delay in meeting the calendar day completion requirements of any milestones or Final Completion and finishing the work under this Contract beyond the stipulated contract time.

1.5 ARTICLE 8 – TIME

PARAGRAPH 8.3 – DELAYS AND EXTENSIONS OF TIME

Add the following Clauses to Subparagraph 8.3, C – Unseasonable Weather:

8.3, C .1 Unseasonable Weather:

If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time and could not have been reasonably anticipated, and that weather conditions had an adverse effect on the scheduled construction.

8.3, C.2 A rain, windstorm, high water or other natural phenomenon of the specific locality of the work, which might reasonably have been anticipated from historical records of the general locality of the work, shall not be construed as abnormal. It is hereby agreed that rainfall greater than the following cannot be reasonably anticipated.

1. Daily rainfall equal to, or greater than, 1/4 of an inch, only when the number of such days in any given month exceeds the number of calendar days the parties agree is normal for the area as listed below:

| **MONTH** | **Number of Calendar days (*)** |
|---|---|
| January | 5 days |
| February | 6 days |
| March | 8 days |
| April | 1 day |
| May | 4 day |
| June | 2 days |
| July | 0 days |
| August | 0 days |
| September | 0 days |
| October | 3 days |
| November | 4 days |
| December | 8 days |

* Information gathered from National Weather Service/ National Oceanic and Atmospheric Administration website from Travis Air Force Base, Fairfield, California.

2. Rainfall data shall be assumed to be the same as that measured at Travis Air Force Base. In the event the number of days lost to rain during any given month exceeds those anticipated above, it is agreed that the Contractor will only consider such days as a basis for a Claim for Additional Time if the Contractor can demonstrate that the rain impacted the Critical Path of the Approved project schedule. Delay claims due to rainfall of one quarter inch or more overnight will be reviewed on a case by case basis for comparison with the nature of work scheduled for the following day.

3. Unused anticipated rain-days shall be realized as Float to the Project and managed per specification Section 01 32 16/ Construction Progress Schedules and Reports. If there are unused anticipated rain-days realized as Float, this would not reduce or modify the Substantial Completion date.

4. Weather Allowance: The Preliminary Construction Schedule and the Master Construction Schedule will include in the overall contract duration an allowance for normal adverse weather. For this project, an allotment of thirty-four (34) weather days for each winter weather period is to be indicated on the critical path as a single, separate activity. The winter weather period is defined as October 1st through March 31st, inclusive. County approved weather delays will be applied against the allotment. Once the allotment is exhausted the Contractor will be granted non-compensable time extensions for County approved weather delays.

1.6 ARTICLE 4.2 – REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS

Add the following Clauses to Article 4.2:

4.2.6 Prior to excavating for the work of this contract, the Contractor shall conduct an underground survey to ascertain actual locations of existing utilities. The Contractor shall employ the use of locating and probing devices, as appropriate for each utility system, to determine utility locations within 6" accuracy.

4.2.7 The Contractor shall hand-dig and daylight each utility system prior to excavating for the Work.

4.2.8 The County shall not be responsible for the repair or replacement of existing known or reasonably discoverable utilities.

1.7 ARTICLE 4 – CONTRACTOR

Add the following Subparagraph, 4.19 MAINTAINING EXISTING UTILITIES to Article 4:

4.19.1 If the Contractor needs to interrupt power, telephone/data, sewer, gas or other required utilities (for any reason) to the existing Detention Facility or the Temporary Facilities noted in Section 01 51 00/ Temporary Facilities and Controls, the Contractor must provide, at Contractor's expense, a means to provide temporary power, telephone/data, sewer, gas or other required utilities to the existing Detention Facility and Temporary Facilities while the original source is interrupted. The Contractor must notify the Project Manager (in writing) at least ten (10) working days before the utility interruption. Notification must include (by both diagram and written form) the plan for providing uninterrupted temporary power and the duration.

**END OF SECTION 00 73 00**

SECTION 01 03 00 – ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for Alternates.

B. Definition: An Alternate is an amount proposed by Bidders and stated on the Bid Form for certain construction activities defined in the Bidding Requirements that may be added to or deducted from Base Bid amount if the County decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems or installation methods described in Contract Documents.

C. Coordination: Coordinate related work and modify or adjust adjacent work as necessary to ensure that work affected by each accepted Alternate is complete and fully integrated into the project.

D. Notification: Immediately following the award of the Contract, prepare and distribute to each party involved, notification of the status of each Alternate. Indicate whether Alternates have been accepted, rejected or deferred for consideration at a later date. Include a complete description of negotiated modifications to Alternates.

E. Schedule: A "Schedule of Alternates" is included at the end of this section. Specification sections referenced in the schedule contain requirements for materials and methods necessary to achieve the work described under each Alternate.

F. Include as Part of Each Alternate, miscellaneous devices, accessory objects and similar items incidental to or required for a complete installation whether or not mentioned as part of the Alternate.

PART 2 - PRODUCTS (Not Applicable.)

PART 3 – EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. The following alternates are to be bid as separate, distinct units of work, complete with Contractor's overhead and profit.

1. Bid Alternate No. 1: Owner Controlled Insurance Program (OCIP). Provide credit amount to the Stipulated Sum based on the County providing General

Liability, Workers' Compensation, and Excess Liability insurance coverage for the project on behalf of the General Contractor and Subcontractors. If Alternate No. 1 is accepted, Section 00 45 26 would no longer apply.

2. See Appendix E for the OCIP Insurance Manual for the project.

**END OF SECTION 01 03 00**

# Appendix E

# Solano County
SB 1022 Classroom and Vocational Training Center

# Owner Controlled Insurance Program
Contractors Insurance Procedures Manual

February 05, 2017



Adendum 4

Alliant

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SECTION 1

# 1.0 INTRODUCTION

## 1.1 Overview

Solano County (Sponsor) may elect to use an Owner Controlled Insurance Program (OCIP) for SB 1022 Classroom and Vocational Training Center (Project). Under such a program, the Sponsor purchases certain insurance policies for protection of some (but not all) of the insurable risks that exist on a construction project. The insurance purchased by the Sponsor will be endorsed to extend coverage of the policy to any enrolled Contractors, Subcontractors, or Sub-Subcontractors. Contractors of every tier on the Project should carefully consider the OCIP and its implications to their company before executing a contract requiring their participation in the OCIP.

The OCIP provides the following insurance for all Contractors, regardless of tier, that are approved for participation in the insurance program:

- Commercial General/ Excess Liability
- Workers' Compensation

The following additional coverages are provided outside of the OCIP:

- Builders' Risk
- Pollution Liability Insurance

Certain Contractors are ineligible for this program. These parties are identified in the Definitions, Section 3.0 of this manual.

The Sponsor will pay all insurance premiums for the OCIP coverage listed above. You should notify your insurer(s) to delete from your insurance program charges and coverage for the on-site activities of this Project that are covered under the OCIP.

Alliant, the OCIP Program Broker/Administrator, will be administering the program on the behalf of the Sponsor.

Insurance coverage and limits provided under the OCIP are limited in scope and specific to this project only. Your insurance representative should review this information. Any additional coverage you may wish to purchase will be at your own expense.
**The guidelines in this manual are to be used for informational purposes only. Any conflict between this document and any contract or subcontract, the contract or subcontract will govern. Any difference with the actual OCIP policies will control in the event of any inconsistency or misunderstanding.**

## 1.2 About this Manual

This manual is designed to identify, define, and assign responsibilities for the administration of the OCIP. The guidelines in this manual are to be used for informational purposes only.

**This Manual:**

- Generally describes the OCIP
- Identifies responsibilities of the various parties involved in the project with regards to the OCIP
- Provides a basic description of the OCIP operation
- Describes audit and administration procedures for the OCIP
- Provides answers to basic questions about the OCIP

This manual will be updated throughout the course of the project if necessary

**This Manual does not:**

- Provide coverage interpretations
- Provide complete information about coverage
- Provide answers to specific claims questions

Specific questions about the OCIP, its administration, or the coverage provided should be referred to the OCIP Administrator identified in the Project Directory section immediately following this introduction.

## 1.3 Responsibilities Concerning Loss Control & Claim Reporting

It will be the responsibility of all Contractors of any tier to exercise every reasonable action to prevent work related injuries, property and equipment damage at the project site, as well as to minimize the exposure of risk to the public and third party property. All Contractors of any tier will conduct loss control prevention practices according to those requirements set by Federal, State and Local Laws, statutes, and specific project procedures developed for this project.

In the event of an accident, it will be the obligation of the responsible Contractor of any tier to see that the injured workers or members of the public are given immediate medical treatment. Also, all appropriate medical and claim forms must be filed with the appropriate Authorities, the Primary OCIP Carrier, Site Safety Personnel, and the OCIP Administrator.

SECTION 2

# 2.0 PROJECT DIRECTORY

## OCIP ADMINISTRATOR

Alliant Insurance Services
Construction Services Group
701 B St, 6th Floor
San Diego, CA 92101

| PROGRAM MANAGER | PROGRAM ADMINISTRATOR |
|---|---|
| Traci Dorris<br>Office: 619-849-3917<br>tdorris@alliant.com | Katie Gatti<br>Office: 619-849-3896<br>katie.gatti@alliant.com |

## OCIP Loss Control

Jay Zuhlke
Office: 909-230-2737
jzuhlke@alliant.com

## WORKERS' COMPENSATION CLAIMS REPORTING

WC DIRECT CLAIM REPORTING TO:
TBD

## OCIP PORTAL – ALLIANT WRAPX

| OCIP Document Submission | Online Enrollment, Payroll Reporting & Document Management |
|---|---|
| Email:alliantwrapx@alliant.com | Website:<br>http://alliantwrapx.alliantinsurance.com/contractorportal<br><br>***Contact Project Administrator for User Access** |

| General Contractor |
|---|
| TBD |

| PROJECT MANAGER | PROJECT ADMINISTRATOR |
|---|---|
| TBD | TBD |
| **POSITION1** | **POSITION2** |
| TBD | TBD |

# OCIP Coverages

| INSURANCE COMPANIES | POLICIES |
|---|---|
| **Old Republic** | **Workers' Compensation** |
| **Old Republic** | **General Liability** |
| **Various** | **Excess Liability** |

# Additional Coverage

| INSURANCE COMPANIES | POLICIES |
|---|---|
| **Illinois Union** | **Pollution** |

SECTION

3

# 3.0 PROJECT DEFINITIONS

The following definitions apply to this project and to the descriptions of the Project Coverage used in this manual:

Approved Off-Site Locations:
Storage yards or staging areas used solely in connection with performing work at the Project Site. All locations must be approved by the Sponsor and insurer.

Certificate of Insurance:
A Document providing evidence of the existence of coverage for a particular insurance policy or policies.

Contract:
A written agreement between the Sponsor and the Contractor for specific work and also includes an agreement between a Subcontractor and any tier of Subcontractor.

Contractor Claims Obligation:
The amount Contractors of every tier are responsible for paying as their contribution for settlement of an insured loss.

Employer:
Any individual, firm, or corporation that provides direct construction labor for work performed at the Project Site.

Enrolled:
Applies to those eligible Contractors, Subcontractors, and Sub-Subcontractors that have submitted all necessary enrollment forms and have been accepted into the OCIP as evidenced by a Certificate of Insurance. *Also described in this manual as a Participating Contractor.*

Ineligible:
Applies to Contractors of any tier excluded from participation in the OCIP, including those involved in loading, transporting, and unloading materials, personnel, parts, or equipment, or any other items to, from or within the Site. *Also described in this manual as an Excluded Contractor.*

Insured:
The Sponsor, Participating Contractors, and any other party so named in the insurance policy.

Insurer:
The insurance company named on a policy or certificate of insurance that provided coverage for the OCIP.

Participating Contractor: See *Enrolled*

Project Site:
Project Site shall mean those areas designated in writing by Sponsor for performance of the Work and such additional areas as may be designated in writing by Sponsor for Contractors use in performance of the Work. Subject to notification and other requirements for off-site locations, the term Site shall also include (a) field office sites, (b) property used for bonded storage of material for the Project approved by Sponsor, (c) staging areas dedicated to the Project, and (d) areas where activities incidental to the Project are being performed by Contractors covered by the workers' compensation policy included in the OCIP, but excluding any permanent locations of Contractors.

Sponsor:
Solano County

Work:
Operations as fully described in the Contract, performed at, or emanating directly from the Project Site. Also, the entire completed construction or the various separately identifiable parts required to be furnished under the Contract documents.

SECTION

4

# 4.0 CONTRACTOR RESPONSIBILITIES

Contractors of any tier are required to cooperate fully with the Sponsor and its OCIP Administrator in all aspects of OCIP operation and administration. All Contractors of any tier will be required to provide information necessary to bind coverage under the OCIP on a "per contract" basis. Responsibilities of the Contractor include:

- Identifying the cost of insurance which is excluded from their bid as appropriate; submits the Contractors Insurance Cost Worksheet (Form B) with their bid.
- Completion of all OCIP enrollment forms
- Include the OCIP provisions in all subcontracts as appropriate
- Notifying the OCIP Administrator of all subcontracts awarded and to provide all necessary enrollment forms
- Notifying the OCIP Administrator of all lower tier subcontracts awarded by providing the Notice of Award Form (Form F) and ensuring eligible lower tier subcontractors enroll in the OCIP
- Maintaining and reporting monthly payroll records
- Cooperating with the OCIP Administrator's requests for information
- Complying with insurance, claim, and safety procedures
- Paying Contractor Claims Obligation promptly as required
- Notifying the OCIP Administrator immediately of any insurance cancellation or non-renewal (contractor-required insurance)

## 4.1 Alliant WrapX

Alliant WrapX (WrapX) is a proprietary Risk Management Information System (RMIS). All relevant OCIP information will be captured and stored online in a "paperless" format through WrapX. Information to be stored includes award notifications, enrollment information, OCIP payroll, and notice of work completions for all contractors on a per contract basis. Alliant Insurance will provide all OCIP Eligible Contractors a project welcome letter detailing instructions for utilizing the WrapX contractor portal upon receipt of a Notice of Award for the awarded contractor.

Submission of all OCIP related documents should be sent by e-mail to: alliantwrapx@alliantinsurance.com

If you should have any questions or require additional information about this process or other matters related to the OCIP, please contact your OCIP Administrator identified in Section 2: Project Directory of this Manual.

## 4.2 Contractor Bids

Each bidder is required to **include in their bid/contract price** its normal cost for the insurance coverages provided by the OCIP and required by Article 11 of section 00 72 00. If the County elects to proceed with the OCIP Plan outlined in this Procedures Manual, a credit will be taken for the OCIP covered insurances. Contractors of any tier shall submit an Insurance Cost Worksheet (see Section 8) to the Sponsor, which will identify the estimated Cost of OCIP Coverages..

The "Cost of OCIP Coverages" is defined as the amount of Contractors' reduction in insurance costs due to eligibility for OCIP Coverages, as determined by using the Alliant WrapX system which includes the Enrollment Form and the Insurance Cost Worksheet. Instructions for access to Alliant WrapX are located in Section 8 of this Insurance Manual. The Cost of OCIP Coverages includes reduction in insurance premiums, related taxes and assessments, markup on the insurance premiums and losses retained through the use of the self-funded program, self-insured retention, or deductible program. The Cost of OCIP Coverages must include expected losses within any retained risk.

If the OCIP Program is implemented, the Contractor must deduct the Cost of OCIP Coverages for all lower tier subcontractors, in addition to its own Cost of OCIP Coverages. If, upon verification by the OCIP Administrator, it is found by the Sponsor that the Cost of OCIP Coverages were not excluded from the contract, a deductive change order will be issued to remove these costs.

Upon award of a contract, Contractor will receive access to the OCIP Administrator's website, for online data submission. (see instructions in Section 8) Contractor shall submit their Insurance Cost Worksheet online, including copies of their Workers' Compensation, General Liability and Excess Umbrella rate and declaration pages. They must, include any deductible or Self Insured retention (SIR) amounts, for Costs of OCIP Coverage verification purposes. Up to 5 years of loss runs may also be required when a large deductible program is in place with the Contractor.

Contractor shall cooperate fully with the OCIP Administrator in providing the necessary insurance data and information as required in the bid specifications and associated documents furnished by the Sponsor and/or OCIP Administrator during the duration of the project or until Sponsor-furnished insurance coverage's are terminated.

## 4.3 Enrollment

Enrollment into the OCIP is required but not automatic. Eligible Contractors must complete the enrollment form online (see instructions in Section 8), and participate in the enrollment process for the OCIP coverage to apply. Access to the project site will not be permitted until the enrollment is complete.

Each Contractor of any tier shall provide details about its lower tier subcontractors via the Notice of Contract Award Form F (contained in Section 8). This form must be completed and submitted to the OCIP Administrator prior to mobilization. Each Contractor is responsible to complete their Enrollment online to obtain coverage under the OCIP.

A separate online Enrollment and Contractor's Insurance Cost Work Sheet is required for each Contract which you are performing Work; however, only one Workers' Compensation policy will be issued for your firm.

In the event the Sponsor elects not to include a Contractor of any tier's work under the OCIP, the standard terms and conditions regarding insurance listed in the Contract Document will then apply. The OCIP Administrator will advise a Contractor of any tier which has submitted an enrollment form if they excluded from the OCIP.

## 4.4 Assignment of Return Premiums

The Sponsor will pay the cost of the OCIP insurance coverage. The Sponsor will be the sole recipient of any return OCIP premiums or dividends. All Participating Contractors shall assign to Sponsor all adjustments, refunds, premium discounts, dividends, credits, or any other monies due from the OCIP insurers.

## 4.5 Payroll Reports

Each Participating Contractor must submit a Monthly Payroll Report online identifying man-hours and payroll for all work performed at the Project Site on a "per contract" basis to the OCIP Administrator. This information will be used to provide the insurance company with the information required to determine the premium for the OCIP.

The monthly man-hour reports shall certify all Work performed at or emanating directly from the Project Site, including supervisory and clerical personnel on site.

Payroll shall be unburdened and allocated by Workers' Compensation Classification(s), and shall exclude the excess or premium paid for overtime (i.e., only the straight time rate shall apply to overtime hours worked). Furthermore, such records shall limit the payroll for Owners and Executive Officers as stated in manual rules.

A Separate Monthly Payroll is required for each Contract for Work you are performing.

## 4.6 Insurance Company Payroll Audit

Each Participating Contractor is required to maintain payroll records for the Project Site in accordance with the Basic Manual of Rules, Classifications, and Experience Rating Plan for Workers' Compensation and Employers Liability Insurance. Each Participating Contractor is required to participate in any audit conducted by the insurers for the OCIP, and to cooperate with the auditor(s) conducting such audit.

## 4.7 Completion of Work

When a Participating Contractor has completed its work, each Participating Contractor shall complete a Notice of Work Completion online and submit it to the OCIP Administrator. The Sponsor will not release final payment until all required data has been submitted to and approved by the OCIP Administrator. It is the upper-tier Contractor's responsibility to assure that each of their lower-tier subcontractors completes this form. This form must be completed separately for each contract.

Any Contractor Claims Obligation that Contractors of any tier are responsible for will be considered at the time of the Contract close-out unless the actual cost of the claim has been established and considered prior to close-out.

## 4.8 Approved Off-Site Locations

The Contractor is responsible, on behalf of itself or its lower tier Contractors, for applying for approval to have off-site locations covered by the OCIP. The Contractor, prior to the use of the site, shall notify the OCIP Administrator of the need and shall request approval of the site. The request should include the location address, description of the site, intended use, and the duration of the work to be performed at the site. The off-site location must be dedicated 100 % to the SB 1022 Classroom and Vocational Training Center. The OCIP Administrator will notify the Contractor if and when the off-site location is approved by the OCIP Insurer. Contractor shall not assume OCIP coverage is provided for the off-site location until it has received confirmation from the OCIP Administrator.

## 4.9 Safety

Contractors of any tier are required to establish a written safety program and to provide a full-time qualified Safety Manager or designated competent safety representative who shall be onsite when any work is in progress. Non-compliance with Project Loss Control Requirements could be considered to be the same as non-compliance with another contractual condition. Minimum standards for Contractor programs are outlined in the Project Safety Manual.

The Sponsor or its loss control representatives will have the right to “Stop Work” when serious defective conditions, unsafe work activities, or life threatening hazards are identified. In accordance with contract requirements, if deemed necessary, the Sponsor may remove any contractor and/or contractor employees that blatantly violate these requirements. The Sponsor, at its discretion, will designate an individual to act on its behalf, in all matters relating to work site safety and health.

## 4.10 Claims Reporting

Please refer to section 7 of this Manual.

## 4.11 Change Order Procedures

All change orders submitted by Contractor of any tier will be priced to **exclude** their normal cost of insurance for the coverage(s) that are provided by the OCIP. The final adjustment will take into account all insurance charges associated with any approved change orders. The Sponsor reserves the right to adjust the initial insurance deductive change order for any significant change orders.

SECTION 5

# 5.0 INSURANCE COVERAGE

## 5.1 Covered Parties

Contractors of any tier must enroll in the OCIP before coverage is available to them for any loss. Therefore no Contractor of any tier shall begin work on site until they have properly enrolled in the OCIP. All insurance, underwriting, payroll, rating or loss history information (including evidence of other insurance required under Section 5 requested by the Administrator) must be provided to the Administrator by Contractor of any tier within five (5) working days of the request. *A Contractor of any tier shall not be deemed to be a Participating Contractor and shall not be permitted to work on the project until enrolled in the OCIP by the Administrator. Enrollment will be established only upon issuance by the Administrator of a OCIP Certificate of Insurance to the Participating Contractor.* Every Participating Contractor shall, at all times during and after the Project, cooperate with the Sponsor, the Administrator, and the OCIP insurers and adjusters concerning matters relating to the OCIP.

## 5.2 Parties Not Covered

Contractors of any tier who will not be included in participation in the OCIP (Nonparticipating Contractors) shall include all vendors, suppliers, truckers, material dealers, and delivery services companies- regardless of contract size. Nonparticipating Contractors shall not be permitted to work on the Project until they have provided to the Sponsor evidence of their compliance with the insurance requirements as outlined in the Contract document.

## 5.3 Exclusion of Contractors from the OCIP

The Sponsor has the exclusive right to exclude other Contractors of any tier from participating in the OCIP. Such Nonparticipating Contractors, who will not be covered under the OCIP, must comply with the insurance requirements as outlined in the Contract document.

## 5.4 Evidence of OCIP Coverage

Each Participating Contractor will be issued an individual Workers' Compensation policy including Employer's Liability coverage. The OCIP Administrator will also provide a Certificate of Insurance evidencing General Liability, and Excess Liability insurance to each Participating Contractor, each of whom will be a named insured on the policy. Other documentation including forms, posting notices, if any, will be furnished to each Participating Contractor. A complete copy of the policy will be furnished to an authorized representative of each Participating Contractor upon written request.

## 5.5 Description of Insurance Coverages

The following coverage is provided by the OCIP:

- Commercial General/ Excess Liability
- Workers' Compensation and Employer's Liability

The following additional coverages are provided outside of the OCIP:

- Builders' Risk
- Pollution Liability Insurance

Non-Workers' Comp Insurance Policies: Master policies will be endorsed to include the Sponsor and any of their affiliates, or subsidiary companies or corporations, as well as the Contractors enrolled in the OCIP as a Named Insured.

The following coverage summaries are provided for informational purposes only. The actual terms and conditions of the coverage provided are contained in the insurance policies under the OCIP, and the Sponsor and others shall not rely upon this summary in lieu of the policies themselves. Copies of the policies will be made available to all potential Participating Contractors upon written request.

### 5.5.1 Workers' Compensation and Employer's Liability Insurance

**Workers' Compensation and Employer's Liability**

| | | |
|---|---|---|
| **Part One:** | Workers' Compensation | Statutory Limit |
| **Part Two:** | Employer's Liability | Annual Limits Per Insured |
| | Bodily Injury by Accident, each accident | $1,000,000 |
| | Bodily Injury by Disease, each employee | $1,000,000 |
| | Bodily Injury by Disease, policy limit | $1,000,000 |

*Each Enrolled Contractor will be issued a separate workers' compensation policy*

## 5.5.2 Commercial General Liability Insurance

| | Limits of Liability Shared by All Insureds for All Projects |
|---|---|
| General Aggregate (Reinstates Annually) | $ 8,000,000 |
| Products/ Completed Operations Aggregate | $ 4,000,000 |
| Personal/ Advertising Injury | $ 2,000,000 |
| Each Occurrence Limit | $ 2,000,000 |
| Fire Damage Legal Liability (any one fire) | $ 300,000 |
| Medical Payments (any one person) | $ 10,000 |
| Products/Completed Operations Tail | 10 years/Statute of Limitation |
| Deductible | Paid for by Sponsor |

*The deductible will apply only to loss covered by insurance policies in the OCIP. The deductible does not impose upon the Sponsor any duties of an insurer toward Participating Contractor. A Single General Liability policy will be issued covering all insureds.*

## 5.5.3 Excess Liability Insurance

| | Limits of Liability Shared by All Insureds for All Projects |
|---|---|
| Each Occurrence Limit | $ 100,000,000 |
| Annual General Aggregate Limit | $ 100,000,000 |
| Follow Form Excess Policy | |

## 5.5.4 Builders' Risk Insurance

The Sponsor shall obtain and maintain in force during the term of this Agreement, a Builders' Risk Insurance policy or policies separate from the OCIP, which shall insure against all risks of physical loss and/ or damage including flood and earthquake, subject to normal policy exclusions, to all buildings, structures, materials, and real property on site, which are intended to be, or have already been incorporated into and forming part of the Project, whether or not such buildings, structures, materials, or real property will have been supplied or made available to Contractors by Sponsor.

The Builders' Risk policy shall be endorsed to add Contractors of any tier as additional named insureds', as their interests may appear and to waive the carrier's right of

recovery under subrogation against Sponsor and all other Contractors of any tier whose interests are insured under such policy.

Unless required otherwise by Sponsor, claims under Builders' Risk insurance provided are subject to a Contractor Claims Obligation of five thousand dollars ($5,000) per occurrence. If a claim results from any construction activity, the responsible Contractor, Subcontractor, or Sub-Subcontractor shall pay the Contractor Claims Obligation up to $5,000 All Builders' Risk losses will be adjusted with and payable to the Sponsor or the Designee for the benefit of all parties as their interest may appear.

The Sponsor shall not be responsible for loss or damage to, or obtaining and/or maintaining in force insurance on temporary structures, construction equipment, tool or personal effects, owned or rented to or in the care, custody, and control of a Contractor of any tier.

In the event of loss or damage to the Project not covered by the Builders' Risk policy, the cost of the repair and/or replacement of such loss or damage shall be the responsibility of the Sponsor.

### 5.5.5 Pollution Liability Insurance

| | | |
|---|---|---|
| a. | **Insurer:** | A++, XV |
| b. | **Terms of Insurance:** | TBD |
| c. | **Policy Limits:** | $ 10,000,000 Per Pollution Condition<br>$ 20,000,000 Aggregate |
| d. | **Policy Form:** | Pollution Liability-Claims Made Form |
| e. | **Coverage Extension:**<br>- Microbial Matter Coverage Endorsement<br>- Wrap-Up Endorsement<br>- Products / Completed Operations Extension – 10 Years | |
| f. | **Premium Payments** | By Sponsor |
| g. | **Deductibles/ SIR** | By Sponsor |

## 5.6 OCIP Termination or Modification

The Sponsor reserves the right to terminate or modify the OCIP or any portion thereof. If the Sponsor exercises this right, Contractors will be provided notice as required by the terms of their individual contracts. At its option, Sponsor may procure alternate coverage or may require the Contractors to procure and maintain alternate insurance coverage.

SECTION

6

# 6.0 CONTRACTOR REQUIRED COVERAGE

Contractors of any tier are required to maintain insurance coverage that protects the Sponsor from liabilities arising from the Contractor of any tier's operations performed away from the project site, for types of coverage not provided by the OCIP, and for operations performed in connection with excluded parties operating under your control or direction.

Verification of insurance shall be submitted in the form of a Certificate of Insurance on a standard ACORD Form 25-S and the required and applicable endorsements to the listed policies. A sample of an acceptable Certificate of Insurance and other documentation is provided for your review in the Appendix.

Contractors are responsible for monitoring their lower tier subcontractors insurance documents, whether enrolled or excluded. The Sponsor reserves the right to disapprove the use of Contractors unable to meet the insurance requirements. Certificates evidencing compliance shall be submitted to Sponsor.

The limits of liability shown for the insurance required of the Contractor and minimum limits only and are not intended to restrict the liability imposed on the Contractors for Work performed under their Contract.

Contractors of any tier agree to obtain and maintain during the life of this contract the following minimum insurance requirements. Contractors of any tier shall pay the premiums required for such insurance.

## 6.1 Workers' Compensation

All Participating Contractors shall maintain at their own expense Workers' Compensation Insurance applicable to all employees and subcontractors hired by the insured, who are not covered under the OCIP workers' compensation policy. The insurance shall provide limits as follows:

**Workers' Compensation and Employer's Liability**

| | | |
|---|---|---|
| **Part One:** | Workers' Compensation | Statutory Limit |
| **Part Two:** | Employer's Liability | Annual Limits Per Insured |
| | Bodily Injury by Accident, each accident | $2,000,000 |
| | Bodily Injury by Disease, each employee | $2,000,000 |
| | Bodily Injury by Disease, policy limit | $2,000,000 |

***Enrolled Contractors*** *shall provide evidence of workers' compensation applicable to "off-site" activities.* ***Excluded Contractors*** *shall provide evidence of workers compensation applicable to "on-site" and "off-site" activities.*

A certificate of insurance evidencing this coverage shall be provided to the Sponsor

## 6.2 General Liability

This insurance shall include coverage for bodily injury, property damage, and personal injury with no less than the following limits:

**General Liability and/or Excess Liability**

| | Enrolled Parties | Excluded Parties |
|---|---|---|
| General Aggregate | $ 2,000,000 | $ 2,000,000 |
| Products/ Completed Operations Aggregate | $ 2,000,000 | $ 2,000,000 |
| Personal/ Advertising Injury | $ 1,000,000 | $ 2,000,000 |
| Each Occurrence Limit | $ 1,000,000 | $ 2,000,000 |

***Enrolled Contractors*** *shall provide evidence of general liability insurance for "off-site" activities.* ***Excluded Contractors*** *shall provide evidence of general liability insurance applicable to "on-site" and "off-site" activities.*

A certificate of insurance evidencing this coverage shall be provided to the Sponsor. This insurance shall be endorsed to name Sponsor as additional insureds and evidenced of such status via additional insured endorsement(s).

## 6.3 Business Auto Liability

Contractors of ever tier will maintain at their own expense Automobile Liability Insurance covering the operations, maintenance, use and loading and unloading of all owned, non-owned, and hired vehicles. As such, all Contractors of any tier shall furnish to the Sponsor a Certificate of Insurance showing such coverage with the following minimum limits of liability. This insurance shall be endorsed to name Sponsor as additional insureds and evidenced of such status via additional insured endorsement(s):

| **Business Auto Liability** | |
|---|---|
| Combined Single Limit: Bodily Injury and Property Damage | $2,000,000 |
| With a $1,000,000 policy limit | |

***All Contractors shall provide evidence of automobile liability. The OCIP does <u>not</u> cover automobile liability.***

## 6.4 Construction Equipment Insurance

Any policies maintained by the Participating Contractors on their owned and/or rented equipment and materials shall contain a provision requiring the insurance carriers to waive their rights of subrogation against the Sponsor and all other indemnities named in their contract documents. ***The OCIP does <u>not</u> cover contractor's property.***

## 6.5 Professional Liability Insurance (Errors & Omissions)

In the event any contract specifications requires a Participating Contractor, including any professional service provider, to perform professional services, such as, but not limited to, architectural, engineering, construction management, surveying, design, etc., a certificate of insurance must be provided to the Sponsor prior to commencing work:

| **Professional Liability** | |
|---|---|
| Each Claim | $ 1,000,000 |
| Aggregate | $ 1,000,000 |

Change in limits, coverage, or loss of aggregate limit due to outstanding claims must be reported to the Sponsor within thirty (30) days of any such event. ***The OCIP does <u>not</u> provide Professional Liability insurance.***

## 6.6 Pollution Liability

If this Agreement involves the removal of asbestos, the removal/replacement of underground tanks, or use of toxic chemicals and substances, the Contractor will be required to provide coverage no less than the following limits, for such exposures subject requirements and approval of the Sponsor:

| **Pollution Liability** | |
|---|---|
| Each Claim/Per Occurrence | $ 5,000,000 |
| Aggregate | $ 5,000,000 |

## 6.7 Conditions of Understanding

The amount and types of insurance coverage required herein shall not be construed to be a limitation of the liability on the part of the Sponsor, Participating Contractors, Nonparticipating Contractors, or any lower-tier Subcontractors. Any type of insurance, or any greater limits of liability than described above, which the Contractor requires for their own protection or on account of statute, shall be the Contractor's own responsibility and at its own expense. The carrying of the insurance described shall in no way be interpreted as relieving a Contractor of any tier, whether Participating or Non-Participating, of any responsibility of liability under this contract.

## 6.8 Other Insurance Required of All Contractors

Participating Contractor shall file certificates of such insurance with the Sponsor, which shall be subject to the Sponsor's approval for adequacy of protection, including the satisfactory character of any Insurer. If requested by the Sponsor, a certified copy of the actual policy(s) with the appropriate endorsement(s) and other documents shall be provided to the Sponsor.

Contractor shall immediately provide written notice to the Sponsor of any notice of cancellation, notice of non-renewal, or any other material modification of the insurance coverages required to be provided by the Contractor.

In the event of failure of any tier to furnish and maintain said insurance and to furnish satisfactory evidence thereof, the Sponsor shall have the right to take out and maintain same coverage for all parties on behalf of the Contractor of any tier who also agrees to furnish all necessary information thereof and to pay the cost thereof to the Sponsor immediately upon presentation of a premium invoice.

SECTION 7

# 7.0 CLAIM PROCEDURES

This section describes the basic procedures for reporting various types of claims. A claim kit will be provided to all Participating Contractors. It will include details about claim reporting and is intended for use at the job site.

## 7.1 Workers' Compensation Claims

The main responsibility for any Contractor is first to see that the injured worker receives immediate medical care. Next, you should notify the on-site Contractor's Safety Supervisor immediately in the event of a serious injury or accident.

An Employers First Report of Injury (Form 5020) must be completed and submitted to the on-site safety representative and OCIP administrator, along with the DWC-1 (Employee's Claim) and the Supervisors Report of Injury Form.

The employer of the injured employee shall report the claim to the OCIP insurer as soon as is practical within 24 hours of the incident.

The Sponsor and their insurer will arrange with preferred medical providers for treatment of all minor or non-life threatening injuries. A list of the providers will be provided to all Participating Contractors.

Participating Contractors must designate a representative at the site to take injured employees to the medical center, and to report the claim. This individual should remain with the injured employee at the center while he/she is being treated. The treating physician should provide a written description of whether or not the injured worker can return to work, a list of restrictions, if any, and the estimated length of time he/she will stay on modified duty.

## 7.2 General Liability Claims

Accidents at or around the job site resulting in damage to property of others (other than the Work itself), or personal injury or death to a member of the public, must be reported immediately to the on-site Contractor's Safety Supervisor. A General Liability Loss Notice (Accord Form 3) shall be completed and delivered within 24 hours to the OCIP Administrator.

Contractors shall not voluntarily admit liability and shall cooperate with the Sponsor or insurer representatives in the accident investigation.

If your firm receives notice of a claim, or forthcoming lawsuit, or is served with a lawsuit arising out of your involvement with this project, please forward a copy of the documentation to the OCIP Administrator *(See Section 2.0: Project Directory for Contact Information)*

## 7.3 Property Claims

Immediately report any damages to your Work or the Work of any other Contractor to the on-site Contractor's Safety Supervisor. In addition, complete the Property Loss Notice (Accord Form 1) and submit it to the OCIP Administrator within five days of the occurrence.

## 7.4 Automobile Claims

No coverage is provided for automobile accidents under the OCIP. It is the sole responsibility of each Contractor to report accidents involving their automobiles to their own insurers.

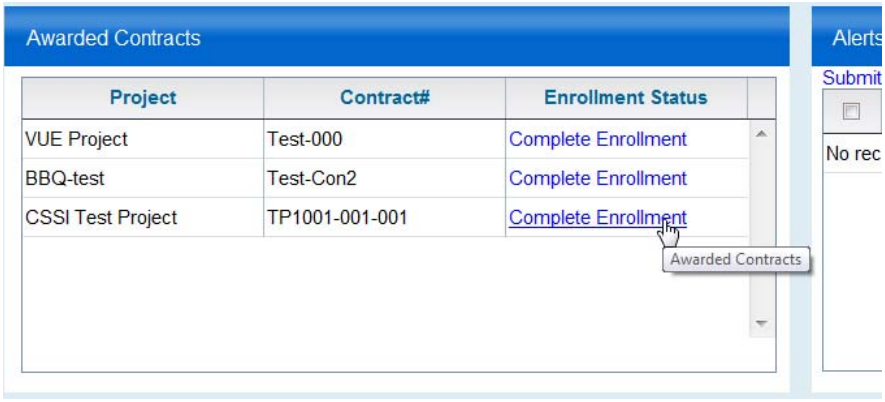
In addition to reporting the claim to its own insurer, each Contractor shall report all accidents occurring in or around the job site to the on-site Contractor's Safety Supervisor. These accidents will be investigated with regard to any liability arising out of the Project construction activities that could result in future claims. Each Contractor shall cooperate in the investigation of all automobile accidents.

# 8.0 APPENDIX

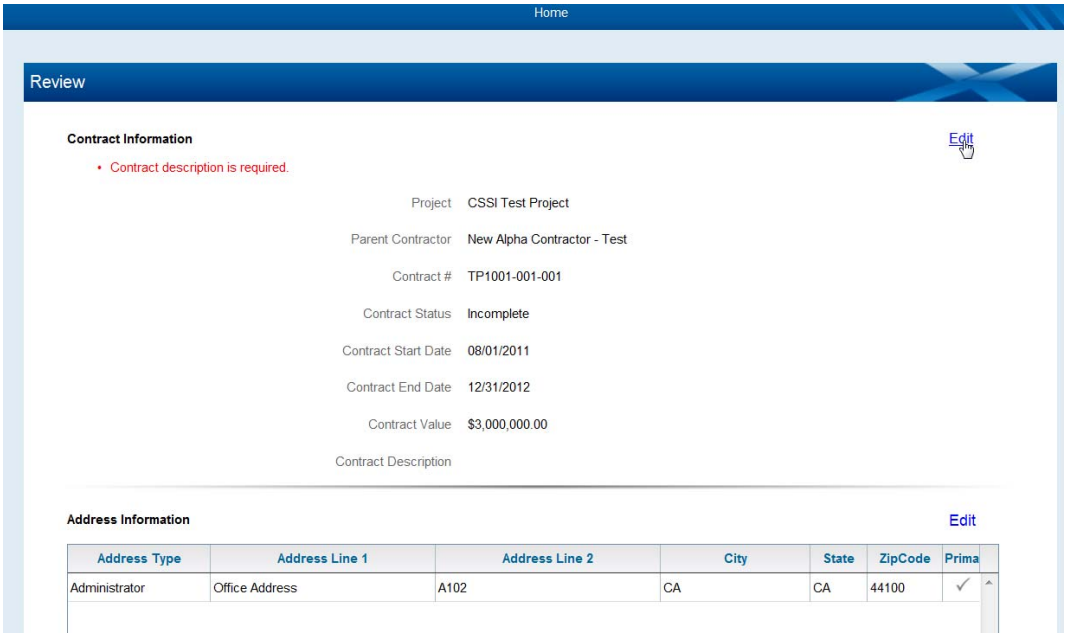
- Enrollment: Alliant WrapX Online Enrollment Instructions
- Insurance Cost Worksheet
- Monthly On-Site Payroll Report – **ONLINE SUBMISSION REQUIRED**
- Notice of Work Termination – **ONLINE SUBMISSION REQUIRED**
- Notice of Contract Award

# Alliant WrapX Enrollment Process

- **Enrollment into the project will be completed online.**
- **You will receive access to the online system: Alliant WrapX, within three days after Alliant has been notified of your awarded contract.**
- **Please contact the Wrap Administrator if you have not been given a login ID and Password**
- **Link to the Contractor Portal:** https://alliantwrapx.alliantinsurance.com/ContractorPortal
- **After logging into the system, find your newly awarded contract under the Awarded Contracts window.**




- **Click on Complete Enrollment to begin the process**
- **The enrollment wizard will start on the Review page. Any section that is not compliant will be listed in Red. Click Edit to begin updating that section, and continue through the enrollment wizard by clicking Next**




- **Please see the required information listed below so you can have all the information ready when you are attempting to enroll.**

# Required Information for Online Enrollment

| | Required Information | Help |
|---|---|---|
| 1 | Contractor name | May include type of company: Corporation, LLC, etc… |
| 2 | Parent contractor name | Name of company you are contracted with |
| 3 | Contractor Federal ID Number | Check Alliant data and update |
| 4 | Start Date at project site | Day physical work starts at jobsite |
| 5 | Estimated completion date | Can be an estimate |
| 6 | Contract Value | |
| 7 | Contract Description | Scope of work |
| 8 | Contractor Address | Physical address of office. Any P.O. Box should be entered under Mailing address |
| 9 | Contractor Main Phone and Fax numbers | |
| 10 | Contractor Primary Contact Name | |
| 11 | Contact position | |
| 12 | Contact phone and fax numbers, and email address | Email is preferred method for communication |
| 13 | Contractor Payroll Contact Name | Can be the same as the Primary Contact |
| 14 | Payroll Contact phone and fax numbers, and email address | Email is preferred method for communication |
| 15 | Workers' Compensation Class Codes to be used on job | Can be found in your company WC rate pages |
| 16 | Estimated Man hours and Payroll | Required for enrollment |
| 17 | Risk ID # | Also called Rating Board file # |
| 18 | Rating Bureau | NCCI or WCRIB or similar name |
| 19 | Experience Modifier (EMR) | Can be found in your company WC rate pages |
| 20 | WC Offsite Carrier | Corporate WC carrier name |
| 21 | WC Offsite Policy # | Corporate WC policy number |
| 22 | WC effective date | Corporate WC effective date |
| 23 | Policy Expiration Date | Corporate WC expiration date |
| 24 | If any work is being subcontracted out, please include information about subcontractors so enrollment can be started for each contractor | At a minimum: Contractor name; estimated start date; contact name, email and phone number; and contract value for subcontracted work. |
| | | |

# FORM – A
# CONTRACTOR ENROLLMENT FORM

**Section I**

| | | |
|---|---|---|
| **Company Name:** | **Address:** | |
| **Main Phone#:** | **Main Fax#:** | |
| **Federal ID#:** | **Company Entity Type (Circle):**<br>**Corporation Partnership Sole Proprietor**<br>**Limited Partnership JV LLC LLP other_____** | |
| **Primary Contact Name:** | **Primary Contact Phone#:** | **Primary Contact Email:** |
| **Payroll Contact Name:** | **Payroll Contact Phone#:** | **Payroll Contact Email:** |
| **Work Description:** | **Project Location/ Project Name:** | |
| **Estimated Start Date:** | **Estimated Completion Date:** | |
| **Who are you contracted with?** | **Contract Value** | |
| **Are you subcontracting out any work?** ☐Yes* ☐No | | |

**Section II**

| | | | | |
|---|---|---|---|---|
| **Your Workers' Comp Carrier:** | | | | |
| **WC Policy #:** | | **Eff Date:** | **Exp Date:** | |
| **Rating Board File#:** | | | | |
| **Rating Date:** | | **Experience Modifier:** | | |
| **State** | **WC Class Code** | **Description** | **Est. Manhours** | **Est. Payroll** |
| | | | | |
| | | | | |
| | | | | |
| | | **Totals** | | |

Insurance Agent/Broker Information:

| | |
|---|---|
| **Agency Name:** | **Phone:** |
| **Contact:** | **Fax:** |
| **Email:** | |

**Note:** Solano County reserves the right to determine who participates in the Wrap-Up Insurance Program. I agree that the following insurance charges will be added to my base bid if I am excluded from the Wrap-Up.

***Note: Please complete a Notice of Subcontractor Award, for each of your subcontractors. All contractors MUST complete forms A and B in order for them to commence work on site. ENROLLMENT IS NOT AUTOMATIC.**

Signature: _____ Date: _____
Name: _____ Title: _____

APPENDIX

# FORM – B
# INSURANCE COST WORKSHEET

## Section I

*Contract/Bid Information*

| | |
|---|---|
| **Contractor Name:** | **Alliant Assigned Contract #** |
| **Gross Contract Value(including insurance cost): $** | **Net Contract Value(excluding insurance Cost): $** |
| **Estimated On Site Payroll: (Auto-fill from Section II) $** | **Estimated Work Hours: (Auto-fill from Section II)** |

## Section II

*Calculate your insurance premium.*

| WC Trade Classification | WC Class Code | Work Hours | Estimated Payrolls | Current WC Rate | Premium = Est. Payrolls x WC Rate |
|---|---|---|---|---|---|
| | | | $ | | $ |
| | | | $ | | $ |
| | | | $ | | $ |
| | | | $ | | $ |
| | | | $ | | $ |

*Attach separate worksheet if more codes apply.*

*** Use Project Site Payroll only to calculate Total Insurance cost.**

| | |
|---|---|
| Total Manual Premium | $ |
| x Experience Mod | |
| = Modified Premium | $ |

**General Liability**
**Do you have a Large Deductible Program?** ☐Yes

| Description | | Rate | Modified $ | Running Total |
|---|---|---|---|---|
| | + or - | | $ | $ |
| | + or - | | $ | $ |
| | + or - | | $ | $ |
| | + or - | | $ | $ |
| **= Total WC Premium** | | | | **$** |
| **WC Premium Rate (Cost/Payroll)** | | | | **$** |

| Current Rate | Factor 100/1000 | Payroll OR Receipts | Premium |
|---|---|---|---|
| | | $ | $ |
| Deductible Amount: | $ | | |

**Excess Liability** **Is your Excess coverage Non-auditable (Flat)?** ☐Yes

| Current Rate | Factor 100/1000 | Payroll OR Receipts | Premium |
|---|---|---|---|
| | | $ | $ |

| | | |
|---|---|---|
| Your O & P % (Overhead and Profit Percentage) | % | $ |
| **TOTAL INSURANCE COST** | | $ |
| **Insurance Rate (Cost/Payroll)** | | $ |

I hereby warrant that this worksheet reflects the projected insurance cost that would apply in the event that my regular insurance program was in force at this location. I also recognize that the **Sponsor or their Representative - Wrap-Up Administrator, Alliant** may request copies of my actual policies to confirm these costs.

***Attach your applicable WC, GL and XS rate pages for rate verification.**

Signature: _____ Date: _____

# FORM – D
# MONTHLY ON-SITE PAYROLL REPORT

**THIS REPORT MUST BE SUBMITTED TO ALLIANT INSURANCE SERVICES ON A MONTHLY BASIS**

Report#: Month Ending:

☐ Check if this is your First Payroll report. ☐ Check if payroll is $0 for the month.

| Contractor Name: | Contract# |
|---|---|
| | |

| Name of Project: |
|---|
| |

*Complete a separate form for each contract.*

| Workers' Compensation Class Code | Work Description | Number of Employees | Total Monthly Man Hours | Reportable Payroll* |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| **TOTAL** | | | | |

☐ Check if this is your Last Payroll Report. Complete Form E, Notice of Work Completion and send with this payroll report.

| I certify that the above information is correct. | |
|---|---|
| Signature: | Date: |
| Name: | Title: |

*Do not include overtime wages, use straight time wage rates only. No fringe benefits, sick time or holiday pay.*

**Please return by Email, Fax or Mail to:**

**Katie Gatti**
**Alliant Insurance Services**
**701 B St. 6th Floor**
**San Diego, CA 92101**

**Email: Katie.Gatti@alliant.com**
**Fax: 619-699-2111**
**Phone: 619-849-3896**

# FORM – E
# NOTICE OF WORK TERMINATION FORM

| | |
|---|---|
| **Company Name:** | **Address:** |
| **Contact for Audit:** | **Federal ID#:** |
| **Name of Project:** | |
| **First Day on Site:** | **Last Day on Site:** |
| **Final Total Payroll:** | **Original Contract Value:** |
| **Change Order Amount:** | **Final Contract Value (including change orders):** |

*Complete for all subcontractors*

| Subcontractor Name | Completion Date | Final Contracting Value (including change orders) |
|---|---|---|
| | | $ |
| | | $ |
| | | $ |
| | | $ |

We hereby verify that all contract work, including the work of subcontractors, has been completed and all on-site payrolls have been submitted.

Signature:_____
Print Name:_____Date:_____

## TO BE SUBMITTED TO CONTRACTOR FOR COMPLETION:

The above referenced contractor has completed their work at the project site under their contract without firm on the above date.

General Contractor:_____

Signature:_____Date:_____

**As per your contract, your final payment may not be released until all payroll has been submitted and payroll audits are performed, including your subcontractor's work of every tier.**

**Please return by Email, Fax or Mail to:**

**Katie Gatti**
**Alliant Insurance Services**
**701 B St. 6th Floor**
**San Diego, CA 92101**

**Email: Katie.Gatti@alliant.com**
**Fax: 619-699-2111**
**Phone: 619-849-3896**

## FORM F: NOTICE OF SUBCONTRACT AWARD

| SUBCONTRACTOR MAKING AWARD: | Alliant Assigned Contract # |
|---|---|
| | |
| BY: | TITLE: |
| PHONE: | FAX: |
| EMAIL ADDRESS: | DATE: |

| WE HAVE AWARDED A SUBCONTRACT AS FOLLOWS: | |
|---|---|
| SUBCONTRACTOR NAME: | |
| ESTIMATED PROJECT START DATE: | CONTRACT VALUE: |
| SCOPE OF WORK | |
| | |
| | |
| SUBCONTRACTOR ADDRESS: | |
| CONTACT NAME: | EMAIL ADDRESS: |
| PHONE: | FAX: |

***Please Note: It is the responsibility of the Contractor awarding Subcontract to ensure that their tier sub(s) fill out, maintain, and file all necessary Wrap-up Enrollment forms and Insurance documentation with the Wrap-up Administrator.*** **No hired tier sub may commence work until they are properly enrolled into the Wrap-up program*, as evidenced by a Certificate of Insurance provided by the Wrap-up Administrator***

**Please return by Email, Fax or Mail to:**

**Katie Gatti**
**Alliant Insurance Services**
**701 B St. 6th Floor**
**San Diego, CA 92101**

**Email: Katie.Gatti@alliant.com**
**Fax: 619-699-2111**
**Phone: 619-849-3896**

**APPENDIX E**
**Owner Controlled Insurance Program**

**Insurance Requirements for SB0122 Classroom and Vocational Training Center Project**

1. Owner Controlled Insurance Program. OWNER may implement an Owner Controlled Insurance Program ("OCIP") for the Project. The OCIP is more fully described in the Contractor's Insurance Procedures Manual (the "Insurance Manual") for the Project, which is incorporated herein by this reference as a Contract Document. OWNER has designated Alliant Insurance Services, Inc. as the OCIP Administrator ("OCIP Administrator") for the Project. The OCIP will include Workers' Compensation and Employer's Liability insurance, Commercial General Liability insurance, and Excess Liability insurance, as summarily described below, in connection with the Project. The insurance provided under the OCIP shall be referred to herein as "OCIP Coverages."

2. Eligible and Enrolled Parties. Parties eligible to enroll in the OCIP are the Contractor, and Subcontractors performing a portion of the Work on the Project site ("Eligible Parties"). Upon enrollment, an Eligible Party shall become an "Enrolled Party."

3. Excluded Parties. Parties that are not eligible to enroll in the OCIP, and who are excluded from the OCIP, are:

(a) Hazardous materials remediation, removal and/or transport companies and their consultants;
(b) Architects, surveyors, engineers, and soil testing engineers, and their consultants;
(c) Vendors, suppliers, fabricators, material dealers, truckers, haulers, drivers and others who merely transport, pick up, deliver, or carry materials, personnel, parts or equipment, or any other items or persons to or from the Project site;
(d) Any Subcontractor of any tier that does not perform any actual labor on the Project site; and
(e) Any other party or entity not specifically identified herein, that is excluded by OWNER in its sole discretion, even if such party or entity is otherwise eligible.

4. Summary of OCIP Coverages. The OCIP Coverages shall apply only to those operations of each Enrolled Party performed at the Project site in connection with the Work, and only to Enrolled Parties that are eligible for the OCIP. OCIP Coverages shall not apply to ineligible parties, even if they are erroneously enrolled in the OCIP. An Enrolled Party's operations away from the Project site, including product manufacturing, assembling, or otherwise, shall only be covered if such off-site operations are identified and are dedicated solely to the Project. OCIP Coverages shall not cover off-site operations until the Enrolled Party requesting off-site coverage receives written acknowledgment of such coverage from the OCIP Administrator. A summary of the coverages provided under the OCIP is set out below.



**Adendum 4**

## SUMMARY OF OCIP COVERAGES

### A. Workers' Compensation/Employer's Liability Insurance

| | |
|---|---|
| Worker's Compensation | Statutory Limit |
| Employer's Liability | |
| Bodily Injury By Accident, each accident | $1,000,000 |
| Bodily Injury By Disease, each employee | $1,000,000 |
| Bodily Injury By Disease, policy limit | $1,000,000 |

### B. Commercial General Liability Insurance Form Equivalent to Most Current ISO Occurrence Form

| | |
|---|---|
| Each Occurrence Limit | $2,000,000 |
| Personal/Advertising Injury Limit (Each Occurrence) | $2,000,000 |
| General Aggregate Limit for all Enrolled Parties (Other Than Products/Completed Operations) | $8,000,000 |
| Products and Completed Operations Aggregate (for all Enrolled Parties) | $4,000,000 |
| Ten (10) Years Products & Completed Operations Extension | |

### C. Excess Liability Insurance (over Commercial General Liability)

| | |
|---|---|
| Combined Single Limit | $100,000,000 |
| General Annual Aggregate for all Enrolled Parties | $100,000,000 |
| Products & Completed Operations Aggregate (for all Enrolled Parties) | $100,000,000 |
| Ten (10) Years Products & Completed Operations Extension | |

The following additional coverages are provided for the participants in the project by OWNER outside of the OCIP:

1. Contractor's Pollution Liability Insurance
2. Builders Risk

1. **Summary of Other Coverages Provided by Owner**.

A summary of coverages provided by OWNER outside of the OCIP is set out below:

### A. Contractor's Pollution Liability Insurance

| | |
|---|---|
| Per Occurrence | $10,000,000 |
| Aggregate | $20,000,000 |
| Ten (10) Years Products & Completed Operations Extension | |



Adendum 4

B. **Builders Risk**

The OWNER shall obtain and maintain in force during the term of this Agreement a Builders' Risk Insurance policy or policies separate from the OCIP, which shall insure against all risks of physical loss and/ or damage including flood and earthquake, subject to normal policy exclusions, to all buildings, structures, materials, and real property on site, which are intended to be, or have already been incorporated into and forming part of the Project, whether or not such buildings, structures, materials, or real property will have been supplied or made available to Contractors by OWNER.

The Builders' Risk policy shall be endorsed to add Contractors of any tier as additional named insureds', as their interests may appear and to waive the carrier's right of recovery under subrogation against OWNER and all other Contractors of any tier whose interests are insured under such policy.

Unless required otherwise by OWNER, claims under Builders' Risk insurance provided are subject to a Contractor Claims Obligation of five thousand dollars ($5,000) per occurrence. If a claim results from any construction activity, the responsible Contractor, Subcontractor, or Sub-Subcontractor shall pay the Contractor Claims Obligation up to $5,000. All Builders' Risk losses will be adjusted with and payable to the OWNER or the Designee for the benefit of all parties as their interest may appear.

The OWNER shall not be responsible for loss or damage to, or obtaining and/or maintaining in force insurance on temporary structures, construction equipment, tool or personal effects, owned or rented to or in the care, custody, and control of a Contractor of any tier.

5. OWNER'S OCIP Obligations. OWNER shall pay the costs of premiums for the OCIP Coverages. OWNER will receive or pay, as the case may be, all adjustments to such costs, whether by way of dividends, retroactive adjustments, return premiums, other moneys due, audits or otherwise. CONTRACTOR hereby assigns to OWNER the right to receive all such adjustments. All Subcontractors shall be required, by written contract to assign to OWNER the right to receive all such adjustments. OWNER assumes no obligation to provide insurance other than that specified in this Appendix E and in the OCIP insurance policies. OWNER'S furnishing of OCIP Coverages shall in no way relieve or limit, or be construed to relieve or limit, any responsibility, liability, or obligation imposed upon CONTRACTOR, or any Subcontractor, under the Contract Documents, the OCIP insurance policies, or by law, including, without limitation, any indemnification obligations which such parties have agreed. OWNER reserves the right at its option, without obligation to do so, to furnish other insurance coverage of various types and limits provided that such coverage is not less than that specified in this Appendix E.

6. CONTRACTOR'S OCIP OBLIGATIONS.

6(a). CONTRACTOR shall incorporate by reference the insurance requirements set out in this Appendix E, into all Subcontractor agreements.

6(b). CONTRACTOR shall enroll in the OCIP prior to the commencement of construction activities at the Project. CONTRACTOR shall ensure that all Subcontractors who are Eligible Parties enroll in the OCIP prior to their commencement of construction activities at the Project, and maintain enrollment during the course of the Project.

6(c). CONTRACTOR shall comply with all of the requirements of the OCIP insurance policies, and the OCIP Insurance Manual. CONTRACTOR shall provide to each of its Subcontractors of every tier a copy of the Insurance Manual, and ensure Subcontractor compliance with all provisions of the OCIP insurance policies, and the OCIP Insurance Manual.

6(d). CONTRACTOR shall acknowledge, and require all of its Subcontractors of every tier to acknowledge, in writing, that OWNER and the OCIP Administrator are not agents, partners or guarantors of any OCIP insurer, that neither OWNER nor the OCIP Administrator are responsible for any claims or disputes between or among CONTRACTOR, its Subcontractors of any tier, and any OCIP Insurer(s), and that neither OWNER nor OCIP Administrator guarantees the solvency or the availability of limits of any OCIP Insurer(s).

6(e). CONTRACTOR shall Provide, within five (5) days of OWNERS request, any information related to CONTRACTOR's insurance costs, including but not limited to payroll records, certified copies of insurance coverages, declaration pages of coverages, certificates of insurance, underwriting data, prior loss history information, safety records or history, OSHA citations, construction cost estimates for this Project, or such other data or information as OWNER, the OCIP Administrator, or OCIP Insurers may request in the administration of the OCIP. CONTRACTOR shall require its Subcontractors to provide the same information, upon request.

6(f). CONTRACTOR shall comply, and require all of its Subcontractors to comply with OCIP Administrator's instructions for electronically enrolling in the OCIP.

6(g). Bid Methodology - CONTRACTOR shall submit a base bid 'which includes its insurance costs for coverages required under Article 11, Section 00 72 00 in the event an OCIP is not implemented, and CONTRACTOR and subcontractors are required to provide all of their own insurance coverages. CONTRACTOR shall submit the Bid Alternate Credit amount to the Stipulated Sum per section 01 03 00 for the "Costs of OCIP Coverages", which is defined as the credit amount of the Contractor's Cost of OCIP Coverages and Subcontractors' reduction in insurance costs due to eligibility for OCIP Coverages, as determined by using the insurance cost summary forms provided in the Insurance Manual. The credits for Costs of OCIP Coverages includes reduction in insurance premiums, related taxes and assessments, markup on the insurance premiums and losses retained through the use of the self-funded program, self-insured retention, or deductible program. The credits for Cost of OCIP Coverages must include expected losses within any retained risk. For the purposes of preparing the OCIP Credit, CONTRACTOR shall assume it is required to provide all of the insured required of Excluded Parties, as set out in Section 7, below. If the Credit is accepted, then during the course of the project change orders must also be priced to exclude the Cost of OCIP Coverages.

7. ADDITIONAL INSURANCE REQUIRED FROM ENROLLED PARTIES AND EXCLUDED PARTIES. CONTRACTOR shall obtain and maintain, and shall require each of its Subcontractors of all tiers to obtain and maintain, the insurance coverage specified herein in a form and from insurance companies reasonably acceptable to OWNER. The insurance limits may be provided through a combination of primary and excess policies, including the umbrella form of policy. Each policy required herein, except the Workers' Compensation policy, shall name the County of Solano, its officers, employees, agents, including Consulting Project Managers while performing contract administration services, and volunteers, and any additional entities as OWNER may request as additional insureds. The additional insured endorsement shall state that the coverage provided to the additional insureds is primary and non-contributory with respect to any other insurance available to the additional insureds. CONTRACTOR shall provide certificates of insurance evidencing all required coverage prior to commencement of Work. The additional insured endorsement to the general liability policy shall be provided by issuance of both ISO Form CG 2010 1001 and ISO Form CG 2037 1001 additional insured endorsements, or such other endorsement as acceptable to OWNER.

**Enrolled Parties** shall provide Worker's Compensation, Employer's Liability, General Liability, and Excess Liability insurance, as set out below, for off-site activities, and Automobile Liability insurance for all activities, both on-site and off-site.

**Excluded Parties** must provide all insurance set out below for both on-site and off-site activities.

7(a). Standard Commercial Automobile Liability Insurance covering all owned, non-owned, and hired automobiles, trucks, and trailers with a combined single limit of not less than $2,000,000 for bodily injury, $2,000,000 for property damage, and with a $1,000,000 policy limit.

7(b). Statutory Workers' Compensation Insurance and Employer's Liability insurance with statutory limits as required by law, including Maritime coverage, if appropriate, and Employer's Liability limits of not less than $1,000,000 each accident, $1,000,000 each employee, and with a $1,000,000 policy limit.

7(c). Commercial General Liability Insurance in a form providing coverage not less than the standard ISO Commercial General Liability insurance policy ("Occurrence Form"), with limits no less than:

| | Enrolled Parties/Excluded Parties |
|---|---|
| Each Occurrence | $1,000,000/$2,000,000 |
| General Aggregate | $2,000,000/$4,000,000 |
| Products/Completed Operations Aggregate | $2,000,000/$4,000,000 |
| Personal/Advertising Injury Aggregate | $1,000,000/$2,000,000 |

7(d). If required by OWNER, Aviation and/or Watercraft Liability Insurance or other insurance, in form and with limits of liability and from an insuring entity reasonably satisfactory to the OWNER.

7(e). Professional Liability. In the event any contract specifications requires CONTRACTOR to perform professional services, such as, but not limited to, architectural, engineering, construction management, surveying, or design, CONTRACTOR shall maintain a Professional Liability policy with limits not less than one million dollars ($1,000,000) per claim and one million ($1,000,000) aggregate.

7(f). Pollution Liability. CONTRACTOR or its subcontractors, if involved with the removal of asbestos or lead, the removal/replacement of underground tanks, or use of toxic chemicals and substances, shall purchase and thereafter maintain Pollution Liability insurance in the amount of not less than five million dollars ($5,000,000) per claim and five million ($5,000,000) aggregate.

7(g). All insurance referred to herein to be carried by CONTRACTOR or any Subcontractor shall be maintained by such parties at their sole expense, with insurance carriers qualified to do business in California and having a rating of not less than A; VI from A.M. Best & Co., unless OWNER, in writing, in its sole discretion, accepts a lower Best's rating.

7(h). OWNER reserves the right to require (1) higher limits and (2) additional insurance coverages if OWNER determines in its sole discretion that such higher limits and/or additional coverages are reasonably necessary for the protection of OWNER. Such additional coverages shall be in a form and with limits of liability, additional insured endorsements, and deductibles or self-insured retentions acceptable to OWNER.

7(i). Prior to commencing work at the project, CONTRACTOR shall deliver to OWNER the endorsements and waivers of subrogation referred to herein, as well as certificates of insurance evidencing the coverages required herein. Promptly upon OWNER's request, CONTRACTOR shall deliver to OWNER a copy of any and all of the insurance policies and other insurance documents required hereunder. In the case of policies expiring while work is in progress, a renewal certificate with all applicable endorsements must be delivered to OWNER prior to the expiration of the existing policy or policies. Permitting CONTRACTOR or any Subcontractor to start work, or continue work, prior to compliance with these requirements shall not constitute a waiver of any of the requirements set forth herein. All certificates of insurance must provide OWNER with thirty (30) days advance written notice of cancellation, intent to non-renew, or adverse material change in or reduction of coverage.

8. Representations and Warranties. CONTRACTOR represents and warrants to OWNER, and shall use its best efforts to ensure that each of its Subcontractors of every tier represent and warrant to OWNER that:

8(a). All information they submit to OWNER, or to the OCIP Administrator, shall be accurate and complete.

8(b). They have had the opportunity to read and analyze copies of the OCIP insurance policies that are available on request, and that they understand the OCIP Coverages. Any reference or summary in this Agreement, to the amount, nature, type or extent of OCIP

Coverages and/or potential applicability to any potential claim or loss is for reference only. CONTRACTOR and its Subcontractors of all tiers have not relied upon said reference, but solely upon their own independent review and analysis of the OCIP Coverages in formulating any understanding and/or belief as to amount, nature, type or extent of any OCIP Coverages and/or its potential applicability to any potential claim or loss.

8(c). CONTRACTOR shall not include in any request for payment any sums to provide or obtain insurance that is being maintained under the OCIP.

9. Audits. CONTRACTOR and all Subcontractors agree that OWNER, the OCIP Administrator, and/or any OCIP insurer may audit their payroll records, books and records, insurance coverages, insurance cost information, and project cost records to confirm their accuracy, and to ensure that the OWNER has not been billed for any cost of insurance that is being provided under the OCIP. In the event any audit reveals that OWNER has been billed by CONTRACTOR or any of its Subcontractors for any cost of insurance that is being provided by OWNER under the OCIP, OWNER shall have the right to deduct from any amounts payable to CONTRACTOR or any Subcontractor such cost, including all expenses and fees of audit.

10. Modification or Discontinuance of the OCIP. OWNER may, for any reason, modify the OCIP Coverages, discontinue the OCIP, or request that CONTRACTOR or any of its Subcontractors of any tier withdraw from the OCIP upon thirty (30) days written notice. Upon such notice CONTRACTOR and/or one or more of its Subcontractors, as specified by OWNER in such notice, shall obtain and thereafter maintain during the performance of the Work, such insurance as specified by OWNER. The form, content, limits of liability, cost, and the insurer issuing such replacement insurance shall be subject to OWNER's approval. The cost of the replacement coverage shall be at OWNER's expense, but only to the extent of the Cost of OCIP Coverages.

11. Waiver of Subrogation. Where permitted by law, CONTRACTOR hereby waives all rights of recovery by subrogation because of deductible clauses, inadequacy of limits of any insurance policy, limitations or exclusions of coverage, or any other reason against OWNER, the OCIP Administrator, its or their officers, agents, or employees, and any other Subcontractor performing Work or rendering services on behalf of OWNER in connection with the planning, development and construction of the Project. CONTRACTOR also agrees that all additional insurance maintained by CONTRACTOR or any Subcontractor under this Appendix E shall include clauses providing that each insurer shall waive all of its rights of recovery by subrogation against OWNER, CONTRACTOR, or any Subcontractor. A waiver of subrogation shall be effective as to any individual or entity even if such individual or entity (a) would otherwise have a duty of indemnification, contractual or otherwise, (b) did not pay the insurance premium directly or indirectly, and (c) whether or not such individual or entity has an insurable interest in the property damaged.

12. Conflicts. In the event of a conflict between the provisions of this Article, the Insurance Manual, and the provisions of the OCIP insurance policies, the terms of the OCIP Insurance Policies shall govern, then the provisions of this Article, then the provisions of the Insurance Manual.

13. Safety. CONTRACTOR is solely responsible for all construction means, methods, safety, techniques, sequences, and procedures. Each subcontractor, of any tier, is responsible for all safety precautions and programs in connection with work under CONTRACTOR's agreement.

The requirements of Cal/OSHA, state, OWNER and city laws, statutes, regulations, codes, ordinances, and orders of those governing bodies having jurisdiction over the work, including the OCIP specific safety specifications listed below, establish the guidelines for this project that safety and loss prevention programs must meet or exceed.
In the event of a conflict or inconsistency, the most stringent standard will govern.

13(a). Project Safety Team Monthly meetings. The Project Safety Team is a safety committee for the project. Each project shall have a committee comprised of CONTRACTOR, Subcontractor, Project Manager and/or OCIP Safety Representative. On a monthly basis the group shall meet to discuss the projects safety program. These meetings may be incorporated into project coordination meetings.

13(b). Drug Free Work Environment. This project prohibits the use, possession, distribution or sale on its premises or workplace the following substances: alcoholic beverages, intoxicants, drugs and related drug paraphernalia. Employees must not report to work while under the influence of any drug or alcoholic beverage. Any substance, including prescription drugs, that impairs mental or motor function must not be used while working at or on this project. Marijuana remains illegal under Federal Law, medical marijuana cards or prescriptions permitting their use will not be allowed.)

The cost of enforcing this policy shall be the responsibility of each employer of the effected employee.

13(c). Safety Representative. Each Contractor/Subcontractor shall have a designated Safety Representative available at the site assigned the responsibilities of managing all aspects of safety related to employees under their direct control.

These duties may be performed by a Field Superintendent or Foreman having the required training, experience and qualifications listed below. These employees may have duties other than safety provided appropriate adherence to State, Local Laws, Ordinances, Codes, Regulations and these Safety Specifications are followed by personal under their direct control.

CONTRACTOR/Sub-Contractor Safety Representative must have the following minimum qualifications:
The CSR/SSR shall have a minimum of 3 -5 years of qualified project safety experience on similar type construction projects.

Evidence of completing the OSHA 10 or 30 Hour Construction Outreach Training or

equivalent with the past 3 yrs.

Current First Aid/CPR certification provided by The American National Red Cross or equivalent training.

Ability to stop work in the event of a workplace hazard, until corrective action has been implemented.

Understanding of Federal and/or State Safety and OCIP Safety Regulations

Ability to conduct appropriate incident investigations.

Ability to communicate with field personal and project staff on relevant Health and Safety items.

13(d). Orientation. One of the requirements of all contractors/subcontractors and their safety representative or designees is to ensure that a complete basic safety orientation is conducted for all their employees new to the site. A Project Orientation by CONTRACTOR is required before an employee can receive a project ID and enter the field. At a minimum, the orientation shall include:

Employee safety requirements and policies.

Site Specific Safety and Health rules.

Permitting procedures, including work permits, excavation, confined space entry, lock-out, etc.

Hazard communication.

Emergency alarms and evacuation procedures.

All employees will complete and sign a Safety Orientation form supplied by CONTRACTOR. Upon successful the employee will receive a hard hat sticker with an identification number to be worn on the employees hard hat at all times while on the project.

13(e). Fall Protection. 100% Fall Protection shall be implemented by all trades for all fall exposures of six (6) feet or more.

13(f). Excavation**.** Trenching or excavating activities must be under the supervision of a competent person at all times.

13(g). PPE

Employees must at all times wear an ANSI Z89.1 approved hard hat on the jobsite.

Employers must supply all personal protective equipment.

Safety glasses with permanently affixed side shields are required at all times. All safety glasses, goggles, and face shields must have the ANSI-Z87 approval.

Sturdy work boots are required at all times on the jobsite. Employees on the jobsite shall not wear tennis shoes, running shoes, casual street shoes, sandals or shoes made of other thin material.

At minimum a Class ll High Visibility reflective vest or equivalent shall be worn at all times while on-site.

13(h). Hazard Communication. CONTRACTOR shall maintain a copy of all Safety Data Sheets, *and* a chemical inventory list, for all hazardous substances used at the jobsite by their firm, as well as for all hazardous substances used at the jobsite by all Subcontractors regardless of tier.

13(i). Return to Work Program. Each Employer should have a written Early Return to Work Program that should be implemented on this project.

SECTION 01 11 00 - SUMMARY OF WORK

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Work required to be performed by the Contractor:

SB1022 Classroom and Vocational Training Center Project
2456 Claybank Road, Fairfield, Solano County, California

In conformity with the Drawings and Specifications, the Agreement Between Owner and Contractor, including the General and Supplementary Conditions and other Division 1 Specification Sections, hereinafter identified as applied to this Project; including furnishing all material, labor, tools, equipment and services necessary therefore and incidental thereto, complete and available for intended use.

1.02 PROJECT DESCRIPTION

A. The Project includes construction of the new Classroom and Vocational Training Center to rehabilitate adult offenders at the Claybank Campus in Fairfield. This 39,340 square-foot facility will house programs that establish and/or expand rehabilitative programs, equip offenders with effective life skills, prepare offenders for productive employment, reduce recidivism rate amongst Solano County's incarcerated population and refocus resources for the purpose of rehabilitation.

The Project consists of two new single-story buildings with classrooms, computer training, vehicle repair bays, building trades training bays, administrative work area, building support and circulation spaces, and paved area for driver training and parking.

B. All work in accordance with the bid/contract documents.

C. The Work will be constructed under a single prime contract.

1.03 LOCATION OF SITE

A. The site of the work is on County property located at 2456/2458 Claybank Road, in the City of Fairfield, Solano County, California. The project work area is the western portion of the existing Stanton Correctional Facility site and in select areas within the existing site boundary, as described in the Drawings.

1.04 SPECIFICATIONS

A. The Specifications are those documents bound in the Project Manual and enumerated in the Table of Contents. The General Conditions of the Contract for Construction. Supplementary Conditions, and Division 0 and 1 General Requirements of the Specifications apply to all Work under this Contract.

1.05 DRAWINGS

A. The Drawings consist of Drawing Sheets listed on G002. The printed documents for the Project take precedence over any furnished electronic versions. Although the electronic versions are believed to be accurate, they should be verified for accuracy and completeness, prior to use.

1.06 SECURITY PROCEDURES

A. Contractor shall cooperate to County authorities and shall observe and comply with all procedures presently in force on the detention facility grounds. Refer to Sections 01 31 00, Project Management, and 01 35 53, Project Security Procedures.

B. After award of Contract, there will be a project start meeting prior to or shortly after issuance of the Notice to Proceed, at which time, security regulations will be reviewed with Contractor, subcontractor, and other applicable parties who have an interest due to performing work on the Project.

C. The Contractor will be required to follow all security procedures put forth by the Solano County Sheriff's Office and Contractor will participate with the Project Manager and Sheriff's Office transition team to ensure that the security procedures are followed by all project personnel.

D. The Project Manager, Sheriff's Office transition team and Contractor will participate in a weekly status meeting to review and monitor the adherence to the security procedures, as well as, develop a plan for dealing with issues that require modification of change to the procedures. This meeting frequency may be adjusted depending on the level of compliance with the Project Security Procedures.

1.07 INTERRUPTION OF SERVICES

A. Contractor shall make provisions to accomplish the work of this Contract without undue interference with detention facility operations. Interruptions to services for the purpose of making or breaking connection shall be made only after consultation with the County a minimum of ten working days in advance of connection break, and shall be at such time and of such duration as may be directed.

B. In addition, existing sewer, water, electrical, mechanical and telephone/security lines disconnected for Work of this Contract shall not remain disconnected for more than 2 hours. If these utilities cannot be restored within the 2-hour period. Contractor shall provide temporary utility service to restore required utility at Contractor's expense.

1.08 SEQUENCE OF CONSTRUCTION OPERATIONS

A. The Work will be conducted according to the Contractor's Construction Schedule accepted by the County.

B. Before starting construction operations, Contractor shall confer with the County to review

sequence of construction operations.

C. The County desires to have the sequence the Work on-site in a manner to allow the operations of the existing correctional facility to continue and function for its intended purpose. The existing operations cannot be interrupted to cause impact on the detention operations and programs. The County does not want to dictate the 'means and methods' of the Contractor however there are operational issues that will need to be addressed.

D. Contractor shall prepare schedules as set forth in Section 01 32 16, Progress Schedules and Reports, and include the sequencing of the Work as described on the Drawings and Specifications.

E. Contractor shall coordinate erection of walls, steel framing, wall framing, wall panels, windows, partitions or other space enclosure with requirements of others for moving large pieces of equipment into building or into room to be enclosed. Contractor shall consult with the Project Manager as to the necessity for deferring erection of such enclosures and shall deliver to the County a schedule of such deferments and reasons therefore. Cost of deferring construction shall be borne by Contractor.

1.09 HOURS OF WORK

A. Contractor shall perform Work of this Contract on normal workdays and within normal work hours; 7:00 a.m. to 5:00 p.m. After hours work and work on Saturdays, Sundays and holidays may be permitted if approval is received from the County at least 2 working days in advance.

1.10 SITE CONDITIONS AND REQUIREMENTS

A. Contractor shall keep drainage facilities, walks, and paved areas clean and free of mud and dirt, obstacles, etc. so that normal drainage and pedestrian and vehicular travel may be maintained.

B. Do not use landscaped area(s) for work operations or storage.

1.11 WORK UNDER OTHER CONTRACTS

A. Coordination with other contractors will be handled through the Project Manager. The Contractor will participate in all coordination meetings between contractors and will work cooperatively to accommodate the needs of other contractors without increasing the costs to the County. The Project Manager will set up said meetings and the amount of meetings will be at the discretion of the Project Manager.

B. The County anticipates that there will be other contracts for telephone/data installations, and furnishings, fixtures and equipment (FF&E) through separate contractors. There may be other contracts in addition to those listed. The scope and timing of this work is not finalized at this time.

1.12 CONTRACTOR USE OF PREMISES

A. General: During the construction period the Contractor shall have full use of the designated Project area for construction operations, including use of the site. The Contractor's use of the premises is limited only by the County's right to perform construction operations with its own forces or to employ separate contractors on portions of the Project.

1. Confine operations to areas in within Contract limits indicated as "Limits of Work". Portions of the site beyond areas in which construction operations are indicated are not to be disturbed.

2. Keep driveways and entrances serving the premises clear and available to the County and the public at all times, including the off-site roadway that leads to the Project site. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.

3. Repair and replace damaged existing construction to remain such as curbs, parking lot paving, roadways, site vegetation and utilities.

4. Contractor must coordinate with the Project Manager and Sheriff’s Office to ensure the operations of the temporary facilities are not disturbed or interrupted. Refer to Section 01 51 00/ Temporary Facilities and Controls.

1.13 MISCELLANEOUS PROVISIONS

A. Project Completion Requirements:

1. Before final acceptance, inspect, test and adjust performance of every system or facility of the Work to ensure that overall performance is in compliance with the contract documents.

2. No later than 11 months after the date of Final Acceptance, and after County occupancy and use of the Project, return and again inspect, test and adjust the work. Measure performance relative to terms of the acceptance test performed at the end of the job and demonstrate and record compliance. See Document 00 72 00, General Conditions of the Contract for Construction, for details and more information.

3. Submit a report of results to the County and Project Manager.

4. Instruct the County's operating personnel on operational requirements needed to maintain compliance.

1.16 STORM WATER POLLUTION PREVENTION PLAN (SWPPP)

A. A SWPPP has not been prepared for the site. Contractor shall prepare the SWPPP in its entirety in accordance with all of the requirements of the General Construction Storm Water Permit. Contractor shall retain a Qualified SWPP Developer (QSD) licensed in the State of California, to prepare this Plan by showing the Best Management Practices for the

prevention and control of pollutants and erosion on the site. Contractor is responsible to implement the SWPPP and make revisions to the Plan as necessary until Completion of the project. Contractor shall comply with all requirements as specified in Section 312500.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

**END OF SECTION 01 11 00**

SECTION 01 21 00 - ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Description and monetary amount of Allowance in Contract Sum
2. Costs in Contract Sum other than in Allowance
3. Procedures for administration of Allowance

B. Related Requirements
1. Document 00 72 00, General Conditions of the Contract for Construction: Article 4.8, Allowances and Article 12, Changes in Work
2. Section 01 33 00: Submittal Procedures

1.2 ALLOWANCE (S)

A. Include in the Bid/Contract amount the allowance (s) costs listed below and Contractor costs noted in Article 1.4 below.

1. Cost of furnishing and installation of interior signage $ 25,000

1.3 COSTS INCLUDED IN ALLOWANCE

A. Cost of the work to Contractor, excluding overhead, profit and other costs included in contract sum as specified in Article 1.4

B. Execution at the site

C. Labor required under the Allowance

D. Applicable taxes

1.4 CONTRACTOR COSTS INCLUDED IN CONTRACT SUM

A. Handling at site

B. Protection from damage

C. Other expenses required to complete work

D. Contractor's overhead and profit

1.5 WORK INCLUDED UNDER ALLOWANCE

A. Interior Signage

The Contractor will provide design of interior signage with County input. Contractor is required to provide a minimum of three (3) detailed subcontractor quotes to furnish and install the signage. The County reserves the right to choose the Subcontractors allowed to bid on the work. The Project Manager will review each quote and make a recommendation to the County.

1.6 CONTRACTOR RESPONSIBILITY FOR ALLOWANCE ITEMS

A. Make all arrangements for performance of Allowance work

B. Provide County with certified copies of invoices, bills of sale or other documents authenticating costs incurred by Contractor for Allowance items.

1.7 PAYMENT/ADJUSTMENT OF COSTS

A. Funds will be drawn from the Contingency Allowance only by Change Order in accordance with the requirements of Specification Section 00 72 00/ General Conditions of the Contract for Construction, Article 12, Changes in the Work.

B. At closeout of Contract, funds remaining in Contingency Allowance will be credited to County by Change Order in accordance with the requirements of Specification Section 00 72 00/General Conditions of the Contract for Construction, Article 12, Changes in the Work.

**END OF SECTION 01 21 00**

# SECTION 01 23 00 - ENHANCEMENTS

## PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for enhancements.

1.3 DEFINITIONS

A. Enhancements: To demonstrate the best value for the Project and the County, bidders are to include proposals for each enhancement.

1.4 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the enhancement into Project.

B. Execute accepted enhancements under the same conditions as other work of the Contract.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

3.1 SCHEDULE OF ENHANCEMENTS

Provide proposal for the Best Value Enhancements No. 1 through 26 as shown on the drawings cover sheet G001 which are not considered part of the Base Bid Project Scope.

**END OF SECTION 01 23 00**

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# SECTION 01 23 01 – DEFERRED APPROVAL ITEMS

## PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for deferred approvals.

B. Contractor shall schedule and give prompt attention to the preparation and submittal of these deferred approval items. Extension of contract time will not be given if project is delayed due to not making submittals in a timely manner.

C. Installation of the deferred approval items of work shall not be started until detail plans, specifications and engineering calculations have been approved by the Architect and Owner in writing through the submittal process.

D. Contractor shall furnish all additional calculations and information required for resubmittal as requested in previous submittal review response.

E. For each deferred approval item, the Contractor, subcontractor or supplier shall provide specifications, specific details, drawings, descriptive materials and shop drawings.

1.3 DEFERRED APPROVAL ITEMS

A. Automatic Fire Alarm system drawings and calculations shall be signed by a licensed Fire Alarm engineer registered in California.

B. Fire sprinkler drawings and calculations shall be signed by a licensed Fire sprinkler engineer registered in California.

C. Metal Building Structural drawings and calculations shall be signed by a licensed Structural engineer registered in California. The pre-engineered metal building foundation system was designed by Kitchell based on preliminary building reactions. The pre-engineered building reactions will be reviewed and validated by Kitchell during the review of the pre-engineered metal building shop drawings, prior to the construction of the foundations.

RFI 0001 — *Stamp Approval Metal Building*
*Acceptable for a Civil Engineer to stamp drawings.*

1.4 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the deferred approval into Project.

B. The Contractor shall schedule and give prompt attention to the preparation and submittal of the Deferred Approval Pre-Engineered Metal Building. Extension of Contract Time will not be granted if the project is delayed due to not making the submittal in a timely manner.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION 01 23 01**

SECTION 01 25 13 - PRODUCT SUBSTITUTIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section specifies administrative and procedural requirements for handling requests for substitutions made after award of the Contract.

B. The Contractor's Construction Schedule is specified in Section 01 32 16, "Construction Progress Schedules and Reports"; and the Schedule of Submittals is included under Section 0133 00, "Submittals Procedures."

C. Standards: Refer to Section 01 42 00 "Definitions and Standards" for applicability of industry standards to products specified.

D. Procedural requirements governing the Contractor's selection of products and product options are included under Section 0160 00 "Materials and Equipment."

1.03 DEFINITIONS

A. Definitions used in this Article are not intended to change or modify the meaning of other terms used in the Contract Documents.

B. Substitutions: Requests for changes in products, materials, equipment, and methods of construction required by Contract Documents proposed by the Contractor after award of the Contract are considered requests for "substitutions." The following are not considered substitutions:

1. Substitutions requested by Bidders during the bidding period, and accepted prior to award of Contract, are considered as included in the Contract Documents and are not subject to requirements specified in this Section for substitutions.

2. Revisions to Contract Documents requested by the County or Architect.

3. Specified options of products and construction methods included in Contract Documents.

4. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.04 SUBSTITUTION PROCEDURE

A. Substitute Products: When the naming of one or more products is followed by "or accepted equal," a substitute product may be offered for consideration. A substitute product is a product other than those specified.

RFI 0011

B. Product substitution requests shall be submitted for approval within 30 calendar days from the date of notice to proceed. Any substitution requests submitted after the allocated time may not be accepted.

C. If a substitution is being proposed, submit drawings, specifications, tests, performance data, and other pertinent information required to substantiate the equality of each substitute product.

D. After the designated substitution period other products may be proposed only if a product indicated or specified can be proved to have subsequently become unavailable.

E. Whenever a product is identified in the Contract Documents by reference to manufacturer's name, trade name, catalog number, or the like, it is so identified for the purpose of establishing a standard, and products of other manufacturers may be equally acceptable, provided the proposed products are, in the opinion of the Architect, of equal quality, utility, and appearance.

F. In requesting acceptance of a product other than that identified in the Contract Documents, the Contractor represents that he/she:

1. Has investigated the proposed product and determined that it is equal to or superior in all respects to that indicated or specified.

2. Will furnish the same guarantees/warranties or bonds for the proposed product as for the product indicated or specified.

3. Will coordinate the installation of the proposed product into the Work, and make such other changes as required to make the Work complete and in compliance with the Contract Documents and applicable regulatory requirements at no additional cost to the County.

4. Waives claims for additional costs and time associated with the proposed product that may subsequently become apparent.

5. Agrees to pay the Architect for costs of reviewing the proposed substitute product, as specified hereinafter.

G. Request for acceptance of a product other than that indicated or specified in the Contract Documents shall be submitted to the Architect on a “Substitution Request Form”, provided at the end of this section, and accompanied by sufficient information to enable proper evaluation to be made. Only one product may be proposed for a product identified in the Contract Documents. Submit with request:

1. Complete technical data, including drawings, performance specifications, cost data, samples, and test reports of the product proposed. Submit additional information, if required by the Architect.

2. A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements such as size, weight, durability, performance and visual effect.

3. Data similar to that specified for the item for which the product is proposed.

4. Complete breakdown of costs indicating the amount to be deducted from the Contract Sum if the proposed product is accepted.

5. Signed statement that the proposed product is in full compliance with the Contract Documents and applicable regulatory requirements.

6. List of other Work, if any, which may be affected by the proposed product. Be responsible for the effect of a proposed product upon related Work in the Project, and pay the additional costs generated by the product if it is accepted, including the cost of the Architect's additional services associated therewith.

7. Information on availability of maintenance service, and source of replacement materials.

8. Sample of manufacturer's standard form of guarantee or warranty for proposed product.

9. A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.

10. Certification by the Contractor that the substitution proposed is equal-to or better in every significant respect to that required by the Contract Documents, and that it will perform adequately in the application indicated. Include the Contractor's waiver of rights to additional payment or time, that may subsequently become necessary because of the failure of the substitution to perform adequately.

H. The Architect will review requests for proposed products with reasonable promptness and notify the Contractor, in writing, of his decision to accept or reject such products.

I. The Architect at his sole discretion will determine the acceptability of proposed products, and his determination shall be final.

J. Architect's Action: No consideration will be given to a substitute product unless, in the Architect's judgment, it complies with the following conditions:

1. It is equal in quality and serviceability.

2. Its use does not entail changes in details or related construction.

3. It is acceptable in regards to design and artistic effect.

4. There is cost, time, or both, advantage to County.

5. The cost of reviewing such proposed products by the Architect or his consultants, or the County's consultants, and any Architect or consultant fees necessary to accommodate the substitution into the Work, shall be processed as a deductive Change Order in accordance with the GENERAL CONDITIONS and SUPPLEMENTARY CONDITIONS.

K. Notification: Written notification of decision will be given within a reasonable time after receiving the required technical data. Acceptable substitutions will be processed as Change Orders.

L. Acceptance of a product shall not relieve the Contractor from responsibility for the proper execution of the Work and any other requirements of the Contract Documents.

M. If a proposed product is not accepted, use the product originally specified or indicated.

N. No products other than those indicated or specified in the Contract Documents shall be purchased or incorporated in the Work without the Architect's prior written acceptance.

PART 2 – PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

**END OF SECTION 01 25 13**

SUBSTITUTION REQUEST FORM FOLLOWS

**SUBSTITUTION REQUEST FORM**

TO_____

PROJECT: SB1022 CLASSROOM AND VOCATIONAL TRAINING CENTER

We hereby submit for your consideration the following product instead of the specified item for the above Project:

Proposed Substitution_____

_____

Section _____Paragraph _____Specified Item _____

Attach complete technical data, including laboratory tests, if applicable.

Include complete information on changes to Drawings and Specifications which proposed substitution will require for its proper installation.

Fill in Blanks Below:

A. Does the substitution affect dimensions shown on Drawings? Yes___ No____. If yes, clearly indicate changes.

_____

_____

B. What effect does substitution have on other trades?_____

_____

_____

C. What effect does substitution have on construction schedule?_____

_____

_____

D. Differences between proposed substitution and specified item? _____

_____

_____

E. Manufacturer's warranty/guarantees of the proposed and specified items are:_____

_____

_____

_____ Same _____ Different (explain on attachment)

The undersigned certifies that the function, appearance and quality are equivalent or superior to the specified item. The undersigned also certifies that all costs caused by or resulting from the requested substitution including, but not limited to, additional design work, construction changes and review time will be paid by the firm requesting the substitution.

Submitted by:

For Use by Design Consultant

Signature_____ ____Accepted ____Accepted as Noted

Firm_____ ____Not Accepted ____ Received Too Late

Address_____ By_____

_____ By_____

By_____ Remarks_____

Telephone_____

# SECTION 01 26 00 - CONTRACT MODIFICATIONS PROCEDURES

## PART 1 - GENERAL

### 1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Document 00 72 0O/General Conditions of the Contract for Construction and Document 00 73 00/ Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

B. Refer to General Conditions, Article 12 for additional provisions regarding changes in the work. If any provision in this Section 01 26 00 should conflict with any provision in General Conditions Article 12, this Section shall control.

### 1.02 NO CHANGES WITHOUT CONSENT; PERFORMING WORK ORDERED

A. No extra Work shall be performed, and no change shall be made, except pursuant to a written Change Order, Work Authorization, or Field Order from the County stating that the extra Work or change is authorized, and no claim for any addition to the Contract Price or Time for Completion shall be valid unless ordered. However, nothing in this Section shall excuse the Contractor from diligently proceeding and fully completing the Project.

### 1.03 CHANGE ORDERS AUTHORIZED; PROCEDURE

A. Authorization

1. Change Orders Authorized. Subject to legal requirements relating to competitive bidding, the County may require changes in, additions to, or deletions from the scope of the Work to be performed or the materials to be furnished pursuant to the Contract Documents.

   The County may, at any time, without notice to the sureties, by written order designated or indicated to be a Change Order, make any change or modification in the Work, or add to the Work within the general scope of the Contract, including, but not limited to changes:

   a. In the Specifications or Drawings;

   b. In the sequence, method or manner of performance of the Work;

   c. In the County-furnished facilities, equipment, materials, service, or site.

2. County Directed Changes Requiring an Increase in Contract Sum. If the Change in or addition to the work will result in an increase in the Contract Sum, the County shall have the right to require the performance thereof on a Lump Sum basis or a Time and Material basis, all as hereinafter more particularly described. The right of the County as aforesaid shall apply with respect to each Change in the Work.

B. Methods of Calculation. Adjustments, if any, to the Contract Price by reason of any such change, addition or deletion, shall be determined by one or more of the following methods, at the County's sole discretion. The Contractor shall provide sufficient substantiating data to allow the County to evaluate the Contractor's request for a Change Order.

3. By a lump sum proposal by the Contractor accepted or amended by formal action by the County; and/or

4. By time and materials charges, limited to the "Actual. Cost" to perform the Work, as defined by Paragraph D of this Article, plus overhead and profit as allowed by Paragraph C of this Section.

C. Overhead/Profit and Allowable Time Limitations on Change Orders. If the County elects to have the Change in the Work performed on a Lump Sum basis, its election shall be based on a lump sum proposal, which shall be submitted by the Contractor to the Project Manager within ten (10) days of the Contractor's receipt of a request The County reserves the right to request the Contractor to adjust the price of the change order if the County disagrees with the Contractor's quoted price. The County's request for a lump sum proposal shall not be deemed an election by the County to have the change in the Work performed on a lump sum basis. The Contractor's and the Contractor's subcontractor's' proposal shall be itemized and segregated by labor and materials for the various components of the change in, or addition to, the Work (no aggregate labor total will be acceptable) and shall be accompanied by signed proposals of any subcontractors who will perform any portion of the change in, or addition to, the Work and of any persons who will furnish materials or equipment for incorporation therein. 'The proposal shall also include the Contractor's estimate of the time required to perform said changes or additional work

The portion of the proposal relating to labor, whether by the Contractor's forces or the forces of any of its subcontractors, may include reasonable anticipated costs of job site labor, including foremen, who will be directly involved in the change in the Work, for such time as they will be so involved. The Contractor's cost for Project Managers, Project Engineers, Superintendents, Clerical, and like personnel are considered as contained in overhead.

1. The Contractor's proposal for additional Work shall include by itemized breakdown for Work done by Contractor's own forces and including subcontractors with sub-subcontractors' itemized breakdowns:

    a. Cost of labor, including: hourly base wage's, Social Security taxes, Federal or State unemployment taxes, worker's compensation insurance, and fringe benefits required by collective bargaining agreements effective for the Contractor or subcontractor.
    b. Cost of materials and equipment or furnishings which will be incorporated into the permanent Work, including manufacturers or supplier's cost, sales taxes, and cost of delivery.

c. Construction equipment costs (not small tools) for time of use required at Contractor's or Subcontractor's unit rates or at discounted local published rates, whichever is less.

d. General Conditions, General Requirements, supervision, overhead (excluding small tools) and profit applied to items number a, b, and c above for:

(1) Work done by Contractor's own forces; not including bond and insurance premiums, 10% of the cost of that portion of additional work.

(2) Work done by subcontractors, all tiers, including bond and insurance premiums, if any, shall not exceed 10% of the cost of that portion of the work plus 5% for the General Contractor. Total combined General Contractor and Sub-Contractor fee shall not exceed 15%.

(3) Under no circumstance will the total allowable mark up for. General Conditions, General Requirements, supervision, overhead (excluding, small tools) and profit, exceed a cumulative total fifteen percent (15%), including markups for all parties involved in a change.

e. Contractor's Performance and Payment Bond premiums, one percent (1 %).

i. In the event that the Contractor fails to submit his proposal within the designated period, the County may order the Contractor to proceed with the Change or Addition to the Work and the Contractor shall so proceed. The County shall unilaterally determine the reasonable cost and time to perform the Work in question, which determination shall be final and binding upon the Contractor. In no event shall the Contractor allow an unresolved change order to hamper the progress of the work,

ii. In the event that the parties are unable to agree as to the reasonable cost and time to perform the change in, or addition to, the work based upon the Contractor's Proposal, and the County does not elect to have the Change in the Work performed on a Time and Materials basis, the County shall make a unilateral determination of the reasonable cost and time to perform the change in the Work, based on their own estimates, the Contractor's submission, or a combination thereof. A Change Order shall be issued for the amounts of cost and time determined by the County and shall become. binding upon the Contractor unless the Contractor submits his protest in writing to the County within thirty (30) days of the issuance of the Change Order. County has the right to direct in writing the Contractor to perform the change in the Work, which is the subject of such Change Order. Failure of the parties to reach agreement regarding the cost and time of performing the change in the Work and/or any pending protest shall not

relieve the Contractor from performing the change in the Work promptly and expeditiously.

iii. If the County elects to have the change in the Work performed on a Time and Materials basis, the same shall be performed, whether by the Contractor's forces or the forces of any of its subcontractor or sub-subcontractors, at actual cost to entity performing the change in Work, without any charge for administration, clerical expense, supervision, or superintendence of any nature whatsoever, or the cost, use or rental of tools or plant. The cost of a Change Order on a Time and Materials basis shall be evaluated according to Paragraph 1.03.C. The Contractor shall submit to the County daily Time and Material tickets, to include the identification number assigned to the change in Work, the location and description of the change in the Work, the classification of labor employed with names and Social Security numbers, the materials used, the equipment rented (not tools) and such other evidence of cost as the County may require. The County may require authentication of all Time and Material tickets and invoices by persons designated by the County for such purpose. The failure of the Contractor to secure any required authentication shall, if the County elects to treat it as such, constitute a waiver by the Contractor of any claim for the cost of that portion of the change in the Work covered by a non-authenticated ticket or invoice; provided, however, that the authentication of any such ticket or invoice by the County shall not' constitute an acknowledgment by the County that the items were reasonably required for the change in the Work.

iv. No costs for General Conditions, General Requirements, supervision, overhead, and profit will be paid by the County on account of a change in the work" except as specifically provided in Paragraph 1,03. C. and shall be deemed to include all costs and expenses which the Contractor or any of its subcontractors may incur in the performance of a change in the Work and which are not otherwise specifically recoverable by them pursuant to Paragraph 1.03.

D. "Actual Costs" Defined. The actual cost to perform the Work for purposes of this Section is limited to the applicable labor rates, including Contractor's contributions directly attributable to the Work authorized; and the material man's or supplier's invoice amount for all material and equipment actually used to accomplish the work authorized. All other direct and indirect costs, all costs attributable to the time needed to perform the Work ordered by such Change Orders, and all profit associated with such Work shall be included in the maximum overhead and profit amounts stated hereinabove.

E. Audit and Verification. With respect to any change in the Work resulting in a change in the Contract Sum, the Contractor shall afford and shall require its subcontractors to afford access to the County at all reasonable times to any books, correspondence, instructions, receipts, vouchers, memoranda, and records of any kind relating thereto, all of which shall be maintained by the appropriate parties for a period of at least three (3) years from and after the date the County makes payment on account of such change in work. The Contractor authorizes the County and shall require its subcontractors to authorize the County to check directly with any suppliers of labor and material with respect to, and to obtain, sworn statements and waivers of lien, if the County so elects.

F. Changes Requiring a Decrease in Contract Sum. If the change in the Work will result in a decrease in the Contract Sum, the County shall require a quotation by the Contractor of the amount of such decrease for use in preparing a Change Order. The Contractor's quotation shall be forwarded to the County within ten (10) days of the Project Manager's request and, if acceptable to the Project Manager, shall be incorporated in the Change Order. Contractor's quotation shall include all direct costs associated with the decreased scope of work, plus five percent (5%) for overhead. If not acceptable, the parties shall make every reasonable effort to agree as to the amount of such decrease, which may be based on a Lump Sum, properly itemized basis in accordance with Subparagraph 1.03.C.

If the Project Manager and the Contractor are unable to agree on the amount of such decrease, the decrease shall be the total estimated reduction in actual cost of the Work, as determined by the Project Manager in his/her reasonable judgment and the Contractor shall be bound to credit this amount to the County.

G. Periodic Change Orders. The Project Manager is authorized to cumulate Work Authorizations and process periodic Change Orders including additions and deletions, and to develop procedures providing the methods for such processing in addition to and consistent with those set forth in herein.

1.04 WORK AUTHORIZATIONS; PROCEDURE

A. Work Authorizations Authorized. The County or designee is authorized to issue Work Authorizations instructing the Contractor to proceed with extra Work.

B. Quotation by Contractor. Other than in extraordinary circumstances, as described below, before a Work Authorization is issued, the Contractor shall submit a quotation setting forth an estimated cost of the Work to be performed with sufficient substantiating data to allow the County to evaluate the quotation, and an estimate of the time necessary to perform the Work. If requested by the Project Manager, the Contractor shall provide additional data to support the quotation. The Contractor shall acknowledge the quotation as binding.

C, Request for Price Adjustment. After the extra Work specified on the Work Authorization is. completed, the Contractor may submit a request for a Contract Price Change Order due to the Work Authorization. The request shall be supported with substantiating data to show the actual costs to perform the Work and the overhead and profit being requested, as defined in Sections 1.03.C. and 1.03.0. The maximum price adjustment claimed shall not exceed ONE HUNDRED AND TEN PERCENT (110%) of the approved quotation.

D. Request for Time Adjustment. If the Contractor claims that the Work Authorization has delayed the construction completion time, he shall verify' the claimed delay by demonstrating with reference to the approved Project Progress Schedule that the Work Authorization in fact caused a delay in the overall completion date of the Project. Upon such demonstration; the' Project Manager shall process a request for a Contract Time extension Change Order pursuant to Specification Section 007200, Article 8.

E. Accumulation of Work· Authorizations. At the Project Manager's sole discretion, the Contractor's claims for Change Orders arising from several Work Authorizations may be accumulated into periodic Change Orders adjusting Contract Price, Time, or both,

separately or in one Change Order. Such periodic Change Orders shall include deductions for changes which constitute Deductive Change Orders as defined in Section 1.03.F., during the time period being considered in the periodic Change Order.

F. Immediate Work Authorizations. In the event extraordinary circumstances arise which require extra Work to be authorized before the Contractor, the County or designee prepares a quotation may issue an immediate Work Authorization without such quotation. Such Work Authorization shall include a maximum authorized sum over which no price adjustment will be authorized. The determination as to whether circumstances as described above exist is discretionary with the County. Such Work Authorizations otherwise shall be processed as specified in this Section.

1.05 FIELD ORDERS; PROCEDURES

A. Field Orders Authorized. The Project Manager may issue Field Orders instructing the Contractor to proceed with Work differing from that shown in the Contract Documents, and which changes the Scope of the Work, by adding or deleting Work, by instructing Work to be located differently than shown on the Contract Drawings, or making other minor changes which the Project Manager determines are in the County's best interests.

B. No Price or Time Adjustment Authorized. ·Field Orders are not authorized to change the Contract Price or Time, or to bind the County to the payment of any sum to the Contractor.

C. No Cost Adjustments Required. If the change ordered in the Field Order will neither delete nor add costs to the Project, the Field Order shall so note. If the Contractor contends that extra work is required, Section 1.03 shall apply.

D. Cost Adjustments Required: If the change ordered in the Field Order will either delete or add costs to the Project, the Field Order shall instruct the Contractor to submit its quotation. Thereafter, Section 1.02 or Section 1.03, as specified by the Project Manager, shall apply.

E. Proceeding Before Decision. If the Contractor proceeds with Work noted on a Field Order without notifying the Project Manager of its claims that the Work is extra work, the Contractor shall have waived its right to request an adjustment to the Contract Price and/or Time. Such notification must be made prior to commencing any of the work noted on the Field Order.

1.06 EXTRA WORK REQUESTS; PROCEDURE

If the Contractor claims that any Clarification, Field Order, or other instruction issued by the County requires Work beyond the Scope of the Agreement for Construction, the following provisions shall apply:

A. Notice to Project Manager. Within ten (10) calendar days, the Contractor shall notify the Project Manager of its request, and submit a quotation for the requested costs, pursuant to Section 1.03.C. The Contractor shall submit additional information requested by the Project Manager to decide the request.

B. Action by Project Manager. The Project Manager shall review the Contractor's submittals and either recommend for approval or deny Contractor's request. If the request is approved, the Project Manager may process either a Change Order or Work authorization, pursuant to this Section. If the request is denied, the Project Manager shall so advise the Contractor. Thereafter, the Contractor shall proceed with the Work in issue. The Project Manager shall issue his/her decision within twenty-one (21) days of receipt of a complete submittal from the Contractor. The Project Manager shall recommend final action to the County and the County's decision shall be binding on the Contractor.

C. Time. If the request is approved, the time during which the request was being considered shall be included in the time allocation for the Work Authorization adjusting the request, and Article 1.03 shall apply thereto; if the request is adjusted by Change Order, any Time extension authorized thereby shall include the Time during which the request was pending. If the request is denied, no Time adjustment shall be authorized.

D. Effect of Proceeding. If the Contractor proceeds with the Work without notifying the Project Manager pursuant to Paragraph A, or before a decision pursuant to Paragraph B, any claim for a Contract Price and/or Time adjustment shall be waived.

E. Scheduling. The Contractor is responsible to schedule the Work and submit extra-work requests so the time required for decision, as specified in Paragraph B, does not delay the Work in general.

F. Contractor Notice of Change. If the Contractor asserts that any event or occurrence has caused a change in, or addition to, the Work which change causes an increase or decrease in the Contractor's cost or the time required for the performance of any part of the Work under the contract, the Contractor shall, within ten (1 0) days of such event, give the County written notice as herein required. Said notice shall include the instructions or circumstances that are the basis of the change and the Contractor's best estimate of the cost and time involved.

i. If the Contractor intends to assert a claim under this Section, he/she must, within. Ten (10) days after receipt of a written Change Order above or the furnishing of a written notice under Paragraph 1.06.F. submit to the Project Manager a written statement setting forth the specific nature and cost of such claim, unless this period is extended by the Project Manager. The statement of claim may be included in the notice under Paragraph 1.06.F. above. Failure to submit such written notice within the specified time frame shall be deemed a waiver of the claim. The statement of claim shall include all direct, indirect and impact costs associated with the change, as well as the Contractor's estimate of the schedule impact of the change, if any.

ii. If the parties are unable to agree to the reasonable cost and' time to perform the Change, or are unable to agree as to whether a change occurred, the County shall make unilateral determination as described in Sub subparagraph 1.03. C.2. The Contractor shall proceed pursuant to the provisions of' that Section.

1.07 CHANGE ORDERS REGARDING TIME FOR COMPLETION

Any time extension authorized by the County pursuant to Specification Section 007200 Article 8, herein shall be set forth in a Change Order issued by the Project Coordinator and County Administrative Officer or the Board of Supervisors.

1.08 CHANGE ORDERS DUE TO UNAVAILABLE MATERIALS

In the event that the Contractor demonstrates good cause for a delay in the Contract Time due to the unavailability of materials, the County; in its sole discretion, may either grant a Contract time extension, or utilize this Section.

In the event that the Project is unable to be completed due to unavailable materials, and if the Project is completed otherwise, the Contractor may request to delete the portion of the Project not yet completed from the Agreement for Construction, thereby allowing a Notice of Completion to be filed on the remainder of the Project. The County shall approve no such Change Order unless the Contractor accompanies his request with an offer to perform the Work so deleted for a price not to exceed the value of the Work deleted by such Change Order, such Work to be commenced upon delivery of the materials, and diligently prosecuted to completion.

In the event the County elects to accept the Contractor's offer, Work done pursuant thereto shall not be construed as Work done on the Project, nor shall such Work be construed as affecting, in any way, the legal significance of the Notice of Completion filed on the Project. The application of this Section is limited as follows:

A. No Change Order shall be issued pursuant to this Section until the Contractor has submitted all documents required for final payment.

B. This Section shall apply only to Work, the completion of which is precluded due to unavailable materials.

C. Utilization of this Section lies solely within the discretion of the County, and such discretion hereby is delegated to the Project Manager.

1.09 EFFECT OF CONTRACTOR'S ACCEPTANCE OF CHANGE ORDER

By accepting a Change Order, Contractor agrees to the changes, if any, in the Contract Price specified for each item and to the specified Extension of time allowed, if any, for completion of the entire Work on account of such Change Order, and agrees to furnish all labor and materials and perform all Work necessary to complete all additional Work for the price adjustment and within the time specified. Contractor shall make no additional claim for adjustment to the Contract Price or time, nor, for additional costs or damages, on account of the work referenced in such Change Order. A Change Order duly issued by the County and accepted by the Contractor shall constitute a complete accord and satisfaction as to the work, Contract Price, and Contract Time changed thereby. Contractor shall defend and indemnify the County, its officers, employees, agents and consultants, if any Subcontractor asserts any claim against the County due to a duly issued and accepted Change Order.

1.10 EFFECT ON SURETIES

All changes authorized by the Contract Documents may be made without notice to, or consent of, the sureties on the Performance and Payment bonds, and shall riot reduce their liability on the bonds.
The County reserves the right to require additional Performance or Payment bonds to secure a Change Order. In this event, the Change Order shall be increased by the actual cost of the bond premium for the additional bond amounts if any.

1.11 GENERAL PROVISIONS RELATED TO CHANGES

The Contractor shall not be entitled to any amount for indirect costs, damages, or expenses of any nature, including, but not limited to, so-called "impact" or "cumulative" costs, labor inefficiency, wage, material or other escalations beyond the prices upon which the proposal is based and to which the parties have agreed , and which the Contractor, its subcontractors or sub-subcontractors or any other person may incur as a result of delay, interferences, suspensions, changes in sequence or the like, for whatever cause, whether reasonable or unreasonable, foreseeable or unforeseeable, or avoidable or unavoidable, arising from the performance of any and all changes in the Work performed. It is understood and agreed that the Contractor's sole and exclusive remedy in such event shall be recovery of his direct costs as compensable hereunder and an extension of the contract Time, but solely in accordance with the provisions of the Contract Documents.

No claim by the Contractor hereunder shall be allowed if asserted after final payment under this Contract. No claim relating to or flowing from a particular Change shall be allowed after execution of the Change Order relating to that change.

If any disputes should arise between the parties with respect to an increase or decrease in the Contract Sum or an expansion or contraction in the Contract Time as a result of a change in the Work, the Contractor shall not suspend performance of a change in the Work or the Work itself unless otherwise so ordered by the County in writing. The County shall, however, pay to the Contractor up to the County's reasonable estimated value of the change in the Work, regardless of the dispute, if said change in the Work results in an increase in the Contract Sum; and the County shall have the right to decrease the Contract Sum up to the County's reasonable estimated value of the change in the work, regardless of the dispute, if said change in the Work results in a decrease in the Contract Sum, and the Contractor shall be bound by the County's decision as to amount of payment or credit.

1.12 MINOR CHANGES IN THE WORK

The County and/or Project Manager shall have authority to order minor changes in the Work not involving an adjustment in the Contract sum or an extension of the Contract Time, arid not inconsistent with the Contract Documents. Such changes shall be effected by written order, and shall be binding on the County and the Contractor. The Contractor shall carry out such written orders' promptly.

**END OF SECTION 01 26 00**

# SECTION 01 29 00 - APPLICATION FOR PAYMENT

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section specifies administrative and procedural requirements governing the Contractor's Applications for Payment.

1. Coordinate the Schedule of Values and Applications for Payment with the Contractor's Construction Schedule, List of Subcontracts, and Submittal Schedule.

B. The Contractor's Construction Schedule requirements are included in Section 013216, "Construction Progress Schedules and Reports"; and Submittal Schedule requirements are included in Section 013300, "Submittals Procedures".

### 1.3 SCHEDULE OF VALUES

A. Coordinate preparation of the Schedule of Values with preparation of the Contractor's Construction Schedule. See Section 013216 "Construction Schedules and Reports" for additional information.

1. Within thirty (30) calendar days after the Award of Contract, the Contractor shall submit Schedule of Values for review by County's Project Manager, allocating a dollar value for each activity on the Construction Schedule.

B. Format and Content: Use the Construction Schedule as a guide to establish the format for the Schedule of Values.

1. Identification: Include the following identification on the Schedule of Values:

a. Project name and location.

b. Name of the County.

c. Project number.

d. Contractor's name and address.

e. Date of submittal.

2. Arrange the Schedule of Values in a tabular form with separate columns to indicate the following for each item listed:

   a. Generic name.

   b. Related Specification Section.

   c. Name of subcontractor.

   d. Name of manufacturer or fabricator.

   e. Name of supplier.

   f. Change Orders (numbers) that have affected value.

   g. Dollar value.

   h. Percentage of Contract Sum to the nearest one-hundredth percent, adjusted to total 100 percent.

3. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Break principal subcontract amounts down into several line items; amounts and line items subject to Project Manager's approval.

   a. Dollar value for each activity will be cost including labor and materials.

   b. Make sum of activity costs equal to total of each Subcontract that will then equal total of Contract Sum.

   c. Separate line items for General Conditions and overhead/profit will be required.

4. Round amounts off to the nearest whole dollar; the total shall equal the Contract Sum.

5. All material storage will be the responsibility of the contractor and stored material will not be reimbursed until said material is installed.

6. Schedule Updating: Update and resubmit the Schedule of Values when Change Orders or Work Authorizations result in a change in the Contract Sum. List each Change Order or Work Authorization as a new line item.

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by the Architect and paid for by the County. See Article 9 of General Conditions for additional information regarding progress payments and final payment.

1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements.

B. Payment Application Times: Each progress payment date is as indicated in the Agreement. The period of construction Work covered by each Application or Payment is the period indicated in the Agreement.

C. Payment Application Forms: Use AIA Document G702/CMA and Continuation Sheets G 703 as the form for Application for Payment.

D. Application Preparation: Complete every entry on the form, including notarization and execution by person authorized to sign legal documents on behalf of the County. Incomplete applications will be returned without action.

1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions have been made.

2. Include amounts of Change Orders issued prior to the last day of the construction period covered by the application.

E. Transmittal: Submit 3 executed copies of each Application for Payment to the Project Manager by means ensuring receipt within 24 hours; one copy shall be complete, including waivers of lien and similar attachments, when required.

1. Transmit each copy with a transmittal form listing attachments, and recording appropriate information related to the application in a manner acceptable to the Project Manager.

F. Waivers of Mechanics Lien and Stop Notice: With each Application for Payment, submit waivers of mechanics' lien and stop notices from every entity who may lawfully be entitled to file a mechanics lien or stop notice arising out of the Contract, and related to the Work covered by the payment.

1. Submit partial waivers on each item for the amount requested on each item.

2. When an application shows completion of an item, submit final or full waivers.

3. The County reserves the right to designate which entities involved in the Work must submit waivers.

G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of the first Application for Payment include the following:

1. List of subcontractors.

2. List of principal suppliers and fabricators.

3. Schedule of Values.

4. Contractor's Construction Schedule (preliminary if not final).

5. Submittal Schedule (preliminary if not final).

6. List of Contractor's staff assignments.

7. List of Contractor's principal consultants.

8. Copies of authorizations and licenses from governing authorities for performance of the Work.

9. Initial survey and damage report.

H. Final Payment Application: Administrative actions and submittals, which must precede or coincide with submittal of the final payment Application for Payment include the following:

1. All pertinent permits and similar approvals such as fire department sign-off.

2. Warranties (guarantees) and maintenance agreements.

3. Test/adjust/balance records.

4. Maintenance instructions.

5. Meter readings.

6. Start-up performance reports.

7. Change-over information related to County's occupancy, use, operation and maintenance.

8. Final cleaning.

9. Application for reduction of retainage, and consent of surety.

10. Completion of Project closeout requirements.

11. Completion of items specified for completion after Substantial Completion.

12. Assurance that unsettled claims will be settled.

13. Transmittal of required Project construction records to County.

14. Proof that taxes, fees and similar obligations have been paid.

15. Removal of temporary facilities and services.

16. Removal of surplus materials, rubbish and similar elements.

17. Change of door locks to County's access.

18. Sign off sheets for waste water treatment tracking conducted by contractor.

19. Post Warranty Bond in the amount of 10% of Final Contract Amount.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

**END OF SECTION 01 29 00**

SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 – GENERAL

1.01 COUNTY PROJECT PERSONNEL

A. This section specifies the County Project Personnel assigned to this Project.

B. Related requirements that describe the titles and roles of the County Project Personnel are specified in other Sections include:

1. General Conditions: Section 00 72 00; Article 2, Administration of the Contract.

C. County Project Personnel:

1. The County Project Manager is:
Mark A. Hummel – Capital Projects Management (CPM) Division Manager
CPM Representative/Project Coordinator is:
Orlie Coronel-Mangune
Solano County General Services Department, Capital Projects Management Division
675 Texas Street, Suite 2500, Fairfield, CA 94533
(707) 784-7908 Phone
(707) 784-7958 - Fax
mahummel@solanocounty.com
ucoronel-mangune@solanocounty.com

2. The Consultant Project /Construction Manager is:
Debi Hertz, Construction Manager
Gilbane Company
2456 Claybank Road, Fairfield, CA 94533
(408) 859-9280 Phone
dhertz@gilbaneco.com

Chris Wilson, Senior Project Executive
Gilbane Company
2456 Claybank Road, Fairfield, CA 94533
(916) 284-4126 Phone
cwilson@gilbaneco.com

3. The Project Architect is:
Gordon Rogers, Project Architect
Kitchell CEM
2450 Venture Oaks Way, Suite 500, Sacramento, CA 95833
(916) 412-4130 Phone
(916) 648-6534 Fax
grogers@kitchell.com

4. The County Inspector of Record is:
Michael Jacks, Senior Building Inspector
Solano County Resource Management, Building and Safety Services
675 Texas Street, Suite 5500, Fairfield, CA 94533
(707) 784-3147 Phone
mdjacks@solanocounty.com

1.02 PROJECT CONTROL

A. The County's Project Manager Consultant will outline and detail communication, correspondence and coordination procedures at Project start (pre-construction conference) meeting.

B. Examination of Site: Contractor and subcontractors shall visit the site prior to bidding and prosecution of the Work and shall familiarize themselves with existing conditions and be prepared to carry out the Work within existing limitations.

C. Condition of Work in Place: Inspect and take responsibility for previously prepared or installed work of other contractors before applying subsequent materials or finishes. If work is in unsatisfactory condition, notify the County's Project Manager. Do not proceed until defective work has been corrected.

D. General Coordination:

1. Subletting and Subcontracting Responsibilities: Refer to Document 00 72 00, General Conditions of the Contract for Construction, Article 5, Subcontractors and Section 01 31 13, Contractor Coordination.

2. Contractor shall coordinate the Work with related work being done by other contractors operating in the area and the County. This coordination shall include reasonable adjustments of schedule in order to allow other contractors or County to do their work.

3. Contractor shall coordinate electrical, mechanical, plumbing, security electronics and detention equipment work, particularly between general trades and electrical, mechanical, plumbing, security electronics and detention equipment/electrical trades so that sleeves, hangers, chases, openings, etc., required for pipe, conduit, and other installations of like character are duly and properly provided for and installed as work progresses.

4. Contractor shall carefully examine Drawings relating to entire work with actual conditions so that Work will be accommodated in spaces provided. General arrangement and location of elements of various systems is shown on the Drawings or specified. Final locations, levels, etc., shall be governed by actual material size used, by building conditions encountered, and by work of all trades. Space conflicts and interferences shall be resolved before work is installed.

5. Contractor shall utilize the Contract Documents, submittals, and layout drawings of the various trades to check and coordinate the Work so that no interferences or conflicts between trades will occur. This checking and coordination shall be performed and completed before construction is commenced in each affected area.

6. Coordinate work to assure efficient and orderly sequence of installation of construction elements. Make provisions for accommodating items installed by the County or under separate contracts.

7. Verify characteristics of interrelated operating equipment are compatible; coordinate work having interdependent responsibilities for installing, connection to, and placing such equipment in service.

1.03 COORDINATION

A. Description

1. Coordinate the Work; do not delegate the responsibility for coordination to any Subcontractor.

2. Resolve differences or disputes concerning coordination, interference, or extent of Work of the various SECTIONS.

B. Specific Coordination

1. Coordination: Coordinate construction activities included under various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of the Specifications that are dependent upon each other for proper installation, connection, and operation.

a. Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.

b. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.

c. Make adequate provisions to accommodate items scheduled for later installation.

2. Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

a. Prepare similar memoranda for the County and separate Contractors where coordination of their Work is required.

b. Prior written notice of ten (10) working days is required before interruption of any existing system. After written notice the contractor is required to set up a coordination meeting with the Project Manager and County personnel. The Project Manager will assist with retrieving the key personnel. The Contractor will submit a plan for interrupting said system that shall include a schedule of events for this operation.

C. Requests for Information (RFI)

1. Comply with requirements of Document 00 72 00, General Conditions, Article 4, Contractor.

2. Submit on form that will be distributed by the Project Manager during the pre-construction meeting.

3. Number RFI's sequentially; include date submitted.

4. Identify Project, Contractor, subcontractor, major supplier, pertinent Drawing sheet and detail number, and Specification Section.

5. Specifically identify time response information is required to avoid impact on Construction Schedule and cost. The time for response should be reasonable to allow for processing and Architect review, research and response.

6. RFI's are requests for information only. If a reply to an RFI requires additional services by Architect, or will change scope of Work or Contract Time, submit Change Order Request Work Authorization.

7. Allow ten working days for a response after delivery to the Project Manager.

8. Request for Information shall include written and graphic solutions proposed by Contractor. Architect will determine if proposal is in accord with Contract Documents and design intent of Project.

9. Contractor's failure to make reasonable effort to propose realistic solution may result in Request for Information returned with no action.

10. Maintain current and accurate Request for Information Log as follows:

a. Sequentially number each RFI. Indicate current status of RFl's at all times; submit log weekly, and as requested by Architect.

b. Maintain for duration of Contract.

c. For RFI's submitted in form of drawings follow submittal procedures specified in Section 01300 "Submittals.

11. Requests for Information shall be issued only for information not clearly defined in the contract documents. For those RFI's that are issued that request information that is clearly shown in the contract documents, the Architect shall be entitled to back charge the Contractor for the actual time spent responding to the RFI. The back charge shall be deducted from the Contractor's next payment application and those funds forwarded to the Architect as compensation.

    a. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

        1) Preparation of schedules
        2) Installation or removal of temporary facilities
        3) Delivery and processing of submittals
        4) Progress meetings
        5) Project Closeout activities

1.05 LOCATIONS, ELEVATIONS, AND LAYOUT OF WORK

A. Contractor shall layout the Work and furnish surveys required for alignment and elevations of the Work, and shall pay all costs. Contractor shall furnish necessary lines, levels, locations, measurements and markers for all on the Work and be responsible for their accuracy.

B. On building structures, Contractor shall layout on forms, walls, floors, and columns, the exact location of partitions as guide to all trades.

1.06 SCHEDULES AND MEETINGS

A. Planning and Scheduling: Refer to Section 01 32 16/ Construction Progress Schedules and Reports.

B. Project and Pre-Installation Meetings: Contractor or his duly appointed representative shall attend project meetings at regular intervals as set by the County's Project Manager and shall attend pre-installation meetings as required by pertinent Specification Sections. Attendance shall be limited to the Contractor and his immediate subordinates, subcontractors where so specified, the County's Project Manager, and representatives of the Architect and Consultants, as requested. County's Project Manager, or duly appointed representative, will keep minutes of meetings; with copies sent to all who attend. Meetings shall be held at job site at the County trailer or other designated location.

C. Project Construction Phases: Work of this Contract shall be executed in one phase. There are several work sequences in the Project that require completion in a certain sequence so that the existing facility can maintain 24/7 operation as a detention facility.

1.07 ALLOWABLE ENTRANCE

A. Contractor, subcontractors, their employees, suppliers and delivery persons shall enter and exit property via County designated entrance.

**END OF SECTION 01 31 00**

SECTION 01 31 13 CONTRACTOR COORDINATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Coordinate the Work; do not delegate the responsibility for coordination to any Subcontractor.

B. Resolve differences or disputes concerning coordination, interference, or extent of Work of the various SECTIONS and all sub-trades.

1.2 GENERAL COORDINATION

A. Coordination: Coordinate construction activities included under various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of the Specifications that are dependent upon each other for proper installation, connection, and operation.

1. Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.

2. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.

3. Make adequate provisions to accommodate items scheduled for later installation.

B. Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

1. Prepare similar memoranda for the County and separate Contractors where coordination of their Work is required.

2. Prior written notice of ten (10) working days is required before interruption of any existing system. After written notice the contractor is required to set up a coordination meeting with the Project Manager and County personnel. The Project Manager will assist with retrieving the key County personnel. The Contractor will submit a plan for interrupting said system that shall include a schedule of events for this operation.

1.3 REQUESTS FOR INFORMATION (RFI)

A. General:

1. Comply with requirements of Article 4 of General Conditions.

2. The Project Manager will conduct a weekly RFI status meeting with the Project Architect, Contractor, County personnel and others as deemed necessary to update the progress of reviewing RFI's.

3. Submit on form that will be distributed by the Project Manager during the preconstruction meeting.

4. Number RFI's sequentially; include date submitted.

5. Identify Project, Contractor, subcontractor, major supplier, pertinent Drawing Sheet and Detail Number, and Specification Section.

6. Specifically identify time response information is required to avoid impact on Construction Schedule and cost. The time for response should be reasonable to allow for processing and Architect review, research and response.

7. RFI's are requests for information only. If a reply to an RFI requires additional services by Architect, or will change scope of Work or Contract Time, Architect will submit Change Order Request Work Authorization.

8. Allow ten (10) working days for a response after delivery to the Project Manager.

9. Request for Information shall include written and graphic solutions proposed by Contractor. The Project Manager and Architect will determine if proposal is in accord with Contract Documents and design intent of Project.

10. Contractor's failure to make reasonable effort to propose realistic solution may result in Request for Information returned with no action.

11. Maintain current and accurate Request for Information Log as follows:

a. Sequentially number each RFI. Indicate current status of RFI's at all times; submit log weekly, and as requested by Project Manager.

b. Maintain for duration of Contract.

c. For RFl's submitted in form of drawings follow submittal procedures specified in Section 01 3300, "Submittal Procedures".

12. Requests for Information shall be issued only for information not clearly defined in the contract documents. For those RFI's that are issued that request information that is clearly shown in the contract documents, the Architect shall be entitled to back charge the Contractor for the actual time spent responding to the RFI. The back charge shall be deducted from the Contractor's next payment application and those funds forwarded to the Architect as compensation.

    a. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

        1. Preparation of schedules

        2. Installation or removal of temporary facilities

        3. Delivery and processing of submittals

        4. Weekly progress meetings, RFI status meetings and other project meetings as called by Project Manager

        5. Project Closeout activities

1.4 CONSERVATION

A. Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

B. Salvage materials and equipment involved in performance of, but not actually incorporated in, the Work. Refer to other sections for disposition of salvaged materials that are designated as County's property.

1.5 STAFF NAMES

A. Within 5 days of Notice to Proceed, submit a list of the Contractor's principal staff assignments, including the Project Manager, Superintendent and other personnel in attendance at the site; identify individuals, their duties and responsibilities; list their addresses, telephone and cell numbers and emergency contact numbers.

1.6 COORDINATION OF LAYOUTS

A. Provide basic layouts of grid lines and station points on sub-floors as necessary to facilitate coordination and layout of partitions and Work at and above ceilings.

1.7 COORDINATION DRAWINGS

A. Prepare coordination drawings before beginning fabrication or delivery of materials to the Project site. Such drawings should include, but not be limited to piping, ducts,

conduit, fixtures and equipment for all utilities, and should demonstrate that such items will fit in the space available within the structure.

B. Keep copies of the coordination drawings at the jobsite.

C. The Project Manager and/or the Architect will verify that coordination drawings have been made, but will not review the coordination drawings.

1.8 ELECTRICAL, MECHANICAL, SECURITY ELECTRONICS AND DETENTION EQUIPMENT COORDINATION

A. Use large-scale layout drawings of the electrical, mechanical, security electronics and detention equipment, together with Shop Drawings or layout drawings of other affected Work, to check, coordinate, and integrate the Work to prevent interferences.

B. Perform and complete checking and coordination before commencing construction in the affected areas.

PART 2 - PRODUCTS (Not Applicable)

PART 3 – EXECUTION

3.1 GENERAL INSTALLATION PROVISIONS

A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Verify characteristics of interrelated assemblies and equipment for compatibility. Coordinate Work having independent responsibilities for installation connection, or servicing access.

C. Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.

D. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject and do not install any damaged and defective items.

E. Provide attachment and connection devices and methods necessary for securing Work. Secure Work true to line and level. Allow for expansion and building movement.

F. Visual Effects: Provide uniform joint widths in exposed Work. Arrange joints in exposed Work to obtain the best visual effect. Refer questionable choices to the Project Manager and/or the Architect for final decision.

G. Recheck measurements and dimensions, before starting each installation.

H. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

I. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.

J. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Project Manager and/or the Architect for final decision.

3.2 CLEANING AND PROTECTION

A. During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration prior to Final Acceptance.

B. Clean and maintain completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

C. Limiting Exposures: Supervise construction activities to ensure that no part of the construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

D. Execute daily/weekly cleaning to keep Work, Site and adjacent properties free from accumulations of waste materials, rubbish and windblown debris, resulting from construction operations.

E. Provide on-site containers for collection of waste materials, debris and rubbish.

F. Remove waste materials, debris and rubbish from site periodically and dispose of at legal disposal areas away from site.

G. Do not allow trash containers to overflow.

H. Clean interior spaces prior to start of finish painting and continue cleaning on as-needed basis until painting is finished.

I. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly coated surfaces.

J. Each Sub Contractor:

1. Clean up daily all waste materials, rubbish, and debris resulting from own operations.

2. Place waste materials, rubbish, and debris from ground floor operations outside of building in an area designated by Project Manager and General Contractor.

3. Place waste materials, rubbish and debris from above ground floor operations in chute provided by General Contractor.

4. Oversee cleaning and ensure that building and grounds are maintained free from accumulations of debris.

5. Sprinkle dusty debris with water.

6. At reasonable intervals, minimum once a week, clean-up site and access and dispose of debris off-site.

7. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials from interior and exterior surfaces of fixtures, hardware and equipment.

8. Repair, patch, and touch-up marred surfaces to match adjacent finishes damaged by his own operations.

9. Vacuum interior areas when ready for painting.

10. Schedule cleaning operations so that contaminants resulting from cleaning do not fall on wet painted or finished surfaces.

K. Contractor:

1. Oversee cleaning and insure that building and grounds are maintained free from accumulations of waste materials, rubbish, and debris on a daily/weekly schedule.

2. Provide and maintain a rubbish chute from upper floors to ground level.

3. Clean up all un-definable debris.

4. Remove all debris and dispose of offsite.

5. Clean all glass and aluminum surfaces.

6. Leave the work "broom clean".

**END OF SECTION 01 31 13**

SECTION 01 31 19 - PROJECT MEETINGS

PART 1 - GENERAL

1.1 PRECONSTRUCTION CONFERENCES

A. Prior to commencement of Work, a pre-construction conference will be held to discuss procedures to be followed during the progress of the Work. The meeting will be scheduled after execution of the agreement and prior to commencement of work.

B. Location: On-site.

C. Attending shall be:

1. County's Representative
2. User's Representative
3. Project Manager
4. Project Architect
5. Contractor
6. Contractor's Superintendent
7. Major Subcontractors
8. Others as appropriate

D. Agenda: Following is suggested agenda. Actual agenda will be prepared and distributed by Project Manager prior to meeting:

1. Distribution and discussion of:
   a. List of major subcontractors and suppliers
   b. Projected Construction Schedules
   c. Critical work sequencing and reiteration of contract obligation toward meeting milestones
   d. Major equipment deliveries and priorities
   e. Project Coordination
   f. Designation of responsible personnel

g. Procedures and processing of:

1. Submittals

2. Field Orders and Clarifications

3. Proposal requests and quotations

4. Change Orders and Work Authorizations

5. Applications for Payment

6. Requests for Information

h. Procedures for maintaining Record Documents

i. Use of premises:

1. Office, work and storage areas

2. County requirements

j. Construction facilities

k. Temporary utilities

l. Security considerations

m. Housekeeping procedures

n. Insurance requirements

o. Wage and hour compliance

p. Conducting work in operating facility

q. Noise control

r. Other Subjects as appropriate

1.2 PROGRESS MEETINGS

A. The Construction Manager will schedule and hold meetings weekly. The Construction Manager will prepare the Agenda for such meetings and distribute to the Contract Administrator, the Architect, and other interested parties at the next successive meeting.

1. Location: Contractor's field office or other acceptable location.

2. Attending shall be:

   a. Project Manager

   b. Contractor

   c. Contractor's Superintendent

   d. Subcontractors, as appropriate to the Agenda

   e. Suppliers, as appropriate to the Agenda

   f. Others, as appropriate to the Agenda

   g. Contract Administrator or representative, as needed

   h. User Department representative as needed

   i. Project Architect, and his professional consultants as needed

3. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of the Project.

4. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule.

   a. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

5. Review the present and future needs of each entity present, including such items as:

   a. Interface requirements

   b. Time

   c. Sequences

   d. Deliveries

   e. Off-site fabrication problems

   f. Access

   g. Site utilization

h. Temporary facilities and services

i. Hours of Work

j. Hazards and risks (Contractor's Responsibility)

k. Housekeeping

l. Quality and Work standards.

m. Change Orders

n. Documentation of information for payment requests

6. Reporting: No later than each successive meeting, the Construction Manager will distribute copies of minutes of the meeting to each party present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

7. Schedule Updating: Revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

1.3 PROGRESS PAYMENT MEETINGS

A. Schedule and hold a billing meeting each month prior to submittal of Application for Payment. Billing meetings shall coincide with last of month progress meeting, whenever possible.

1. Location: Contractor's field office or other acceptable location.

2. Attending shall be:

a. Project Manager

b. Contractor

3. Prepare an itemized draft of the month's proposed billing for review with the Project Manager and Architect at the billing meeting. Refer to SECTION 01027 "APPLICATION FOR PAYMENT", for further requirements.

4. Following review of the proposed billing, revise as required, prepare Application for Payment, and submit to the Project Manager. The Project Manager will certify and forward it to the Contract Administrator, who will authorize payment upon receipt of partial waivers of lien from the Contractor and all Subcontractors for previous payment.

1.4 PRE PUNCH LIST MEETING

A. After notification is provided to the Construction Manager that the contractor is ready for a punch list to be generated, the Construction Manager shall hold a meeting to review the expectations of the punch list.

B. Attending shall be:

1. County’s Representative
2. Maintenance Supervisor
3. Project Manager
4. Project Architect
5. County's and Architect's Consultants, as appropriate
6. Contractor

1.5 FINAL CLOSEOUT MEETING

A. Refer to the General Conditions.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

**END OF SECTION 01 31 19**

SECTION 01 32 16 PROGRESS SCHEDULES AND REPORTS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies administrative and procedural requirements for the critical path method (CPM) of scheduling and reporting progress of the Work

B. Work under this Section shall consist of furnishing computerized Time Scaled Critical Path Method (CPM) Progress Schedule showing in detail how Contractor plans to execute and coordinate the Work; and submitting schedules, logs, updates and reports.

C. Contractor shall have sufficient professional schedulers on staff or as sub-consultant to expand and detail the CPM Progress Schedule for all construction operations. The assigned scheduler shall be trained and experienced (minimum of five (5) years experience with comparable size/types of construction) in compiling construction scheduling data, in analyzing schedule data by use of CPM, and in preparation and issuance of periodic reports as required. Contractor to provide resume of experience for individual or firm assigned as Project Scheduler for approval by County to County Project Manager, prior to preparing any scheduling work.

D. The scheduler shall provide input to develop and update Project Schedules, including realistic activity sequences and durations, allocation of labor and materials, processing of Shop Drawings, and samples/purchase/delivery of products requiring long lead-time procurement. The schedule is to be broken down into activities of three (3) weeks maximum duration, with the exception of procurement. Construction manpower shall be projected for each activity. Each activity shall be explicit in definition and location of Work. The schedule is to be updated 1) once per month, 2) whenever Work is behind schedule to an extent greater than fourteen (14) days, and/or 3) to add approved change order Work.

E. Contractor shall use Primavera SureTrak Project Manager 3.0 or, Primavera Project Planner V.6 software

1.02 RELATED REQUIREMENTS

A. Document 00 72 00 - General Conditions of the Contract for Construction; Article 4/ Contractor, Paragraph 4.10/ Contractor’s Construction Schedule, Article 8/ Time, Article 9/ Payments and Completion and Article 12/ Changes in the Work.

B. Document 00 73 00: Supplementary Conditions; Contract Time and Liquidated Damages.

C. Section 01 29 00: Application for Payment

D. Section 01 31 00: Project Management and Coordination.

E. Section 01 33 00: Submittal Procedures.

F. Section 01 77 00: Closeout Procedures

1.03 SCHEDULE DESCRIPTION

A. Requirements for CPM scheduling are included to insure adequate planning and execution of the Work and to assist the County in evaluating progress of the Work economically and chronologically, and so the County can coordinate Work by others.

B. The Contractor shall be solely responsible for establishing the schedule for the Work and shall be responsible for such schedule to be consistent with meeting the contract milestone and completion dates as established by the County.

1. The Contractor shall develop a Critical Path Method Schedule demonstrating fulfillment of all contract requirements. The project schedule shall be kept current to be utilized for scheduling, coordinating, monitoring work progress, and for preparation of the monthly payment application for payment under this Contract including all Work of Subcontractors and equipment and material suppliers.

C. Schedule shall be based on and incorporate Contract Milestone and Completion Dates specified in the Contract Documents. Schedule shall furnish or comply with the following requirements:

1. Time scaled- manpower loaded CPM type schedule.

2. No activity on schedule shall have duration longer than 21 calendar days, with exception of fabrication, concrete curing and procurement activities, unless otherwise approved by the County. Activity durations shall be total number of actual days required to perform that activity including consideration of weather impact on completion of that activity.

3. Procurement of major equipment, through receipt and inspection at job site, identified as separate activity.

4. County-furnished materials and equipment, if any, shall be identified as separate activities.

5. Dependencies (or relationships) between activities.

6. Processing/approval of submittals and shop drawings for major equipment. Activities dependent on submittal acceptance and/or material delivery shall not be scheduled to start earlier than expected acceptance or delivery dates.

7. Responsibility code for each activity corresponding to subcontractor responsibility for performing the work. Since the CPM Construction Progress Schedule is one of the Contractor's most important tools, the Contractor shall develop and provide a complete, efficient and understandable Work Breakdown Structure (WBS) code to submit to the Owner for review and approval. Suggested character fields for the code structure are:

| Name | Length | Description |
|---|---|---|
| PHAS | 1 | Phase or stage |
| TYPE | 4 | Type of activity |
| FLOR | 1 | Floor |
| AREA | 4 | Area and/or room |
| RESP | 7 | Responsible party |

| | | |
|---|---|---|
| SPEC | 5 | CSI section number |
| OF/CI | 4 | Owner Furnished/Contractor Installed Equipment |

9. Allow 30 calendar days for developing punch list(s), completion of punch list items, and final inspection of Work, or designated portion thereof, by the County. No other activities shall be scheduled during this period.

10. Interface with work of other contractors (or entities).

11. Separate buildings and other independent project elements shall be individually identified in network.

12. No 'negative' lags shall be allowed in schedules.

D. Overall time of completion and time of completion for each milestone shown on the Schedule shall adhere to the specified Contract time, unless an earlier (advanced) time of completion is requested by Contractor, agreed to by the County, and formalized by Change Order.

E. Schedule shall be the basis for evaluating job progress, progress payments, and time extension requests. Contractor shall develop Schedule and monitor actual progress as compared to Schedule.

1.04 SUBMITTALS

A. Interim First 90-Days Schedule: Within 10 calendar days after receiving Notice to Proceed, and prior to proceeding with any work on site, submit electronic copies (CD) and 2 prints of detailed Schedule presenting orderly and realistic plan for completion of the Work for the first 90 days, in conformance with requirements of this Section.

1. The Interim Schedule shall reflect the following information:

a. Procurement, submittals, construction drawings, shop drawings, approvals, fabrication and delivery of all major and long lead equipment and material items.

b. Work expected to occur within the first ninety (90) calendar days of the project, consistent with meeting all established milestone and completion dates.

c. The Interim Schedule shall be descriptive of the work to be performed so that the Contractor, and the County can easily monitor progress of the work. All work activities shall be manpower and will be the basis for payment during the beginning months of the project.

2. Provide MS-Windows formatted compact disks containing Schedule files in 'native' format.

3. Within fifteen (15) calendar days after receipt of the Interim Schedule, the County will notify the Contractor of the approval or disapproval of the Interim Schedule. In the event of disapproval, the Contractor shall resubmit the schedule within seven (7) calendar days. No progress payments will be made for work in progress or completed until the Interim Schedule is approved.

4. Acceptance of 90-Day Schedule by County, failure of 90-Day Schedule to include an element of work, or inaccuracy in 90-Day Schedule will not relieve Contractor from responsibility for accomplishing Work in accordance with the Contract.

B. Procurement Log: Submit 2 copies of a Procurement log, cross-referenced to Schedule, including the following information for each type of material or equipment to be provided:

1. Material or equipment description.

2. Technical specification reference.

3. Duration in calendar days required for preparation and review of submittals.

4. Duration in calendar days required for fabrication and delivery.

5. Cross reference to activities which will be affected by delivery date of material or equipment item.

6. Scheduled delivery dates.

C. Official Contract Construction Schedule: The Critical Path Method Schedule to be prepared by the Contractor pursuant to this section will be a part of a total system for scheduling, reporting work progress, and preparing the monthly payment applications.

RFI 0011

1. Within forty-five (30) calendar days after the Notice to Proceed, the Contractor shall submit to the County's Project Manager one (1) electronic copy of schedule files and three (3) original prints of the complete project schedule for approval or disapproval. In the event the complete project schedule is disapproved, the Contractor shall resubmit a corrected schedule within five (5) calendar days after the Contractor receives the notice of disapproval.

2. Should the Contract Schedule not be accepted within ninety (90) calendar days after Notice to Proceed, the Contractor may be due provisional progress payments(s) on work performed, based on the 90-Day Interim Schedule. It is the responsibility of the Contractor to reconcile such cost information and payments with the Contract Schedule. However, no payment shall be approved after the ninety (90) calendar day period, until the County has accepted the Contract Schedule.

3. The County will review submitted Schedule for conformance with requirements. Within fourteen (14) calendar days after receipt, the County will accept Schedule or will return it with comments. If proposed Schedule is not accepted, Contractor shall revise Schedule to incorporate comments and resubmit Schedule for acceptance within seven (7) calendar days after receiving it. Accepted Schedule shall become the Official Contract Construction Schedule and Progress Schedule.

4. Acceptance of Schedule by County, failure of Schedule to include an element of work, or inaccuracy in Schedule will not relieve Contractor from responsibility for accomplishing Work in accordance with the Contract.

5. The approved Interim 90-Day Schedule shall be incorporated into the final Contract Schedule

and shall represent the initial ninety (90) calendar days of the Contract Schedule.

6. The initial submittal of the Contract Construction Schedule shall not reflect contract changes or delays. These changes shall be added within the first schedule revision.

7. The initial submittal of the official Contract Construction Schedule shall include, in addition to construction activities, the following:

   a. The submittal and approval of construction drawings, shop drawings and materials, the procurement and fabrication of major materials and equipment, and their installation and testing.

   b. Contract requirements dates of all or parts of the Work will be shown including all activities of the County that affect the progress of the work.

   c. Activities of completed work ready for use by next trade, etc.

   d. Activities relating to different areas of responsibility, such as sub-contracted Work that is distinctly separate from that being done by Contractor directly.

   e. Different categories of Work as distinguished by craft or crew requirements.

   f. Different categories of Work as distinguished by materials.

   g. Distinct and identifiable subdivisions of Work such as structural slabs, beams, masonry walls or columns.

   h. Location of Work within the project that necessitates different times or crew to perform.

   i. Outage schedules of limiting times that existing utility services may be interrupted to construct the Project.

   j. Items listed separately in Schedule of Values for payment purposes.

   k. Acquisition and installation of equipment and materials supplied and/or installed by County or separate Contractors.

   l. Material stored on site.

   m. The Contractor will be responsible for dividing the work within the Project to accommodate no durations in excess of twenty-one (21) calendar days.

8. Major Equipment/Materials: For all major equipment and materials fabricated or supplied for Project, Construction Schedule shall show a sequence of activities including:

   a. Preparation of shop drawings and sample submissions.

   b. Review of shop drawings and samples.

   c. Shop fabrication, delivery, and storage.

d. Erection or installation.

e. Test of equipment and materials.

f. Required dates of completion.

9. Construction activities are to be delineated separately for off-site sewer, site development, earthwork, utilities, roads, parking lots, fences and like Work and each building, separately.

10. The network diagrams shall clearly indicate any work that is planned to be accomplished on a work schedule other than eight (8) hours per day and forty (40) hours per week.

11. The basic concept of CPM network diagramming will be followed to show how the start of a given activity is dependent on the completion of preceding activities and its completion restricts the start of following activities. The diagrams shall show a continuous flow from left to right with no right to left sequences.

12. The following information will be provided in a report for each network activity:

    a. Activity description.

    b. Activity duration in workdays.

    c. Working activities and General Conditions activities shall be identified separately.

    d. Estimated man-hours for each activity.

    e. Activity predecessors.

    f. Activity successors.

    g. Activity logic ties.

13. The Contractor shall provide to the County's Project Manager his schedule data. Schedule information provided by the Contractor shall support completion dates of the contract.

14. Approval of schedule should not be construed as direction from the County to Contractor on how to schedule the work.

15. Subsequent to approval of the contract schedule, the Contractor will provide one (1) electronic copy of the network diagrams and three (3) printed copies, plus three (3) copies of all supporting documents (Contract Price, Schedule of Values, breakdown, etc.) Monthly update data will be submitted in the same form and numbers. Size of network diagrams for each sheet shall be no larger than 30 inches by 42 inches or as approved by the County.

16. After Completion and Acceptance of the Official Contract Schedule: The Contractor will provide initial computer reports and weekly and monthly reports thereafter, as follows:

    a. Schedule Reports: Initial and subsequent Schedule Reports will contain the following

minimum information for each activity and shall be produced at a minimum of once a month:

i. Activity Number;

ii. Activity Description;

iii. Estimated duration in days;

iv. Early and late finish dates;

v. Percentage of each activity completed as of each report;

vi. Remaining float/days behind schedule;

vii. Responsibility for activity;

viii. Current status of activity as compared to baseline schedule.

b. Short Interval Schedule
   i. Short Interval Scheduling (SIS) shall be used throughout onsite construction activity.

   ii. Interval shall be a 3-week projection and shall include week submitted and two weeks thereafter.

   iii. It shall contain sufficient detail to evaluate daily milestones and manpower/equipment loading and shall identify/tie into monthly updated Schedule.

   iv. Short Interval Schedule shall be submitted weekly.

   v. At weekly meeting scheduled with County, Contractor to submit Short Interval Schedules for review and discussion of upcoming construction activities.

c. Payment Progress Reporting: Project Manager and Contractor shall select a specified time for updating the Project Schedule at the jobsite each month.

   i. The Project Manager and Contractor and his/her designated scheduling representatives will attend the meeting to review the project progress.

   ii. The schedule shall be the basis for monthly pay requests derived from the joint review of the cost loaded schedule.

   iii. All progress and status information provided by the Contractor shall clearly define the reporting period for which the status is provided.

d. At the monthly progress review meeting, the Contractor will provide "actual start" and "actual completion" dates for activities that were started or completed during the reporting period. The Contractor and the County will agree upon and assign percent complete values to activities in progress. In the event of a disagreement, the County, or

its designated representative, shall make the final decision as to percent completion of each activity.

e. After joint review, County will process the Contractor's pay request based on progress from the schedule.

   i. Payment to the Contractor shall be made from the progress reflected by the Interim or the Contract Schedule.

   ii. Receipt of an acceptable monthly update is a condition precedent to receiving monthly payment request.

f. Time is of the Essence: Whenever it becomes apparent from the current monthly progress review that phases of Work or the Contract Completion Date will not be met, through no fault of the County, the Contractor will take the following actions with no change in the contract amount:

   i. Increase construction manpower to eliminate an adverse backlog of work.

   ii. Increase the number of working hours per shift, shifts per day, working days per week, the amount of construction equipment, or any combination of the foregoing to eliminate the adverse backlog of Work in coordination with all applicable Labor Codes.

17. The Official Contract Schedule as approved by the County will be an integral part of the Contract, and will establish interim Contract Completion Dates or milestone dates for the various activities.

18. It is expressly understood and agreed that the failure by the County to either order the Contractor to expedite an activity or to expedite the activity by other means, pursuant to the two preceding paragraphs, shall not be considered precedent setting with respect to any other activities which may fall behind the Official Contract Schedule approved by the County; nor will it relieve the Contractor from completion of the Project Work in accordance with the Official Contract Schedule and the Contract Completion Date.

19. County's acceptance of, or its review of, comments about any schedule or scheduling data shall not relieve the Contractor from its sole responsibility to plan for, perform, and complete the Work within the Contract Time. Acceptance of or review of comments about any schedule shall not transfer responsibility for any schedule to County nor imply their agreement with (1) any assumption upon which such schedule is based, or (2) any matter underlying or contained in such schedule.

20. Failure of County to discover errors or omissions in schedules that it has reviewed, or to inform Contractor that Contractor, Subcontractors, or others are behind schedule, or to direct or enforce procedures for complying with the Contract Schedule shall not relieve Contractor from its sole responsibility to perform and complete the Work within the Contract Time and shall not be a cause for an adjustment of the Contract Time or the Contract Sum.

D. Schedule Revisions:

1. General: Revisions to the approved Construction Schedule must be approved in writing by the Project Manager and Contractor.

2. Contractor: Submit requests for revision to schedule to the Project Manager together with written rationale for revisions and description of logic for researching Work and maintaining Specific Contractual Milestone Dates listed in Contract Documents.

3. Proposed revisions acceptable to Project Manager and County will be incorporated into next update of Construction Schedule.

4. When proposed Change Order is issued which has potential to impact specified completion dates, a Time Impact Evaluation (TIE) shall be prepared by Contractor to reflect impact of such changes. After TIE has been accepted and Contractor ordered to proceed with proposed Change Order, it shall be incorporated into Schedule. No additional cost beyond that provided in the General Conditions will be allowed for incorporation of approved proposed Change Orders into Schedule.

5. Should Contractor, after acceptance of Schedule, intend to change their plan of construction, they shall submit their requested revisions to the County, along with written commentary of revision, including description of logic for rescheduling the Work, methods of maintaining adherence to intermediate milestones and other specific dates and reasons for revisions. If requested changes are acceptable to the County, they will be incorporated into Schedule in next reporting period.

E. Acceptance: Acceptance of revised schedule by Project Manager and/or County does not relieve Contractor of meeting contractual milestone and completion dates.

1.05 RECOVERY SCHEDULE

A. General: Should updated Construction Schedule show Contractor to be fourteen (14) or more calendar days behind schedule at any time during construction, Contractor will prepare Recovery Schedule displayed on CPM schedule, at no additional costs to County. Prepare Recovery Schedule to show plan for returning to original schedule as expeditiously as possible.

B. Schedule Preparation: Within three (3) days after notice from Project Manager, prepare and submit to Project Manager a Recovery Schedule, incorporating best available information from Subcontractors and others that will permit return to Construction Schedule at earliest possible time. Prepare Recovery Schedule to same level of detail as Construction Schedule.

C. Schedule Review: Within five (5) days after notice from Project Manager, participate in conference with Project Manager and County to review and evaluate Recovery Schedule. Submit revisions necessitated by review for Project Manager and County's approval within two (2) days of conference. Use approved Recovery Schedule for its planned duration as basis for return to Construction Schedule.

D. Schedule Assessment: Five (5) days prior to expiration of Recovery Schedule, confer with Project Manager and County to assess effectiveness of Recovery Schedule. As a result of this conference, Project Manager will direct Contractor as follows:

E. Behind Schedule: If Project Manager determines Contractor is still behind schedule, Project Manager will direct Contractor to prepare another Recovery Schedule for subsequent pay period.

F. On Schedule: If Project Manager determines Contractor has successfully complied with provisions of Recovery Schedule, Project Manager will direct Contractor to return to use of Construction Schedule.

1.06 OWNERSHIP OF FLOAT

A. Float is defined as amount of time between early start date and late start date or between the early finish date and late finish date for such activities, as depicted on Construction Schedule. Float is not for exclusive use or benefit of either County or Contractor and shall be apportioned according to project need and with the approval of the County.

1.07 TIME EXTENSIONS

A. Contractor shall submit network window for claimed time extension requests, showing impact of claimed delay on Schedule.

B. Float or Slack Time is the amount of time between earliest start date and late start date or between earliest finish date and latest finish date of activities of Schedule. No time extensions or delay costs will be allowed for delays caused by the County, on paths or activities containing float time, providing such delay does not exceed float time in latest updated version of Schedule.

C.The County shall have no obligation to consider time extension request unless requirements of Contract Documents are complied with; the County shall not be responsible or liable to Contractor for constructive acceleration due to failure of the County to grant time extensions under the Contract Documents, should Contractor fail to comply with submission requirements and justification requirements of this Contract for time extension requests. Contractor's failure to perform in accordance with Schedule shall not be excused because Contractor has submitted time extension requests, until and unless such requests are approved by the County

1.08 DAILY REPORTS

A. Contractor shall submit Daily Activity Report to the County for each workday, including weekends and holidays, when worked.

B. Contractor may use Contractor’s own report form, provided it contains same information included in standard form furnished by the County.

1.09 PAYMENTS WITHHELD

A. Progress Payments may be withheld in whole or in part should Contractor fail to comply with requirements of this Section.

B. Refer to Document 00 72 00, General Conditions of the Contract for Construction.

1.10 CONTEMPORARY PERIOD ANALYSIS

A. It is the County's desire and intent to resolve all issues affecting the Substantial Completion date in a timely, efficient, and effective manner. To achieve this goal, the County and Contractor shall participate in contemporaneous analyses of all delays and advances of the schedule by application of the Contemporaneous Period Analysis method. The Contemporaneous Period Analysis shall coincide with the monthly schedule update meetings.

B. The logic and planning elements of the CPM schedule are the Contractor's however, assessment of impacts due to changes or other events, in accordance with the Contemporaneous Period Analysis method described herein, must be performed on the most recent accepted update of the schedule. Further, impacts due to changes or other events shall be assessed utilizing the accepted schedule update that represents the data date closest to, and just prior to, the date of the impacting event. An alternative method can be to progress the schedule to a data date that represents the date of the impacting event. Subsequent to the assessment of schedule sequences representing the impacting events, the schedule may be updated to the next data date with appropriate logic or duration changes resulting from the impacting events. All data shall be provided to the Owner's Project Manager.

C. While the County or Contractor might not agree in all instances as to the proper assessment of liability of delay, it is essential that both parties determine and accept the monthly update. Agreement is essential as the update becomes the baseline Progress Schedule for the upcoming period and is the schedule to be updated for the next monthly schedule update meeting.

D. Submission of a valid monthly update and the completion of the Contemporaneous Period Analysis are conditions precedent to the review and approval of any request for an extension in the Contract Time. Failure to complete monthly updates and to participate in Contemporaneous Period Analysis will defer consideration of any time extensions by the County until the Work is completed and all as-built progress can be analyzed by the County. Further, the County will assess liquidated damages, if any, regardless of the status of any requests for time extensions pending, until any such requests are resolved.

E. The Contractor shall obtain training by a qualified consultant in the application of the Contemporaneous Period Analysis method. The training shall be provided to appropriate Contractor field personnel, appropriate major Subcontractor personnel, and appropriate Owner personnel. The training should not exceed one day. The requirement for training may be waived by the Owner provided the Contractor can demonstrate sufficient working knowledge of the Contemporaneous Period Analysis method. The Contractor shall bear all costs for training specified herein.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

**END OF SECTION 01 32 16**

# SECTION 01 32 33 - CONSTRUCTION PHOTOGRAPHS

## PART I – GENERAL

### 1.01 SECTION INCLUDES

A. This Section describes the requirements for furnishing photographs depicting work in progress.

B. Digital Files.

C. Prints.

D. Submittals.

### 1.02 RELATED SECTIONS

A. Document 00 72 00 - General Conditions of the Contract for Construction; Payment procedures.

B. Section 01 11 00: Summary.

C. Section 01 33 00: Submittal Procedures.

E. Section 01 77 00 - Closeout Procedures: Project record documents.

### 1.03 PHOTOGRAPHY

A. Provide full-color photography of site and construction throughout progress of Work produced by commercial photographer or other experienced photographer acceptable to the County.

B. Provide factual presentation. Digital files shall not be manipulated in any manner except as to correct for exposure/contrast and/or sharpness shortcomings.

C. Provide images with optimal exposure, contrast, sharpness/resolution and maximum depth-of-field and minimum distortion.

D. Prepare photographs not more than three calendar days prior to each scheduled Application for Payment, and as required to record the following events as a minimum, other events may require photography as Project progresses:

1. Site clearing.

2. All site work including landscaping

3. Demolition and abatement.

4. Grading/Building pads.

5. Excavations/Backfilling.

6. Underground utility/infrastructure connections.

7. Foundations.

8. Structural and non-structural framing.

9. Enclosure of buildings including window walls/storefront (all faces).

10. Interior progress (room-by-room; area-by-area for larger spaces).

11. Final completion.

E. Take photographs as evidence of existing Project conditions as follows:

1. Exterior views: site conditions of existing detention facility where work interfaces with new work under New Construction "Limits of Work".

2. Interior views of all work performed within existing detention facility as part of Renovation work and Hazardous Materials abatement.

F. Video record all underground utility installations prior to backfill operations, all exterior and interior wall enclosures where utilities or other building system components occur and miscellaneous areas determined by Project Manager where recording of work is required for future use.

## 2.04 DIGITAL FILES

A. Standard color digital capture shall be utilized. This method shall be used for the entire body of images.

B. Digital files shall have date (month/day/year) and time imprinted/recorded by camera at time of exposure.

C. Submitted digital files shall be in JPEG or TIFF format.

D. Digital files shall be a minimum of 640 x 480 pixels.

E. Digital files shall be stored and maintained on a web-based photo management system with access provided to the County.

## 2.05 SUBMITTALS

A. Deliver digital photos on USB flash drive media with each Application for Payment.

B. Maintain one set digital file, identical to those submitted to the County, at the Project site.

C. All digital files shall become the property of the County without restriction on their use.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

**END OF SECTION 01 32 33**

SECTION 01 32 50 - PROJECT MANAGEMENT CONTROLS SYSTEM (PMCS)

PART 1 - GENERAL

1.1 GENERAL

A. The Contractor is to provide all hardware, software, protection and backup for a complete web-based PMCS.

1. Provide appropriate level of access to Owner, Architect, and Construction Manager.

2. Provide two sets of fully functional Adobe Professional software and any other software required to electronically review and comment on documents.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work using the Contractor's Project Management Controls System. The Project PMCS will be used by the Contractor and the County, A/E and CM team to communicate, transfer documents and expedite the approval process. This Section also includes the minimum hardware and software requirements to implement the Website interface to the Project Management Software for the following procedures:

1. Request for Interpretation / Information (RFI) and RFI log.

2. Submittals:

a. Submittal Register and tracking log.

b. Submittal Packages.

3. Meeting Minutes-Kick-off meetings, Weekly OAC Meetings, Pre-con meetings, QA/QC meetings, Commissioning meeting and special meetings.

4. Daily Construction Reports:

a. Daily Details.

b. Daily Work.

5. Document Management.

6. Outstanding Items List.

7. Punch list.

8. Inspection Requests.

9. Cost Control.

10. Non-Compliance Notices

11. Team Directory with telephone, email addresses sorted by company and individual, emergency contact list.

12. QA/QC Reports

    a. Daily Quality Control/inspection Reports

    b. independent Laboratory's test and inspection reports

    c. Product Manufacturers Inspection Reports (roofing, waterproofing, etc.)

B. Related Sections:

1. Section 01 31 19, "Project Meetings."

2. Section 01 33 00, "Submittal Procedures."

3. Section 01 40 00, "Quality Control."

1.3 CONNECTIVITY REQUIREMENTS:

A. Provide all labor, material, tools and equipment necessary for a complete onsite installation, maintenance and as required operation throughout the project of one (1) personal computer (PC) and 1 tablet computer for use in connecting to PMCS Website per section 01 51 00 Temporary Facilities Controls. System and connectivity requirements shall be in accordance with selected PMCS' recommendations and product setup and installation instructions.

1. The County shall specify the number of expected users and define the roles & responsibilities of each County, A/E and CM user. Contractor will administer the usernames and passwords accordingly.

2. Any sub-contractors, supplier or vendor that the Contractor requests to allow access to the PMCS Website will be evaluated by the Owner's Representative on a case by case basis. However, this does not constitute that access will be granted, as the data input into the system is the sole responsibility of the Contractor.

1.4 REQUESTS FOR INTERPRETATION (RFIs)

A. The Contractor will use PMCS Website to generate all RFIs. Immediately on discovery of the need for interpretation of the Contract Documents, prepare and submit a RFI using PMCS Website.

B. Contractor shall coordinate with sub-contractors and submit RFIs in a prompt manner so as to avoid delays.

C. Content of the RFI: Include a detailed description of item(s) needing interpretation, fill in all applicable PMCS Website fields including the following:

1. Subject.
2. Question.
3. Discipline.
4. Category.
5. Importance
6. Dated Created.
7. Date Required.
8. Contractor's Suggestion
9. Author's Name.
10. Author's Company Name.
11. Specification Section reference number.
12. Drawing reference number.
13. Include Field dimensions and conditions, elevations, location on the drawing with reference to sheet number and dates, sketches and pictures as appropriate.
14. When possible, Contractor should offer a proposed solution to the issue.

D. Attachments: Drawings, descriptions, measurements, photos, Product Data, Shop Drawings and other information necessary to fully describe items needing interpretation shall be electronically uploaded into PMCS Website / Document Management section using ISO 32000-1:2008 PDF format that is scaled 100% to the original paper size and linked to the associated RFI. File type, format, and size shall be in accordance with the Systems' recommendations. See Section 01 33 00, Submittal Procedures, on number of print copies required.

E. Architect's Action: Architect will review each RFI, determine action required, and reply via the PMCS Website.

1.5 SUBMITTALS

A. The Contractor will use PMCS Website to generate and track all submittals and submittal packages.

B. Contractor shall create on PMCS Website a submittal register of all items to be submitted in accordance with the specifications sections. Contractor shall obtain pre-approval of the submittal matrix before being uploaded to PMCS Website.

C. Contractor shall create submittal packages, add reviewers to submittal packages and close out the submittal packages in accordance with the system's recommendations.

D. Attachments: Drawings, descriptions, measurements, photos, Product Data, Shop Drawings and other project documents and/or information necessary to fully describe items within the submittal package shall be electronically, uploaded into PMCS Website / Document Management section using ISO 32000-1:2008 PDF format that is scaled 100% to the original paper size and linked to the associated submittal package. File type, format, and size shall be in accordance with the Systems' recommendations.

E. See Section 01 33 00, Submittal Procedures, on number of submittal print copies required.

1.6 MEETING MINUTES

A. Construction Progress Meetings: Project Manager shall hold meetings on a weekly basis in accordance with Section 01 31 19, Project Meetings.

B. Project Manager will generate minutes for each Construction Progress Meeting in accordance with the Division 1 Specifications, for posting on PMCS Website.

C. Contractor is responsible to download posted Meeting Minutes from PMCS Website for distribution to Contractor personnel, subcontractors, vendors and all interested parties within the Contractor's control.

1.7 PUNCHLIST

A. The PMCS will include a punch-list tracking module. The Project Manager will use the punch list module to generate a room by room and all exterior elements punch list at the end of the construction project. Contractor shall monitor and respond to Punch List Items in accordance to the PMCS Website systems recommendation.

1.8 INSPECTION REQUESTS (IREQ)

A. Contractor shall use PMCS Website to generate all IREQs. At least three work days prior of a requirement of inspection of the Construction Work, contractor shall prepare and submit an IREQ using PMCS Website.

B. Contractor shall be responsible to coordinate and schedule testing with the IOR and 3rd Party Testing Company (as required). IREQs shall be scheduled at least three working days prior to a requirement of inspection so as to avoid delays.

RF 0003 Inspection Request Notification Response 24 hr Notice Acceptable

C. Content of the IREQ: Include a detailed description of item(s) needing Inspection and/or Testing. Fill in all applicable PMCS Website fields including the following:

1. By Contractor:
    a. Subject.
    b. Inspection Request.
    c. Inspection Type.
    d. Date Created.
    e. Required date of requested Inspection.
    f. Author's Name.
    g. Author's Company Name.
    h. Drawing reference number.
    i. Detail Reference Number.
    j. Inspector's Name.
    k. Inspector's Company.
    l. Whether 3rd Party Testing required
    m. 3rd Party Inspection Company.
    n. 3rd Party Inspector Name.
2. By Inspector of Record (IOR):
    a. Is the Inspection required? (This should be filled in prior to Inspection Date).
    b. Who will attend by the scheduled Inspection?
    c. Did the Inspection pass or fail?
    d. Inspector's comments and summary.
3. By 3rd Party Testing Company:
    a. Who will attend the scheduled Inspection?
    b. Testing Inspector type.
    c. Estimated amount of field hours required to perform testing
    d. Type of Laboratory testing required to perform the specified testing.
    e. Inspector's Comments and summary.

f. If special inspection or testing failed to meet specification or drawing criteria, indicate to whom the results are provided, and date.

D. Contractor shall schedule inspections at least three working days prior of a requirement of inspection so as to avoid delays in advance. Contractor's description of requirements on the IREQ shall be accurate, complete, concise, and coordinated and shall reference the correct project documents and details.

E. Attachments: Drawings, descriptions, measurements, photos, Product Data, Shop Drawings and other project documents and/or information necessary to fully describe items needing inspection shall be electronically scanned, uploaded into PMCS Website / Document Management section and linked to the associated IREQ. File type, format, and size shall be in accordance with the Systems' recommendations. Do not modify issued document size of any documents that need to be scaled to verify inspections.

F. IOR's Action: Inspector of Record will review each IREQ, determine action required, and reply via the PMCS Website. Allow 1-2 working days for IOR's response for each IREQ. IREQs received after 2:00 p.m. will be considered as received the following working day.

G. The following IREQs will be returned without action:

1. Incomplete IREQ or IREQs with frivolous errors.
2. Requests for approval of substitutions.
3. Requests for adjustments in the Contract Time or the Contract Sum.
4. Requests for interpretation of IOR's actions on Inspection.
5. Request for inspection on construction work other than the description in the IREQ.
6. IREQ scheduled less than three working days in advance.
7. IREQ scheduled for testing and inspection without the presence of 3rd party testing.

H. IOR's action may include a request for additional information.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

**END OF SECTION 01 35 00**

SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Timing:

1. Make submittals within the times specified herein and not all at one time. Submit in accordance with the sequence of procurement, fabrication and construction, and according to Submittal Schedule submitted to Project Manager.

2. Make submittals far enough in advance of scheduled dates of installation to allow the time required for reviews, for securing necessary approvals, for possible revision and resubmittal, and for placing orders and securing delivery.

B. Related Documents:

1. Drawings and general provisions of Contract, including Document 00 72 00/ General Conditions of the Contract for Construction and Document 00 73 00/ Supplementary Conditions and other Division - 1 Specification Sections, apply to this Section.

2. Section 01 60 00/ Materials and Equipment for Product Options and Substitutions.

3 Section 01 32 50 Project Management Controls System (PMCS).

C. Identification:

1. Identify each submittal and re-submittal with the following information:

a. Project name and address as they appear on the Contract Documents

b. Contract name and number

c. Contractor's name and address

d. Date of submission

e. Numbering System: Submittals shall be identified by specification section (i.e., 02810001, 07210-001, 11191-001, etc.) Any re-submittals shall be numbered sequentially according to the original submittal section, followed by the subscript ". 1, .2, .3 submittal number (i.e., 001.1, 001.2, etc.). Submittals and re-submittals shall be kept intact with the original number. Do not add new drawing or information outside the scope of the original Submittal, unless specifically requested. Do not assign a new number for a resubmittal.

f. Reference: List Specification Section number and product reference as a cross reference for each submittal.

2. Identify each submittal with the following additional identification:

a. Contractor's stamp with initials or signature, certifying to review of submittal, compliance with Contract Documents, and coordination with other impacted work, and verification of field measurements. The Architect will return any submittal not bearing this stamp without being reviewed.

b. Drawing and Specification SECTION numbers to which the submittal applies.

c. Subcontractor's or supplier's name and address

d. Name and telephone number of the individual to contact for additional information regarding the submittal.

e. Whether it is an original or a re-submittal

D. Summary:

1. This Section specifies administrative and procedural requirements for submittals required for performance of the Work, including:

a. Submittal schedule

b. Submittal procedures

c. Daily construction reports

d. Shop Drawings

e. Product Data

f. Samples

g. Manufacturer's' instructions

h. Manufacturers' certificates

2. Administrative Submittals: Refer to other Division - 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:

a. Permits

b. Applications for payment

c. Performance and payment bond

d. Insurance certificates

e. List of Subcontractors

1.) The Schedule of Values submittal is included in Section 01 2900 I "Applications for Payment."

2.) CPM Schedule: As specified in Section 01 3216, Construction Progress Schedules and Reports.

3) Inspection and test reports are included in Section 01 4000 "Quality Control" and Section 01 45 29 "Testing Laboratory Services"

E. Coordination of Submittals:

1. General: Prior to submittal for the Architect's or consultant's review, as applicable, fully coordinate material as follows:

a. Determine and verify field dimensions and conditions, materials, catalog numbers, and similar data.

b. Coordinate shop drawing submittals with previously issued Addenda and Information Bulletins.

c. Coordinate with the various types of Work and public agencies involved.

d. Secure necessary approvals from public agencies and others and signify by stamp, or other means, that approvals have been secured.

e. Unless otherwise specifically permitted by the Architect, make submittals in groups containing all associated items.

2. Completeness: Submittals shall be complete; partial submittals will be rejected for not complying with the Contract Documents.

1.02 SCHEDULES

A. Submittal Schedule: Include submittal date and date required for return for each submittal required by the Contract Documents. No action will be taken on such submittals without prior receipt, review, and acceptance of Submittal Schedule.

1. Prepare a complete schedule of submittals. Submit within 30 calendar days after Notice to Proceed. See Article 4.12 of the General Conditions for additional information. The schedule is to identify every item on which the contractor

intends to provide a submittal whether or not it is required specifically in the contract documents.

NOTE: Some submittals maybe required within the first ten calendar days of the Notice to Proceed due to the sequence of Work. Contractor to review statutes and contract documents.

2. Coordinate submittal schedule with the list of subcontracts, schedule of values and the list of products as well as the Contractor's construction schedule.

3. Prepare the schedule in chronological order. Provide the following information:

   a. Scheduled date for the first submittal

   b. Related Section number

   c. Event Number associated with CPM Construction Schedule

   d. Submittal category

   e. Name of subcontractor

   f. Description of the part of the Work covered

   g. Scheduled date for re-submittal

   h. Scheduled date the Architect's final release or approval

B. Distribution: Following response to initial submittal schedule, print and distribute 3 copies and an electronic file (pdf) to the Project Manager. Contractor is responsible to coordinate their subcontractors in accordance with schedule provided to Owner. Post copies in the Project meeting room and field office.

   1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

C. Schedule Updating: Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting. Instruct recipients to report promptly any problems anticipated by dates or sequences shown in schedule.

1.03 SUBMITIALS PROCEDURES

A. Coordinate preparation and processing submittals with performance of construction activities.

1. Make submittals in groups containing associate items to ensure that information is available for checking each item when received.

a. Partial submittals may be rejected as not complying with requirements of Contract documents and Contractor shall be liable for any resulting delays.

2. Requests for deviation from Contract Documents shall be submitted for consideration before submittal of affected items. Only deviations, which have been previously accepted in writing, shall be included in submittals.

B. Place permanent label or title block on each submittal for identification. Indicate name or entity preparing each submittal in label or title block. See Paragraph 1.01.C herein for further information requirements on each submittal label or title block.

1. Provide space on label or beside title block to record Contractor's and Architect's review markings and action taken.

C. Contractor's Review:

1. Review submittals for accuracy, completeness, and conformity with Contract Documents.

a. Submittal shall be construed as stipulating Contractor has thoroughly and completely reviewed, and coordinated data.

b. Submittals that indicate less than Contractor's full compliance will be returned without action.

c. Delays caused by failure to comply will not be acceptable basis for extension of Completion Time.

2. Certify submittals have been reviewed and coordinated by adding following affidavit to each submittal:

"The undersigned certifies this submittal has been reviewed, approved, and coordinated in compliance with requirements of Section 01 33 00 of the Project Manual."

Signature _ Date__

Name Printed _ Title__

a. Submittals not certified by being stamped and signed by Contractor will be returned without action, as will submittals which, in the Project Manager or Project Architect's opinion, have not been adequately reviewed and coordinated by the Contractor.

D. Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for re-submittals.

E. Package each submittal appropriately for transmittal and handling.

F. Project Architect's Review:

1. Submittals are reviewed for general conformance with design concept and general compliance with information given in Contract Documents only.

2. Review of separate item shall not indicate acceptance of assembly of which item is part.

G. Review shall not relieve Contractor from responsibility for errors or deviations from requirements of Contract Documents.

H. Submittal Log: Maintain accurate submittal log for duration of Contract. Indicate current status of all submittals at all times. Make submittal log available for the Project Manager's review upon request.

I. Re-submittals:

1. Subject to same terms and conditions as original submittal.

2. Project Architect will accept not more than one re-submittal.

a. Should additional re-submittals be required; Contractor shall reimburse County for Project Architect's account for time spent in processing additional re-submittals at rate of 2.5 times rate of Direct Personnel Expense (DPE). Direct Personnel Expense is defined as direct salaries of Project Architect's personnel engaged on Project and portion of costs of mandatory and customary contributions and benefits related thereto, including employment taxes and other statutory employee benefits, insurance, sick leave, holidays, vacations, pensions, and similar contributions and benefits.

3. Claims will not be considered for Contractor's additional time or expense associated with re-submittals.

J. Revisions:

1. Make only those revisions required or accepted by Project Architect.

1.04 DAILY CONSTRUCTION REPORTS

A. Prepare daily construction reports to record: manpower of the general contractor and each onsite subcontractor, a summary of progress, high & low temperature, precipitation, contract days expended, CPM activities performed and percent complete for each activity, and other pertinent information. Prepare one report for each workday. Submit the report of the previous day no later than 8:00 am the following workday.

1.05 SHOP DRAWINGS, PRODUCT DATA, SAMPLES, AND OTHER SUBMITTALS

A. General:

1. Submit only as required by the various Specification SECTIONS. Do not submit shop drawings, product data, samples or other submittals, unless specifically required.

2. Submit in accordance with the accepted submittal schedule. Send copies of transmittals to the County.

3. Submit in the manner and quantities specified hereinafter.

4. Allow a minimum of 10 working days for processing by the Project Manager, Architect and his consultants, as applicable. Some submittals may require more processing time based upon consultant's input and the complexity of the submittal. If certain submittals are critical, they should be so identified at time of submission. If a specific submittal cannot be reviewed and returned within 10 working days, the Architect will develop with the Project Manager and Contractor a timely "turn-around" that will not impact the construction schedule.

B. Shop Drawings:

1. Submit PDF electronic files of shop drawings.

2. The Architect or his consultants, as applicable, will review the Shop Drawings; mark the PDF drawings with required revisions; stamp the drawings and indicate "No Exceptions Noted," "Make Corrections Noted," "Revise and Resubmit," or "Rejected," and return the drawings. "Revise and Resubmit" or "Rejected" stamps shall not be construed by the Contractor as a valid reason for an extension of time.

3. Contractor shall review the returned drawings and take appropriate action as indicated.

a. If drawings are marked "Revise and Resubmit," make revisions and indicate them with a "cloud," stamp and date, and resubmit in the same manner and number as for the original submittal.

b. If drawings are marked "Rejected," make a new submittal and submit in the same manner and number as for the original submittal.

c. If drawings are marked "No Exceptions Noted" or "Make Corrections Noted", print and distribute copies for County and Inspector, as well as those required for Contractor and Subcontractors.

4. The Architect or his consultants, or the County's consultants, as applicable, may review at their discretion up to one re-submittal and take action, as appropriate, in the same manner as for the original submittal. If more than one re-submittal is required, any associated costs as a result of additional reviews shall be an extra service of the Architect, or his consultants or the County's consultants, as applicable, and will be processed as a deductive Change Order in accordance with the GENERAL CONDITIONS and SUPPLEMENTARY CONDITIONS.

5. As with the original submittal, review the returned drawings and take appropriate action as indicated. As specified hereinabove, resubmit and revise until final action by the Architect or his consultants, or the County's consultants, as applicable. Final action is signified by the markings "No Exceptions Noted," or "Make Corrections Noted," on the returned drawings.

6. Following final action by the Architect or his consultants, or the County's consultants, as applicable, the Contractor shall make copies and distribute as required for accomplishment and inspection of the indicated Work. Provide electronic PDF copies of approved shop drawings for the County’s records.

7. Only those Shop Drawings that bear stamps showing final review of the Contractor, Architect, or the Architect's consultants, or the County's consultants, as applicable, shall be used.

8. Reproduction and Mailing Costs: The Contractor shall pay the reproduction and mailing costs of all prints relating to submittals required by contract documents.

9. Coordination drawings are a special type of Shop Drawing that show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or function as intended.

a. Preparation of coordination Drawings is specified in Section 01 3113 " Contractor Coordination" and may include components previously shown in detail on Shop Drawings or Product Data.

b. Submit coordination Drawings for integration of different construction elements. Show sequences and relationships of separate components to avoid conflicts in use of space.

C. Product Data:

1. Submit in electronic format (pdf) brochures, catalog cuts, and similar material as required by contract document.

2. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, rough-in diagrams and templates, wiring diagrams and performance curves. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as "Shop Drawings."

   a. Mark electronic copy to show applicable choices and options. Where printed Product Data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information:

      1) Manufacturer's printed recommendations

      2) Compliance with recognized trade association standards

      3) Compliance with recognized testing agency standards

      4) Application of testing agency labels and seals

      5) Notation of dimensions verified by field measurement

      6) Notation of coordination requirements

   c. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.

3. Review and processing of Product Data shall be the same as that for Shop Drawings.

D. Samples:

1. Submit in the size specified in the individual Specification Sections, with 3 samples to be returned to the Contractor, together with three additional Samples, which will be retained by the Architect or his consultants, or the County's consultants, as applicable.

2. Ship samples to the Project Manager's on-site office, carriage prepaid. Samples to be returned to the Contractor will be shipped, carriage collect.

3. Submit samples to illustrate functional and aesthetic characteristics of Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

4. Preliminary Submittals:

   a. Unless precise color, pattern, and texture or similar characteristics are specifically described, submit full set of choices for material or product.

   b. Preliminary submittals will be reviewed and returned with Project Architect's mark indicating selection and other action.

   c. Architect reserves right not to make individual determination or selections until all samples of all materials are submitted.

   d. Submit samples of all selected colors, patterns, textures or other similar characteristics as selected by Project Architect.

5. Submit number of samples required by Contractor plus three that will be retained.

   a. Where variation in color, pattern, texture or other characteristics are inherent 'in material or product, submit multiple units (not less than 3), that show approximate limits of variations.

   b. Accepted samples will form standard of comparison for finished Work.

   c. Defects, and deviations in excess of those in accepted samples, are unacceptable and are subject to rejection of completed Work.

6. Include identification on each sample, with full Project information, including:

   a. Project name and location

   b. Manufacturer and supplier

   c. Name, finish, and composition of material

   d. Location where material is to be used

   e. Specification Section number.

7. Reviewed samples which may be used in the Work are indicated in individual specification sections.

8. Field Samples: Provide field samples as required by individual sections. Install samples in locations as directed, completed and finished.

E. Other Submittals: Submit as specified in the individual Specification Sections.

1.06 MANUFACTURERS INSTRUCTIONS

A. When specified in individual Sections, submit PDF’s of manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for Product Data.

B. Identify conflicts between manufacturers' instructions and Contract Documents.

1.07 PATTERNS AND COLORS

A. Unless the exact pattern and color of a product are indicated in the Contract Documents, whenever a choice of pattern or color is available for a product, submit 3 hard copies, not PDF’s of accurate color charts and pattern charts to the Architect for his review and selection.

1.08 CERTIFICATES OF COMPLIANCE

A. Submit certificates of compliance with the associated Shop Drawings, Product Data, Samples, and other submittals required for the product.

B. Submit on 8-1/2-inch-x-11-inch white paper and electronic file (pdf).

C. Submit three copies.

D. Submit in form of letter or company standard forms, signed by officer of manufacturer.

E. Each certification shall include the following:

1. Project name and location

2. Contractor's name and address

3. Quantity and date or dates of shipment or delivery to which certificate applies

4. Manufacturer's name

F. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

G. Certificates may be recent or previous test results on material or product, but must be acceptable to Project Architect.

H. The Project Manager and Architect will retain the certificates of compliance; no review reply is intended.

1.09 DEFERRED APPROVAL

A. See sheet G002, for applicable items that require Deferred Approval.

B. Submit a minimum of three (3) sets of drawings, calculations, product data, samples, etc. for review by the County Building Department or 'deferred' Agency. All drawings and calculations must be "wet stamped" and signed.

C. Allow a minimum of three (3) weeks for County Building Department or 'deferred' Agency to review.

D. Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for re-submittals.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

**END OF SECTION 01 33 00**

# SECTION 01 35 13.16 – SPECIAL PROJECT PROCEDURES FOR DETENTION FACILITIES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Limits and scope of work under the Detention Equipment Contractor (DEC) Section shall be defined in these specifications and correspondingly shown on the drawings.

C. Provide materials, labor, equipment and services necessary to furnish, deliver and install a completely functional integrated system.

D. Division 01 Section “Sustainable Design Requirements” for additional LEED requirements.

E. All equipment and work shall comply with all applicable codes.

### 1.2 SUMMARY

A. This Section includes the responsibilities for a single-source Detention Equipment Contractor (DEC) for detention work.

1. The DEC shall submit an aggregate bid for Work described in the following specification sections. The details and specific Scope of Work related to the installation of the equipment shall be defined between the DEC and General Contractor at the time of Bid. The DEC shall be responsible for performing the coordination required between detention equipment and the security electronic systems, as well as the Electrical work as it relates to security hardware.
    a. Detention Equipment Work required by, but not specified in, this Section includes the following:
        1) Section 083463, Detention Doors and Frames including Sidelites and interior Security Windows
        2) Section 087163, Detention Door Hardware
        3) Section 088853, Security Glazing
2. Approved DEC firms must base their bid on the equipment and products specified herein. Design changes or substitutions will not be allowed unless approved prior to bidding. Value engineering proposals will not be considered.
3. The DEC shall have in their employ a superintendent to be on site to supervise the work of this section. The superintendent’s sole responsibility shall be to supervise and coordinate the scope of work of the DEC. The superintendent shall be at the site at all times when the work is being performed.
4. If any portion of the work listed in paragraph 1.2.A.1.a above is subcontracted, the responsibility for equipment and system coordination remains with the DEC.

5. The DEC is solely responsible for review and coordination of detention devices with the security electronic drawings and specifications. The DEC shall notify the Architect / Consultant if any modifications are required prior to hardware or device installation.
6. The DEC is solely responsible for acquiring and paying for any and all licenses and permits required to perform their Work. If licenses are required before bidding, then the DEC shall not bid any portion of the Work until the required licenses are obtained.

B. Related Work:
1. Section 033000 “Cast-In-Place Concrete” for concrete requirements for floors and deck above.
2. Section 042200 “Concrete Unit Masonry.”
3. Section 055000 “Metal Fabrications” for embeds and anchor bolt requirements.
4. Section 079200 “Joint Sealants” for security sealants.
5. Section 081113 “Hollow Metal Doors and Frames.”
6. Section 083113.53 “Security Access Doors and Frames” for requirements for security access doors installed in walls.
7. Section 083463 “Detention Doors and Frames.”
8. Section 102800 for Detention Toilet Accessories.
9. Section 224000 for Security Plumbing Fixtures.
10. Division 26 for electrical requirements.
11. Division 28 Section 281300 "Access Control System."
12. Division 28 Section 284619 "Programmable Logic Controller."

1.3 PRE-QUALIFICATION REQUIREMENTS:

A. The following Detention Contractors are pre-approved to perform the work of this division.
1. CMLRW Security, Erie, CO: 720-466-3650
2. Cornerstone Detention Products, Inc., Decatur, AL: Phone 256-355-2396
3. ISI Detention Contracting, San Antonio, TX: Phone 210-495-5245
4. Sierra Detention Systems, Golden, CO: Phone 303-278-6879
5. Southern Folger, San Antonio, TX Phone 210-533-1231

B. Approval of a firm as a DEC does not relieve that DEC from furnishing all materials from manufacturers as herein specified.

1.4 SCOPE AND RESPONSIBILITY:

A. The DEC is solely responsible for performing the coordination required between the Division 08 Detention Scope of Work with the Division 28 Security Electronics Scope of Work.

B. The DEC shall be responsible for the coordination, integration and interfacing of the products and systems specified in Division 8 and Division 28, and in accordance with shop drawings and submittals approved by the Architect / Consultant.

C. The DEC shall be responsible for all labor and equipment for receiving, unloading, distributing, setting and installation of all security related items. This includes, but may not be limited to, bars, plates, angles, access frames and doors, security frames and security sidelights, and miscellaneous security frames specified in Division 8.

D. Under the requirements of this Section, the DEC shall be responsible for furnishing and installing the following, as specified in all locations. The details and specific scope of work related to a portion of the installation of this equipment shall be defined between the DEC and General Contractor at the time of Bid.
   1. Detention Hollow Metal Frames, Sidelights, and Interior Security Windows.
   2. Detention Hollow Metal Doors.
   3. Detention Hardware.
   4. Security and Non-Security Glass and Glazing for Security Hollow Metal and Security Windows.

E. Installation of all systems and equipment is subject to clarifications as indicated in the reviewed shop drawings and field coordination drawings.

F. The DEC is solely responsible for acquiring and paying for all licenses and permits required to perform their Work. If licenses are required before bidding, then the DEC shall not bid any portion of the Work until the required licenses are obtained.

1.5 SUBMITTALS

A. General: Submittals shall be made in accordance with Conditions of Contract and Division 1 Sections. DEC shall review Detention Work submittals and verify construction details and provide answers to manufacturer's questions prior to submission to the General Contractor. **Submittals not reviewed by the DEC prior to submission to the General Contractor, will be returned rejected**. Submittals shall be supplied on USB drive.

B. Product Data: Mark each copy to show applicable choices and options where printed product data includes information on several products, some of which are not required, mark copies to indicate the applicable information.

C. Shop Drawings: Highlight, encircle, or otherwise indicate deviations from the Contract Documents.

D. Coordination Drawings: Prepare and submit Project-specific Coordination Drawings, drawn accurately to scale, for installation of detention work. Include the following information, as applicable:
   1. Show relationship of components shown on separate Shop Drawings.
   2. Show dimensions and clearances of interrelated detention work.
   3. Provide templates and patterns.
   4. Indicate required operation sequences of interrelated detention work.
   5. Indicate required installation sequences.
   6. Refer to Division 26 for specific Coordination Drawing requirements for electrical installations required for detention work.

E. The submittal shall reflect the equipment and material as they are defined by the project plans and specifications, contract and signed/documented clarifications, substitutions and changes to the above documents by the Architect.

F. It is the DEC's responsibility to coordinate detention/security items in this scope of work, and to answer all manufacturer questions or concerns that are not strictly design related. The DEC

shall redline the manufacturers' individual shop drawings and/or schedules, and note corrections prior to submittal for Architectural/Consultant review. When multiple items are submitted by the manufacturer on a single cutsheet, the DEC shall note with an arrow, circle or note cloud, to show which product on the sheet is submitted for this scope of work. DEC submittals not reviewed and redlined prior to submittal to Architect/Consultant for final review, will be returned rejected.

G. Qualified installers trained by the manufacturer shall perform the installation of all detention hardware and sliding devices. **Submittal of written confirmation from the manufacturer showing individual field technicians as approved installers shall be required.**

H. The submittal documents shall be updated throughout the project construction. These documents shall be included with the operation and maintenance manuals to provide accurate as-built documentation of all installed equipment and material.

I. Other Informational Submittals:
   1. Examination reports documenting inspections of substrates, areas, and conditions.

J. Submittals not organized as specified shall be considered incomplete and will be rejected.

1.6 OPERATING/MAINTENANCE MANUALS

A. DEC shall furnish three (3) copies of Operation and Maintenance Manuals for all security and non-security items furnished under this specification. These manuals shall include:
   1. Instructions for the care and operation of the materials.
   2. Parts list with exploded views of material with moving parts to aid the Owner with ordering replacement parts.
   3. Telephone, Fax, Address, website and instructions for contacting the appropriate personnel during the warranty period as well as for service.
   4. Refer to division 1 specification for additional requirements.

B. Operation and Maintenance Manual shall include information for every mechanical item with moving parts and every electrical item submitted in the approved hardware schedule. This is to include all material in the related submittal and is not limited to "detention" equipment.

C. Submittals shall be "AS BUILT" documents and shall include all changes from approved submittal documents clearly noted on each sheet. The document type and the document number that initiated the final change shall be clearly noted on these as builts.

D. The owner has the right to request an interactive Operation Manual in place of the printed hard copy manuals described above. The interactive manual will utilize the files described above as a basis for an interactive document utilizing a web browser. All manuals, files, and data sheets would be published in a format compatible with Internet Browsers equal to Microsoft Internet Explorer. Hyperlinks would link each item in a master table of contents to individual manuals, shop drawings, and files. The DEC shall clarify with the owner the type of documentation required.

E. Submittals not organized as specified shall be considered incomplete and will be rejected.

1.7 SUBSTITUTIONS

A. No substitutions of equipment or material will be permitted where specific trade names or a manufacturer is listed, unless the architect adds them by an addendum.

B. Materials and products specified by name of manufacturer or brand trade name shall be the basis of the bids received unless changed by addendum prior to the bid dates.

C. In the event a contractor wishes to use any materials or products other than those specified he shall make a written request to the Architect, naming the proposed substitution. All substitutions of locksets, must be accompanied by a written letter from the manufacturer stating that the substituted lockset matches the specified lockset function exactly as shown in the individual hardware sets per specification section 087163.

D. All additional costs resulting from the use of an approved substitution shall be borne by the contractor without additional expense to the Owner. Such additional costs shall include necessary modifications and alterations to structures, equipment, raceways and furnishing of all additional materials required to affect the substitution.

1.8 QUALITY ASSURANCE

A. The following DEC's are pre-approved to perform the work of this Section:
1. CML Security, Erie, Co: Phone 720-466-3650
2. Cornerstone Detention Products, Inc., Decatur, AL: Phone 256-355-2396
3. ISI Detention Contracting, San Antonio, TX: Phone 210-495-5245
4. Sierra Detention Systems, Brighton, CO: 303-278-6879
5. Southern Folger Detention Equipment Company, San Antonio, TX: Phone 210-533-1231
6. Universal Security Products, San Ramon, CA: Phone 510-785-8222

B. Approval of a firm as a DEC does not relieve that DEC from furnishing all materials from the manufacturers as herein specified.

C. All materials and labor specified in this Section of the Specifications shall be furnished by a single qualified DEC who shall assume responsibility for the detailing, coordinating, erecting, performance, and warranty of this work, in accordance with this specification.

D. Qualified installers trained by the manufacturer shall perform the installation of all detention hardware and sliding devices. **Submittal of written confirmation from the manufacturer showing individual field technicians as approved installers shall be required**.

1.9 COORDINATION

A. Coordinate work to ensure efficient and orderly installation of each part of detention work. Coordinate and schedule detention work that depends on other work for proper and timely installation, connection, and operation.
1. Coordinate installation of different detention components to ensure maximum accessibility for required maintenance, service, and repair.
2. Coordinate provisions to accommodate detention work scheduled for later installation.

3. Coordinate detention work with work by the Security System Integrator (SSI).

B. Coordinate selection of detention products for compatibility.

C. Assemble and coordinate Shop Drawings for detention work provided by separate entities.

D. Coordinate sequencing and scheduling of detention work. Secure time commitments for performing critical construction activities from separate entities responsible for detention work.
1. Schedule construction operations in sequence required to obtain best results where installation of one part of detention work depends on installation of other components, before or after its own installation.
2. Coordinate sequence of detention work activities to accommodate tests and inspections.

E. Coordinate installation of anchorages and embedments for detention work. Obtain and distribute, to parties involved, setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation so as not to delay progress of the Work.
1. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing detention work to comply with indicated requirements.

F. Coordinate temporary facilities and controls required by detention work.
1. Maintain an ongoing inventory of all material.
2. Arrange for a secure, dry, locked storage area or room in the building for storing detention equipment products prior to installation.
3. Receive, unload and distribute products to site storage location and/or installation locations. Minor scratches on painted surfaces shall be cleaned and touched-up with rust-inhibitive primer. Defective disfigured products shall be rejected.
4. Tag all products with markings that show proper installation locations.

G. Coordinate protection of installed detention work.

H. Coordinate preparation of Project Record Documents for detention work and integrate information from entities responsible for detention work to form one combined record.

I. Coordinate preparation of operation and maintenance manuals for detention work and integrate information from entities responsible for detention work to form one combined record.

J. Defective Products: Items found to be defective, either through manufacturing, damage in transit or by field installation, shall be replaced prior to final completion. DEC shall make special manufacturing and shipping arrangements to accomplish this replacement prior to completion.

K. Coordination Meetings: Conduct coordination meetings specifically for detention work at regular intervals. Coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and pre-installation conferences.

1.10 WARRANTY

A. The DEC shall warrant the material and equipment and labor furnished by the DEC under this Section to be free from defects in material and workmanship for a period of one (1) year after substantial completion. Should written notice be served on the DEC during the warranty period of any such defect, the DEC shall make good the defect at its own expense. Coordination of warranty problems between division 8 and 27/28 shall be the responsibility of the DEC.

B. The DEC must have full-time employees trained in and devoted to the maintenance and repair of systems and equipment furnished.

C. The DEC shall provide warranty service throughout the warranty period in a timely manner.
   1. Service response requirements shall include the following:
      a. Twenty-four (24) hour phone number.
      b. DEC shall respond to warranty call within twenty-four (24) hours of notification.
      c. Response personnel shall be factory technicians trained by the manufacturers of the equipment, with five years experience, servicing equipment of the type included in this project.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION**

3.1 INSTALLATION

A. Ensure quality of field welding of detention work and anchorages.

B. Verify that detention work is installed and connected according to the Contract Documents.

C. Verify that wiring installation complies with manufacturer's submittal and written installation requirements in Division 26 and 28 Sections.

D. Observe startup service of detention work.

E. Observe installation and startup checks of detention work according to manufacturer's written instructions.

F. Inspect installed detention work to verify compliance with requirements. Prepare inspection reports and indicate compliance with and deviations from the Contract Documents.
   1. Perform additional inspections to determine compliance of replaced or additional work.
   2. Prepare field quality-control certification that states installed detention work and its installation complies with requirements in the Contract Documents.

G. Testing: After installing electrified detention work and after electrical circuitry has been installed, energized and is functional, test detention work for compliance with requirements.
   1. When testing reveals detention work is not in compliance with requirements, perform additional random testing to determine extent of noncompliance.
   2. Where test results indicate that detention work does not comply with specified requirements, retest after repairs or replacements are made.

H. Perform additional testing and inspecting, at Contractor's expense, to determine compliance of replaced or additional work.

3.2 INSPECTIONS AND TESTING

A. The General Contractor / Construction Manager and DEC shall be responsible for issuing a letter to the Architect and R&N Systems Design, LLC confirming that the work is complete and ready for inspection and testing. If the project is completed in phases, a letter will be submitted for each phase to be inspected. As an attachment to the letter confirming the work is "complete" and ready for inspection, the DEC must attach a self generated "field test" report for each device which confirms in detail that the DEC has performed their own inspection and test prior to the inspection by the Architect / Consultant. The inspection shall include control and monitoring of the hardware, as well as the installation and adjustments of the mechanical functions. The Superintendent and Project Manager shall be present and assist in the inspection / testing of the Work.

B. If additional inspections are required because the Work is incomplete at the time of the scheduled inspection or if any portion of the system fails to function as designed, the DEC shall be responsible for paying for the time and expenses for the Architect and Security Consultant to re-schedule and re-inspect the Work. This cost shall include time and expense for each individual of the Security Consulting firm required for the re-inspection. The charge shall be a minimum of **$5000.00** per individual occurrence. This cost will include travel time, inspection time and travel expenses. This amount must be **paid prior** to re-scheduling the inspection.

3.3 SPARE PARTS

A. The DEC shall deliver all spare parts at the completion of the project. The spare parts shall be clearly marked as to content and packaged for ease of handling by one (1) person without the use of forklifts or other equipment. The DEC shall obtain a signature from the owner's representative receiving the spare parts.

B. The DEC shall furnish the parts described in each subsection of the specifications provided by the DEC. Mark the specification section on the packaging for each device. **Refer to individual specification sections for spare parts to be provided as a requirement for each section**.

3.4 TRAINING

A. The DEC shall provide without additional cost to the Owner, representatives specially trained in the operation of detention hardware and devices provided. The representatives shall train the Owner's personnel in operations, repair, and upkeep of all Detention Work. Coordinate dates for training sessions with the Owner prior to scheduling dates.

B. The DEC shall be responsible for notifying the Architect five (5) weeks prior to substantial completion of the total security system that training is scheduled. The DEC will coordinate the number to be trained with the Owner's representative.

C. The inspection shall include Systems, Subsystems, Equipment, and Components. Where these terms are used together or separately, they shall be referred to as "the system". The DEC shall be prepared to test every point for each system.

D. On-Site Training: Provide qualified personnel for instruction and a training period involving the Owner's designated personnel and the DEC as designated by the user. Representatives must be capable of training Owner's personnel in the adjustment, operation and repair of detention work, including pertinent safety requirements. Instruction shall be given during the first week after detention work has been accepted and turned over to the Owner for regular operation, except if adjustment and/or repairs are required for its use. In such case, training sessions are not to occur until such adjustments and/or repairs have been satisfactorily completed.
   1. On-site instruction and training shall include a minimum of four (4) consecutive eight (8) hour days.
   2. Training shall be coordinated with the scheduled training period for Division 27/28 work.
   3. Training sessions to be videotaped. Tapes to be given to Owner.
   4. In addition to the training requirements listed above the DEC shall include all associated cost to provide additional onsite owner training following substantial completion. The additional training shall occur at the three (3) month period and shall cover topics as referenced in paragraph "D" above. Coordinate this additional training with the owner.

E. During the warranty period, if significant changes or modifications take place in the equipment or system, additional instruction shall be provided at no cost to the Owner (unless such changes or modifications are Owner initiated) to acquaint the operating personnel with the changes or modifications.

F. Training Certification
   1. Each facility employee shall receive at the conclusion of the security systems training program a certificate certifying his attendance of the total session or portion thereof.

G. DEC shall maintain attendance records of each class. This attendance shall be submitted to the Architect at the completion of training.

**END OF SECTION 01 35 13.16**

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# SECTION 013513.16 – SPECIAL PROJECT PROCEDURES FOR DETENTION FACILITIES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Limits and scope of work under the Detention Equipment Contractor (DEC) Section shall be defined in these specifications and correspondingly shown on the drawings.

C. Provide materials, labor, equipment and services necessary to furnish, deliver and install a completely functional integrated system.

D. Division 01 Section “Sustainable Design Requirements” for additional LEED requirements.

E. All equipment and work shall comply with all applicable codes.

### 1.2 SUMMARY

A. This Section includes the responsibilities for a single-source Detention Equipment Contractor (DEC) for detention work.

1. The DEC shall submit an aggregate bid for Work described in the following specification sections. The details and specific Scope of Work related to the installation of the equipment shall be defined between the DEC and General Contractor at the time of Bid. The DEC shall be responsible for performing the coordination required between detention equipment and the security electronic systems, as well as the Electrical work as it relates to security hardware.

    a. Detention Equipment Work required by, but not specified in, this Section includes the following:

        1) Section 083463, Detention Doors and Frames including Sidelites and interior Security Windows
        2) Section 087163, Detention Door Hardware
        3) Section 088853, Security Glazing

2. Approved DEC firms must base their bid on the equipment and products specified herein. Design changes or substitutions will not be allowed unless approved prior to bidding. Value engineering proposals will not be considered.
3. The DEC shall have in their employ a superintendent to be on site to supervise the work of this section. The superintendent’s sole responsibility shall be to supervise and coordinate the scope of work of the DEC. The superintendent shall be at the site at all times when the work is being performed.

4. If any portion of the work listed in paragraph 1.2.A.1.a above is subcontracted, the responsibility for equipment and system coordination remains with the DEC.
5. The DEC is solely responsible for review and coordination of detention devices with the security electronic drawings and specifications. The DEC shall notify the Architect / Consultant if any modifications are required prior to hardware or device installation.
6. The DEC is solely responsible for acquiring and paying for any and all licenses and permits required to perform their Work. If licenses are required before bidding, then the DEC shall not bid any portion of the Work until the required licenses are obtained.

B. Related Work:

1. Division 03 Section 033000 “Cast-In-Place Concrete” for concrete requirements for floors and deck above.
2. Division 04 Section 042000 “Unit Masonry.”
3. Division 05 Section 055000 “Metal Fabrications” for embeds and anchor bolt requirements.
4. Division 07 Section 079200 “Joint Sealants” for security sealants.
5. Division 08 Section 081113 “Hollow Metal Doors and Frames.”
6. Division 08 Section 083113 “Access Doors and Frames” for requirements for security access doors installed in walls.
7. Division 10 Section 102800 for Detention Toilet Accessories.
8. Division 22 Section 224000 for Security Plumbing Fixtures.
9. Division 26 for electrical requirements.
10. Division 28 Section 281300 "Access Control."
11. Division 28 Section 284619 "PLC Electronic Detention Monitoring and Control Systems."

1.3 PRE-QUALIFICATION REQUIREMENTS:

A. The following Detention Contractors are pre-approved to perform the work of this division.

1. CMLRW Security, Erie, CO: 720-466-3650
2. Cornerstone Detention Products, Inc., Decatur, AL: Phone 256-355-2396
3. ISI Detention Contracting, San Antonio, TX: Phone 210-495-5245
4. Sierra Detention Systems, Golden, CO: Phone 303-278-6879
5. Southern Folger, San Antonio, TX Phone 210-533-1231

B. Approval of a firm as a DEC does not relieve that DEC from furnishing all materials from manufacturers as herein specified.

1.4 SCOPE AND RESPONSIBILITY:

A. The DEC is solely responsible for performing the coordination required between the Division 08 Detention Scope of Work with the Division 28 Security Electronics Scope of Work.

B. The DEC shall be responsible for the coordination, integration and interfacing of the products and systems specified in Division 8 and Division 28, and in accordance with shop drawings and submittals approved by the Architect / Consultant.

C. The DEC shall be responsible for all labor and equipment for receiving, unloading, distributing, setting and installation of all security related items. This includes, but may not be limited to, bars, plates, angles, access frames and doors, security frames and security sidelights, and miscellaneous security frames specified in Division 8.

D. Under the requirements of this Section, the DEC shall be responsible for furnishing and installing the following, as specified in all locations. The details and specific scope of work related to a portion of the installation of this equipment shall be defined between the DEC and General Contractor at the time of Bid.

1. Detention Hollow Metal Frames, Sidelights, and Interior Security Windows.
2. Detention Hollow Metal Doors.
3. Detention Hardware.
4. Security and Non-Security Glass and Glazing for Security Hollow Metal and Security Windows.

E. Installation of all systems and equipment is subject to clarifications as indicated in the reviewed shop drawings and field coordination drawings.

F. The DEC is solely responsible for acquiring and paying for all licenses and permits required to perform their Work. If licenses are required before bidding, then the DEC shall not bid any portion of the Work until the required licenses are obtained.

## 1.5 SUBMITTALS

A. General: Submittals shall be made in accordance with Conditions of Contract and Division 1 Sections. DEC shall review Detention Work submittals and verify construction details and provide answers to manufacturer's questions prior to submission to the General Contractor. **Submittals not reviewed by the DEC prior to submission to the General Contractor, will be returned rejected**. Submittals shall be supplied on USB drive.

B. Product Data: Mark each copy to show applicable choices and options where printed product data includes information on several products, some of which are not required, mark copies to indicate the applicable information.

C. Shop Drawings: Highlight, encircle, or otherwise indicate deviations from the Contract Documents.

D. Coordination Drawings: Prepare and submit Project-specific Coordination Drawings, drawn accurately to scale, for installation of detention work. Include the following information, as applicable:

1. Show relationship of components shown on separate Shop Drawings.
2. Show dimensions and clearances of interrelated detention work.
3. Provide templates and patterns.
4. Indicate required operation sequences of interrelated detention work.
5. Indicate required installation sequences.
6. Refer to Division 26 for specific Coordination Drawing requirements for electrical installations required for detention work.

E. The submittal shall reflect the equipment and material as they are defined by the project plans and specifications, contract and signed/documented clarifications, substitutions and changes to the above documents by the Architect.

F. It is the DEC's responsibility to coordinate detention/security items in this scope of work, and to answer all manufacturer questions or concerns that are not strictly design related. The DEC shall redline the manufacturers' individual shop drawings and/or schedules, and note corrections prior to submittal for Architectural/Consultant review. When multiple items are submitted by the manufacturer on a single cutsheet, the DEC shall note with an arrow, circle or note cloud, to show which product on the sheet is submitted for this scope of work. DEC submittals not reviewed and redlined prior to submittal to Architect/Consultant for final review, will be returned rejected.

G. Qualified installers trained by the manufacturer shall perform the installation of all detention hardware and sliding devices. **Submittal of written confirmation from the manufacturer showing individual field technicians as approved installers shall be required.**

H. The submittal documents shall be updated throughout the project construction. These documents shall be included with the operation and maintenance manuals to provide accurate as-built documentation of all installed equipment and material.

I. Other Informational Submittals:

1. Examination reports documenting inspections of substrates, areas, and conditions.

J. Submittals not organized as specified shall be considered incomplete and will be rejected.

## 1.6 OPERATING/MAINTENANCE MANUALS

A. DEC shall furnish three (3) copies of Operation and Maintenance Manuals for all security and non-security items furnished under this specification. These manuals shall include:

1. Instructions for the care and operation of the materials.
2. Parts list with exploded views of material with moving parts to aid the Owner with ordering replacement parts.
3. Telephone, Fax, Address, website and instructions for contacting the appropriate personnel during the warranty period as well as for service.
4. Refer to division 1 specification for additional requirements.

B. Operation and Maintenance Manual shall include information for every mechanical item with moving parts and every electrical item submitted in the approved hardware schedule. This is to include all material in the related submittal and is not limited to "detention" equipment.

C. Submittals shall be "AS BUILT" documents and shall include all changes from approved submittal documents clearly noted on each sheet. The document type and the document number that initiated the final change shall be clearly noted on these as builts.

D. The owner has the right to request an interactive Operation Manual in place of the printed hard copy manuals described above. The interactive manual will utilize the files described above as a basis for an interactive document utilizing a web browser. All manuals, files, and data sheets would be published in a format compatible with Internet Browsers equal to Microsoft Internet Explorer. Hyperlinks would link each item in a master table of contents to individual manuals, shop drawings, and files. The DEC shall clarify with the owner the type of documentation required.

E. Submittals not organized as specified shall be considered incomplete and will be rejected.

## 1.7 SUBSTITUTIONS

A. No substitutions of equipment or material will be permitted where specific trade names or a manufacturer is listed, unless the architect adds them by an addendum.

B. Materials and products specified by name of manufacturer or brand trade name shall be the basis of the bids received unless changed by addendum prior to the bid dates.

C. In the event a contractor wishes to use any materials or products other than those specified he shall make a written request to the Architect, naming the proposed substitution. All substitutions of locksets, must be accompanied by a written letter from the manufacturer stating that the substituted lockset matches the specified lockset function exactly as shown in the individual hardware sets per specification section 087163.

D. All additional costs resulting from the use of an approved substitution shall be borne by the contractor without additional expense to the Owner. Such additional costs shall include necessary modifications and alterations to structures, equipment, raceways and furnishing of all additional materials required to affect the substitution.

## 1.8 QUALITY ASSURANCE

A. The following DEC's are pre-approved to perform the work of this Section:

1. CML Security, Erie, Co: Phone 720-466-3650
2. Cornerstone Detention Products, Inc., Decatur, AL: Phone 256-355-2396
3. ISI Detention Contracting, San Antonio, TX: Phone 210-495-5245
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5. Southern Folger Detention Equipment Company, San Antonio, TX: Phone 210-533-1231
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B. Approval of a firm as a DEC does not relieve that DEC from furnishing all materials from the manufacturers as herein specified.

C. All materials and labor specified in this Section of the Specifications shall be furnished by a single qualified DEC who shall assume responsibility for the detailing, coordinating, erecting, performance, and warranty of this work, in accordance with this specification.

D. Qualified installers trained by the manufacturer shall perform the installation of all detention hardware and sliding devices. **Submittal of written confirmation from the manufacturer showing individual field technicians as approved installers shall be required**.

1.9 COORDINATION

A. Coordinate work to ensure efficient and orderly installation of each part of detention work. Coordinate and schedule detention work that depends on other work for proper and timely installation, connection, and operation.

1. Coordinate installation of different detention components to ensure maximum accessibility for required maintenance, service, and repair.
2. Coordinate provisions to accommodate detention work scheduled for later installation.
3. Coordinate detention work with work by the Security System Integrator (SSI).

B. Coordinate selection of detention products for compatibility.

C. Assemble and coordinate Shop Drawings for detention work provided by separate entities.

D. Coordinate sequencing and scheduling of detention work. Secure time commitments for performing critical construction activities from separate entities responsible for detention work.

1. Schedule construction operations in sequence required to obtain best results where installation of one part of detention work depends on installation of other components, before or after its own installation.
2. Coordinate sequence of detention work activities to accommodate tests and inspections.

E. Coordinate installation of anchorages and embedments for detention work. Obtain and distribute, to parties involved, setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation so as not to delay progress of the Work.

1. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing detention work to comply with indicated requirements.

F. Coordinate temporary facilities and controls required by detention work.

1. Maintain an ongoing inventory of all material.
2. Arrange for a secure, dry, locked storage area or room in the building for storing detention equipment products prior to installation.
3. Receive, unload and distribute products to site storage location and/or installation locations. Minor scratches on painted surfaces shall be cleaned and touched-up with rust-inhibitive primer. Defective disfigured products shall be rejected.
4. Tag all products with markings that show proper installation locations.

G. Coordinate protection of installed detention work.

H. Coordinate preparation of Project Record Documents for detention work and integrate information from entities responsible for detention work to form one combined record.

I. Coordinate preparation of operation and maintenance manuals for detention work and integrate information from entities responsible for detention work to form one combined record.

J. Defective Products: Items found to be defective, either through manufacturing, damage in transit or by field installation, shall be replaced prior to final completion. DEC shall make special manufacturing and shipping arrangements to accomplish this replacement prior to completion.

K. Coordination Meetings: Conduct coordination meetings specifically for detention work at regular intervals. Coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and pre-installation conferences.

1.10 WARRANTY

A. The DEC shall warrant the material and equipment and labor furnished by the DEC under this Section to be free from defects in material and workmanship for a period of one (1) year after substantial completion. Should written notice be served on the DEC during the warranty period of any such defect, the DEC shall make good the defect at its own expense. Coordination of warranty problems between division 8 and 27/28 shall be the responsibility of the DEC.

B. The DEC must have full-time employees trained in and devoted to the maintenance and repair of systems and equipment furnished.

C. The DEC shall provide warranty service throughout the warranty period in a timely manner.

1. Service response requirements shall include the following:

a. Twenty-four (24) hour phone number.
b. DEC shall respond to warranty call within twenty-four (24) hours of notification.
c. Response personnel shall be factory technicians trained by the manufacturers of the equipment, with five years experience, servicing equipment of the type included in this project.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 INSTALLATION

A. Ensure quality of field welding of detention work and anchorages.

B. Verify that detention work is installed and connected according to the Contract Documents.

C. Verify that wiring installation complies with manufacturer's submittal and written installation requirements in Division 26 and 28 Sections.

D. Observe startup service of detention work.

E. Observe installation and startup checks of detention work according to manufacturer's written instructions.

F. Inspect installed detention work to verify compliance with requirements. Prepare inspection reports and indicate compliance with and deviations from the Contract Documents.

1. Perform additional inspections to determine compliance of replaced or additional work.
2. Prepare field quality-control certification that states installed detention work and its installation complies with requirements in the Contract Documents.

G. Testing: After installing electrified detention work and after electrical circuitry has been installed, energized and is functional, test detention work for compliance with requirements.

1. When testing reveals detention work is not in compliance with requirements, perform additional random testing to determine extent of noncompliance.
2. Where test results indicate that detention work does not comply with specified requirements, retest after repairs or replacements are made.

H. Perform additional testing and inspecting, at Contractor's expense, to determine compliance of replaced or additional work.

## 3.2 INSPECTIONS AND TESTING

A. The General Contractor / Construction Manager and DEC shall be responsible for issuing a letter to the Architect and R&N Systems Design, LLC confirming that the work is complete and ready for inspection and testing. If the project is completed in phases, a letter will be submitted for each phase to be inspected. As an attachment to the letter confirming the work is "complete" and ready for inspection, the DEC must attach a self generated "field test" report for each device which confirms in detail that the DEC has performed their own inspection and test prior to the inspection by the Architect / Consultant. The inspection shall include control and monitoring of the hardware, as well as the installation and adjustments of the mechanical functions. The Superintendent and Project Manager shall be present and assist in the inspection / testing of the Work.

B. If additional inspections are required because the Work is incomplete at the time of the scheduled inspection or if any portion of the system fails to function as designed, the DEC shall be responsible for paying for the time and expenses for the Architect and Security Consultant to re-schedule and re-inspect the Work. This cost shall include time and expense for each individual of the Security Consulting firm required for the re-inspection. The charge shall be a minimum of **$5000.00** per individual occurrence. This cost will include travel time, inspection time and travel expenses. This amount must be **paid prior** to re-scheduling the inspection.

## 3.3 SPARE PARTS

A. The DEC shall deliver all spare parts at the completion of the project. The spare parts shall be clearly marked as to content and packaged for ease of handling by one (1) person without the use of forklifts or other equipment. The DEC shall obtain a signature from the owner's representative receiving the spare parts.

B. The DEC shall furnish the parts described in each subsection of the specifications provided by the DEC. Mark the specification section on the packaging for each device. **Refer to individual specification sections for spare parts to be provided as a requirement for each section**.

3.4 TRAINING

A. The DEC shall provide without additional cost to the Owner, representatives specially trained in the operation of detention hardware and devices provided. The representatives shall train the Owner's personnel in operations, repair, and upkeep of all Detention Work. Coordinate dates for training sessions with the Owner prior to scheduling dates.

B. The DEC shall be responsible for notifying the Architect five (5) weeks prior to substantial completion of the total security system that training is scheduled. The DEC will coordinate the number to be trained with the Owner's representative.

C. The inspection shall include Systems, Subsystems, Equipment, and Components. Where these terms are used together or separately, they shall be referred to as "the system". The DEC shall be prepared to test every point for each system.

D. On-Site Training: Provide qualified personnel for instruction and a training period involving the Owner's designated personnel and the DEC as designated by the user. Representatives must be capable of training Owner's personnel in the adjustment, operation and repair of detention work, including pertinent safety requirements. Instruction shall be given during the first week after detention work has been accepted and turned over to the Owner for regular operation, except if adjustment and/or repairs are required for its use. In such case, training sessions are not to occur until such adjustments and/or repairs have been satisfactorily completed.

1. On-site instruction and training shall include a minimum of four (4) consecutive eight (8) hour days.
2. Training shall be coordinated with the scheduled training period for Division 27/28 work.
3. Training sessions to be videotaped. Tapes to be given to Owner.
4. In addition to the training requirements listed above the DEC shall include all associated cost to provide additional onsite owner training following substantial completion. The additional training shall occur at the three (3) month period and shall cover topics as referenced in paragraph "D" above. Coordinate this additional training with the owner.

E. During the warranty period, if significant changes or modifications take place in the equipment or system, additional instruction shall be provided at no cost to the Owner (unless such changes or modifications are Owner initiated) to acquaint the operating personnel with the changes or modifications.

F. Training Certification

1. Each facility employee shall receive at the conclusion of the security systems training program a certificate certifying his attendance of the total session or portion thereof.

G. DEC shall maintain attendance records of each class. This attendance shall be submitted to the Architect at the completion of training.

END OF SECTION 013513.16

SECTION 01 35 53 - PROJECT SECURITY PROCEDURES

PART 1 - GENERAL

1.01 GENERAL

A. The following special requirements for Solano County Sheriff's Institutions and Facilities are applicable to the Solano County Classroom and Vocational Training Center site; hereinafter referred to as Training Center. Security regulations include, but are not limited to, the given provisions in this Section.

B. The Solano County Classroom and Vocational Training Center Project will be divided into two (2) levels of security requirements.

- Level 1 security clearance is required for access to, and general work performed in the new construction site area, which will be required to be fenced off from the existing facility area and maintained with a separate ingress/egress, Work Area 1.

- Level 2 security clearance is required for access to, and work performed at the existing facility (Institution) where work will take place within an operational detention facility, Work Area 2. A Level 2 clearance is also required for any contractor who designs, programs and installs security equipment or any contractor who may have access to the County/Security network, including protected data/information.

C. The Contractor shall meet with the Project Manager and the Sheriff's Office Transition Team Manager prior to beginning any work on-site to review the applicable security procedures and develop a Security Requirements Plan that can be used to communicate the Project Security Procedures to all personnel that will be on-site or who will visit site during the construction of this Project. The Contractor will be required to designate one of their on-site personnel to represent the Contractor, monitor and implement the Security Requirements Plan.

D. Reference: Contractor, sub-contractors, and their on-site employees will be required to read, sign, and date the rules regarding association with inmates, in addition, the Sheriff's Office has General Orders 5.026 and 5.027 regarding behavior around inmates for volunteers and employees; a copy will be provided Contractor.

E. Sheriff's Transition Team and Correctional Officer

1. Sheriff's Transition Team representative: A Sheriff's Office employee assigned as a permanent member to the Sheriff's Transition Team who holds the rank of Correctional Officer, Custody Sergeant or Custody Lieutenant. This is a permanent position that provides project supervision and support for the

planning, construction and operational needs of the Training Center project. They are responsible for coordinating and assigning tasks associated with the transition project, including: Policy and Procedures; Post Orders; Phasing Coordination; Construction Site Observation; Training; Staffing, Classification and Movement of Inmates; Vendor Coordination and Facility Inspection.

2. Correctional Officer: A Sheriff’s Office employee assigned to supervise and control inmates in a detention facility.

1.02 USE OF PROPERTY

A. Contractor shall confine work operations to the areas of work indicated on the Drawings and within Work Area 1 and Work Area 2. Material storage, fabrication facilities, and the like, shall be located as near to the working areas as custodial regulations permit. However, checking in and out entering and exiting of Institution grounds from and to lay-down, material storage, fabrication, and tool storage areas will be required. Contractor shall make allowances in bid for delays caused by checking in and out. Contractor shall allow up to 1 hour each way for access arrival/departure of employees and material to and from Institution grounds for Work Area 2.

B. The Project Manager and Sheriff's Transition Team representative will designate an appropriate material storage, tool storage or shop facility area, and the like, on Institution grounds for Contractor's use. This applies to Work Area 1 and 2.

C. Materials, supplies and persons shall be subject to inspection by Correctional Officers upon entering or leaving Institution grounds and during work hours This applies to Work Area 1 and 2.

1.03 CONTRACTOR'S WORKERS CLEARANCES AND IDENTIFICATION

A. Contractor's personnel must receive Level 1 Criminal Identification Information (C.I. & I.) clearance prior to entering the Institution or grounds at no cost to the Contractor. C.I. & I. clearance may include fingerprinting, photography through the County of Solano, California, Department of Justice and orientation by the Transition Team at the Institution. Approximately 2 hours processing should be included with Contractor's bid for each person that will be working on this Project. This will be required of each new worker only once. For Level 2 security clearances, the contractor will be responsible for payment of a $39.00 rolling fee and $32.00 DOJ fee for submittal of fingerprints per personnel. Fees are subject to change.

B. The C.I.&I. process to get personnel 'cleared' can take up to approximately 20 working days; Contractor shall work to provide this information to the Sheriff’s Office as quickly as possible to ensure that assigned personnel can access and work on site.

C. Workers will be required to show photo identification and their Institution-issued identification when requested by Sheriff's Transition Team representative or Correctional

Officer. They will be allowed to park their private vehicles in designated construction parking areas, as directed by the Project Manager and Sheriff's Transition Team representative.

D. No firearms, ammunition, narcotics, pepper sprays, chemical agents, cell phones, knives, drugs, intoxicants, handcuffs, handcuff keys, alarm keys, cameras, audio recording devices or explosives will be allowed on the premises. All persons shall remove ignition keys from their vehicles and lock the vehicle when it is not in use.

E. Construction personnel will not be permitted into occupied areas without being escorted at all times by a Correctional employee.

F. Workers may be in the same vicinity of inmates at times. Correctional Officers will advise workers and inmates of standard procedures to maintain separation.

G. Contractor's personnel will be required to work in clothing different from that worn by the inmates. Inmates currently wear striped two-piece uniforms. Project Manager and Sheriff's Transition Team representative will notify Contractor of any clothing issues that develop with on-site construction personnel and Contractor shall take action to remedy issue.

H. Within 5 calendar days after award of Contract, Contractor shall provide a 'priority' list of personnel who will be working on Project site upon commencement of work. Lists of other personnel will follow based on the Project Schedule. Contractor shall provide 48-hour notice of changes or additions in personnel as such changes or additions occur.

1. Listing shall include the following information:
   Name
   Driver's License Number
   Social Security Number
   Date of Birth

2. Prior arrest/conviction record may or may not affect the eligibility of a worker. The Sheriff's Office will be the approval authority in each individual case. The Sheriff's Office stresses that Contractor's personnel should be as truthful and divulging as possible to assist in these decisions. Information about work arrest/conviction records will be kept confidential.

3. Name of Contractor's pre-approved personnel working on Project site, separated according to trade classification, shall be submitted to Institution at least 24 hours before commencing work of that trade.

4. Workers may enter Project site with temporary visitor passes issued after security clearance has been obtained, prior to obtaining C.I. & I. identification. Site visitors and consultants may be issued a day pass issued by the Sheriff's

Transition Team representative and must wear the day pass and be escorted through the site and Project at all times.

5. Allow 20 working days for security clearance, prior to new employee being permitted on Project site. Workers are subject to eviction from Institution at any time when a question of security clearance arises. Eviction for this reason is not a statement as to the character of the employee being evicted. Allow 30 days to verify security clearance where a question has arisen. Workers may be removed from clearance status at any time at the discretion of the Sheriff's Office.

1.04 WORK HOURS

A. Normal work hours are Monday through Friday from 7:00 a.m. to 5:00 p.m. However, the County shall reserve the right to adjust start/quit times in the best interest of the Project.

B. Contractor shall make special arrangements for overtime work with the Sheriff’s Transition Team representative through the County Project Manager. No overtime will be allowed unless prior approval has been obtained.

C. Contractor shall pay for necessary Institution Correctional services for time before and after normal working hours and time worked on Saturday, Sunday or County holiday. Arrangements for extra Correctional Officer services shall be made 48 hours in advance. A minimum of two Correctional Officers is required. The Institution will determine staffing requirements. Charges to Contractor for extra services will be $50.00 per hour for each staff member.

1.05 SECURITY

A. If Institution officials deem it necessary to declare a "State of Emergency", work may be curtailed or terminated for the duration of said emergency. Contractor shall be aware that events of this nature are considered potentially everyday occurrences on project sites of this nature. Requests for additional compensation for occurrences of the aforementioned type will not be considered.

B. All persons shall remove ignition keys from their vehicles when they are out of the vehicle Contractor's equipment shall be rendered temporarily inoperative when not in use; by locking or other means.

C. In order to maintain Institution security, inspection searches on the project site may become necessary; therefore, keys shall be furnished to provide access to all locked areas or places on the project site and for periodic fire prevention inspection. The Institution will not be responsible for Contractor's loss due to fire.

D. Personal search is not normally required. However, the Institution reserves the right to search workers when there is probable cause, as determined by the Institution.

E. Lunch boxes, toolboxes and vehicles may be inspected on a regular basis, as determined by the Sheriff's Transition Team representative.

F. Contractor is responsible for missing tools. In the event of missing tools, the expense of search by Correctional Officers shall be paid for by Contractor.

G. Debris loading into trucks or dumpsters shall be observed by a Correctional Officer, in applicable situations. In the event an officer is not notified and present to view a loading, Contractor shall remove the debris from the truck or dumpster to the satisfaction of the officer in order to make an inspection. The Contractor shall pay for costs for such actions. This issue can be adjusted with discussion with Sheriff's Transition Team representative.

H. Food service facilities are not available for Contractor's personnel on-site. Workers will have to carry lunch boxes and shall eat in designated areas only when eating on-site. Metal utensils are not permitted. Glass bottles, metal cans or any items made of glass/metal materials shall not be placed in garbage receptacles or areas where inmates may access them. Items of this nature should be removed from the Work site at the end of each day.

I. Contractor will be required to provide the Institution, or its representative, with a master inventory list of tools brought into the Institution; this applies to Work Area 2 only. These tools, and the like, shall be stored in locked boxes in an area designated by Sheriff's Transition Team representative.

J. Under the administration of the Correctional Officer Escorts, the master inventory list will be checked once at beginning of each work period, once during work period, and once again at end of work period. Correctional Officer Escorts will hold master inventory list. Correctional Officer Escorts shall report lost or broken tools to their Supervisor. This loss shall also be reported on "Loss of Tools Report" form, to be completed by Contractor; this applies to Work Area 2 only.

K. Contractor shall include in the bid all costs necessary to accommodate Correctional Officer Escorts in the inventories (tool checks), described above, to the satisfaction of the Correctional Officer, this applies to Work Area 2 only

L. Tools and equipment not necessary for completion of Project should be removed from vehicles and toolboxes prior to arriving at Institution. Removal of unnecessary tools and equipment may facilitate required searches.

M. Broken tools shall be disposed of off Institution grounds. Contractor shall also ensure that metals, or other items deemed dangerous in the opinion of the Institution, are stored away and protected from inmate pilferage.

N. Mismanagement of tools, equipment or materials will result in Contractor's personnel being removed and barred from Institution property. The Institution reserves the right to determine any mismanagement concerned.

O. The following tools are considered "escape priority tools" and shall be color-coded by Contractor, as directed by the Institution.

1. Contractor shall notify Institution personnel prior to use of the following items:

a. Hacksaws.
b. Bolt cutters.
c. Oxygen-acetylene equipment.
d. Hydraulic jacks.
e. Blocks and tackles.
t. Ropes.
g. Ladders over 6 feet.
h. Portable scaffolds.
i. Files.
j. Steel pipe cutters.
k. Pneumatic jackhammers with equipment.
I. Welding torches and cutting tips.
m. Impact hammers and bits.
n. Powder activated tools.

2. Items including. but not limited to the following are considered dangerous tools and stock:

a. Knives.
b. Hatchets.
c. Axes.
d. Chisels.
e. Hammers.
t. Screwdrivers.
g. Prick punches.
h. Scribes.
i. Sharp pointed tools.
j. Electric grinders and/or belt grinders.
k. Shears and scissors.
I. Grinders. stationary or portable.
m. Shears - metal cutting (capable of shearing 1/16" metal stock).
n. Plexiglass, plastic or fiberglass.
o. Any other tools as designated by the Institution.

P. Control of Hacksaw. Do-All Saw and Band saw Blades: Contractor shall notify the Institution prior to bringing hacksaws. do-all saws and/or band saw blades onto Institution grounds. Controlled items will be issued and stored in accordance with Institution policy. Lost blades or missing parts of broken blades shall be reported to the Correctional Officer Escort. Under no circumstances shall blades be brought into the Institution other than through outlined procedure.

Q. Use and Control of Ladders: Ladders shall be used and transported under direct and constant supervision of Institution personnel. Ladders 6 feet in height and over, and which are not in use, shall be under chain and padlock furnished by Contractor. They shall be accounted for on a daily basis. At the end of workday, ladders shall be stored in an area designated by the Sheriff's Transition Team representative.

R. Use and Control of Scaffolding: Contractor shall notify the Correctional Officer Escort prior to scaffolding being used in order that clearances may be obtained. When it is necessary to leave scaffolding at the project site overnight or longer, the Sheriff's Transition Team representative will be notified so that he/she may evaluate security precautions that must be taken in the area that the scaffolding is to be left. Scaffolding shall be placed in an area, which provides adequate security measures, as determined by the Institution. Scaffold shall be securely chained and padlocked in such a manner to prevent it from being moved. Chain and padlocking devices shall encompass more than single rungs or struts of scaffolding and thereby provide adequate protection from becoming freed from such security. When not in use on project site, scaffolding shall be broken down and stored in an area designated by Correctional Coordinator. Contractor shall furnish Chains and locks.

S. Control/Storage of Volatile Materials: Custodial control by Contractor shall be maintained over volatile, quick and evaporating liquids and alcohol based thinners. These items should be kept in a secure, locked facility and in a designated area.

T. Locks on equipment, toolboxes, ladders and scaffolding shall be installed by Contractor to the satisfaction of the Sheriff's Transition Team representative.

U. Gang boxes for storage of tools shall be specially constructed to allow for "shadow boards" or other means to quickly identify contents by Sheriff's Transition Team representative.

V. In Unoccupied Institution areas: Hand tools may be secured in gang box and left inside of unoccupied Institution areas which are being worked on by Contractor. Power and other larger tools that cannot be secured in gang box may be left overnight. Ropes, ladders over 6 feet in height, cutting/welding torches and other equipment designated by Sheriff's Transition Team representative shall be stored in area designated area. Welding torches shall be broken down to separate gas tank from cutting tip. Tips may be secured in tool room, but gas tank shall not be stored inside security perimeter. Hacksaw, band saw, and do-all blades shall be stored as previously described.

1.06 HOSTAGES

A. The Solano County Sheriff's Office has a no hostage policy and hostages will not be recognized for bargaining purposes. The Contractor is to communicate this to all personnel that will come on site.

B. Responsible subcontractor personnel and other designated personnel shall attend security briefing at Preconstruction Meeting.

1.07 REMOVAL OF DEBRIS

A. Debris, waste materials, and other trash resulting from work of this project, shall be disposed of regularly per Section 017419, Construction Waste Management. Disposal shall be off of County property and Contractor shall pay fees required for use of public dumps. Burning on County property is prohibited. Containers/dumpsters in which debris is placed will be subject to clearance by Sheriff's Transition Team representative as stated in Article 1.05/G. of this Section. Arrangements for outside waste companies to enter Institution grounds to pick-up/drop-off dumpsters shall be made with the Sheriff's Transition Team representative.

1.08 WORKING INMATES

A. Guarded inmates may be performing work at the Institution at the same time as Contractor. Under such conditions, Contractor shall cooperate with the County and conform to certain security requirements, as may be directed by the County.

1.09 CAMERAS AND AUDIO OR VISUAL RECORDING DEVICES

A. Cameras and other Audio or Visual Recording Devices may be allowed with written approval and arrangements with Sheriff's Transition Team representative. Written protocol will be discussed with Contractor at Pre-construction meeting. Contractor shall obtain approval from Institution prior to use of such devices within Institution grounds.

**END OF SECTION 01 35 53**

# SECTION 01 40 00 - QUALITY CONTROL AND QUALITY ASSURANCE

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for quality control and quality assurance.

B. Quality assurance includes the planned and systematic activities implemented in a quality system so that quality requirements for a product or service will be fulfilled.

C. Quality control includes inspections and tests and related actions including reports, performed by independent agencies, governing authorities, and the Contractor. They do not include Contract enforcement activities performed by the Project Manager, County Inspector or the Architect.

D. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.

E. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.

1. Specific quality control requirements for individual construction activities are specified in the Sections that specify those activities. Those requirements, including inspections and tests, cover-production of standard products as well as customized-fabrication and installation procedures.

2. Inspections, test and related actions specified are not intended to limit the Contractor's quality control procedures that facilitate compliance with Contract Document requirements.

3. Requirements for the Contractor to provide quality control services required by the Project Manager, Architect, County, or authorities having jurisdiction are not limited by provisions of this Section.

1.3 QUALITY CONTROL RESPONSIBILITIES

A. Contractor Responsibilities: The Contractor shall provide inspections, tests and similar quality control services, specified in individual Specification Sections and required by governing authorities, except where they are specifically indicated to be the County's responsibility, or are provided by another identified entity. Costs for these services shall be included in the Contract Sum.

1. The Contractor shall employ and pay an independent agency, to perform specified quality control services, and quality control services required by laws, rules, regulations, and regulatory authorities.

2. The County will engage and pay for the services of an independent agency to perform inspections and tests specified as the County's responsibility.

a. Where the County has engaged a testing agency or other entity for testing and inspection of a part of the Work, and the Contractor is also required to engage an entity for the same or related element, the Contractor shall not employ the entity engaged by the County, unless otherwise agreed in writing with the County.

3. Retesting: The Contractor is responsible for retesting where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance with Contract Document requirements, regardless of whether the original test was the Contractor's responsibility.

a. Cost of retesting construction revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original construction.

4. Associated Services: The Contractor shall cooperate with agencies performing required inspections, tests and similar services and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include but are not limited to:

a. Providing access to the Work and furnishing incidental labor and facilities necessary to facilitate inspections and tests.

b. Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.

c. Providing facilities for storage and curing of test samples, and delivery of

samples to testing laboratories.

d. Providing the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.

e. Security and protection of samples and test equipment at the Project site.

B. Duties of Testing Agency: The independent testing agency engaged by the Contractor to perform inspections, sampling and testing of materials and construction specified in individual Specification Sections and by applicable laws, rules, and regulations; shall cooperate with the Project Manager, County, Inspector and the Project Architect and Contractor in performance of its duties, and shall provide qualified personnel to perform required inspections and tests.

1. The agency shall notify the Project Manager, Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. The agency is not authorized to release, revoke, alter or enlarge requirements of the Contract Documents, or approve of or accept any portion of the Work.

3. The agency shall not perform any duties of the Contractor.

C. Coordination: The Contractor and each agency engaged to perform inspections, tests and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition, the Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.

1. The Contractor is responsible for scheduling times for inspections, tests, taking samples and similar activities.

1.4 QUALITY CONTROL SUBMITTALS

A. The County's and Contractor's independent testing agencies shall submit a certified written report of each inspection, test or similar service, to the Project Manager, the Architect and the Contractor, in duplicate.

1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.

2. Report Data: Written reports of each inspection, test or similar Service shall include,

but not limited to:

a. Date of issuance

b. Project and title number

c. Name, address and telephone number of testing agency

d. Dates and locations of samples and tests or inspections

e. Names of individuals making the inspection or test

f. Designation of the Work and test method

g. Identification of product and Specification Section

h. Complete inspection or test data

i. Test results and interpretation of test results

j. Ambient conditions at the time of sample-taking and testing

k. Comments or professional opinion as to whether inspected or tested Work complies with Contract Document requirements.

l. Name and signature of laboratory inspector

m. Recommendations on retesting

## 1.5 TESTING AGENCY QUALIFICATIONS

A. Qualification for Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, which are pre-qualified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories, and which specialize in the types of inspections and tests to be performed.

B. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the State in which the Project is located.

## 1.6 TEST SELECTION

A. The Contractor shall be responsible for, and shall pay for, all off-site and on-site tests except tests on the following materials/installations:

1. Concrete
2. Grout
3. High-strength bolting
4. Structural welding (shop and field)
5. Reinforcing steel
6. Bolts installed in concrete.
7. Expansion and epoxy anchors

B. The Contractor shall notify the Project Manager in writing (3) three working days in advance of time for the above named tests.

1.7 FIELD MOCK-UPS

A. Specific requirements for field mock-ups are specified in the individual specifications Sections.
B. Submit field mock-ups a minimum of fourteen (14) days prior to installation of work.
C. No installation or application until the field mock-up is approved.
D. Submit schedule for field mock-up construction, sow date and relationship to County accepted contract schedule.
E. Construct field mock-ups in location as approved by the County representative.
F. County and A/E representatives will review the field mock-ups for conformance with the requirements of the contract documents.
G. Modify or replace field mock-up until mock-up is approved.
H. Approved field mock-ups:
1. Must remain until the remainder of the Work of the Section requiring field mock-up is complete
2. Will be used as the standard of acceptable quality for the remainder of the Project.
3. May be incorporated into the work at the discretion of the County Representative.
4. Must be removed at the completion of the Work of that Section when required by Section or when not incorporated into the work.

RFI 0204 — SITE - Chain Link Fence and Gate Mock-Up — 1.7B - 1-day review of the gate and accessories mock-up

RFI 0132 — Gypsum Board Texture Finish — Mock-up Requirement

RFI 78 — CMU Mock-Up Requirements — In-Place 1-Day review OK

1.8 MANUFACTURERS' FIELD SERVICES AND REPORTS

A. Observer's Qualifications:

1. Submit qualifications of observer to the County thirty (30) days in advance of required observations.

2. Observer subject to approval of the County.

B. Observer to report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

1.9 INSPECTIONS

A. Contractor shall participate in and make work available for First-Delivery Inspections, First Equipment in Place inspections, Benchmark Inspections, Closure inspections, Start-up and Turnover Inspections.

1.10 QUALITY ASSURANCE RESPONSIBILITIES

A. Contractor Responsibilities: Appoint a Responsible Party to participate in the QA and QC

activities identified, including providing immediate response and correction of deficiencies. Participate in QA/QC meetings including kick-off and pre-installation meetings,

PART 2 - PRODUCTS (Not Applicable)

PART 3 – EXECUTION

1.1 REPAIR AND PROTECTION

A. General: Upon completion of inspection, testing, sample-taking and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes. Comply with Contract Document requirements per "Cutting and Patching."

B. Protect construction exposed by or for quality control service activities, and protect repaired construction.

C. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

**END OF SECTION 01 40 00**

# SECTION 01 42 00 - REFERENCES

## PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. “Owner or County”: Are used interchangeably and refers to Solano County.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
   1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
   1. AABC - Associated Air Balance Council; www.aabc.com.
   2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
   3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
   4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
   5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
   6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
   7. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org.
   8. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
   9. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
   10. AF&PA - American Forest & Paper Association; www.afandpa.org.
   11. AGA - American Gas Association; www.aga.org.
   12. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
   13. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
   14. AI - Asphalt Institute; www.asphaltinstitute.org.
   15. AIA - American Institute of Architects (The); www.aia.org.
   16. AISC - American Institute of Steel Construction; www.aisc.org.
   17. AISI - American Iron and Steel Institute; www.steel.org.
   18. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
   19. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
   20. ANSI - American National Standards Institute; www.ansi.org.
   21. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
   22. APA - APA - The Engineered Wood Association; www.apawood.org.
   23. APA - Architectural Precast Association; www.archprecast.org.
   24. API - American Petroleum Institute; www.api.org.
   25. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
   26. ARI - American Refrigeration Institute; (See AHRI).
   27. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
   28. ASCE - American Society of Civil Engineers; www.asce.org.
   29. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
   30. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.

31. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
32. ASSE - American Society of Safety Engineers (The); www.asse.org.
33. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
34. ASTM - ASTM International; (American Society for Testing and Materials International); www.astm.org.
35. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
36. AWEA - American Wind Energy Association; www.awea.org.
37. AWI - Architectural Woodwork Institute; www.awinet.org.
38. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
39. AWPA - American Wood Protection Association; (Formerly: American Wood-Preservers' Association); www.awpa.com.
40. AWS - American Welding Society; www.aws.org.
41. AWWA - American Water Works Association; www.awwa.org.
42. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
43. BIA - Brick Industry Association (The); www.gobrick.com.
44. BICSI - BICSI, Inc.; www.bicsi.org.
45. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.com.
46. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
47. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bwfbadminton.org.
48. CDA - Copper Development Association; www.copper.org.
49. CEA - Canadian Electricity Association; www.electricity.ca.
50. CEA - Consumer Electronics Association; www.ce.org.
51. CFFA - Chemical Fabrics & Film Association, Inc.; www.chemicalfabricsandfilm.com.
52. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
53. CGA - Compressed Gas Association; www.cganet.com.
54. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
55. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
56. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
57. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
58. CPA - Composite Panel Association; www.pbmdf.com.
59. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
60. CRRC - Cool Roof Rating Council; www.coolroofs.org.
61. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
62. CSA - Canadian Standards Association; www.csa.ca.
63. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
64. CSI - Construction Specifications Institute (The); www.csinet.org.
65. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
66. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
67. CWC - Composite Wood Council; (See CPA).
68. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
69. DHI - Door and Hardware Institute; www.dhi.org.
70. ECA - Electronic Components Association; (See ECIA).
71. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
72. ECIA ? Electronic Components Industry Association; www.eciaonline.org
73. EIA - Electronic Industries Alliance; (See TIA).

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75. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
76. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
77. ESTA - Entertainment Services and Technology Association; (See PLASA).
78. EVO - Efficiency Valuation Organization; www.evo-world.org.
79. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
80. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
81. FM Approvals - FM Approvals LLC; www.fmglobal.com.
82. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
83. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridaroof.com.
84. FSA - Fluid Sealing Association; www.fluidsealing.com.
85. FSC - Forest Stewardship Council U.S.; www.fscus.org.
86. GA - Gypsum Association; www.gypsum.org.
87. GANA - Glass Association of North America; www.glasswebsite.com.
88. GS - Green Seal; www.greenseal.org.
89. HI - Hydraulic Institute; www.pumps.org.
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91. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
92. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
93. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
94. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
95. IAS - International Accreditation Service; www.iasonline.org.
96. IAS - International Approval Services; (See CSA).
97. ICBO - International Conference of Building Officials; (See ICC).
98. ICC - International Code Council; www.iccsafe.org.
99. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
100. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
101. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
102. IEC - International Electrotechnical Commission; www.iec.ch.
103. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
104. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
105. IESNA - Illuminating Engineering Society of North America; (See IES).
106. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
107. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
108. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
109. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
110. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
111. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
112. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
113. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
114. ISO - International Organization for Standardization; www.iso.org.
115. ISSFA - International Solid Surface Fabricators Association; (See ISFA).

116. ITU - International Telecommunication Union; www.itu.int/home.
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119. LPI - Lightning Protection Institute; www.lightning.org.
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123. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
124. MHIA - Material Handling Industry of America; www.mhia.org.
125. MIA - Marble Institute of America; www.marble-institute.com.
126. MMPA - Moulding & Millwork Producers Association; (Formerly: Wood Moulding & Millwork Producers Association); www.wmmpa.com.
127. MPI - Master Painters Institute; www.paintinfo.com.
128. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
129. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
130. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
131. NADCA - National Air Duct Cleaners Association; www.nadca.com.
132. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
133. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
134. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
135. NCMA - National Concrete Masonry Association; www.ncma.org.
136. NEBB - National Environmental Balancing Bureau; www.nebb.org.
137. NECA - National Electrical Contractors Association; www.necanet.org.
138. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
139. NEMA - National Electrical Manufacturers Association; www.nema.org.
140. NETA - InterNational Electrical Testing Association; www.netaworld.org.
141. NFHS - National Federation of State High School Associations; www.nfhs.org.
142. NFPA - NFPA; (National Fire Protection Association); www.nfpa.org.
143. NFPA - NFPA International; (See NFPA).
144. NFRC - National Fenestration Rating Council; www.nfrc.org.
145. NHLA - National Hardwood Lumber Association; www.nhla.com.
146. NLGA - National Lumber Grades Authority; www.nlga.org.
147. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
148. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
149. NRCA - National Roofing Contractors Association; www.nrca.net.
150. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
151. NSF - NSF International; (National Sanitation Foundation International); www.nsf.org.
152. NSPE - National Society of Professional Engineers; www.nspe.org.
153. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
154. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
155. NWFA - National Wood Flooring Association; www.nwfa.org.
156. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
157. PDI - Plumbing & Drainage Institute; www.pdionline.org.
158. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
159. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
160. RFCI - Resilient Floor Covering Institute; www.rfci.com.

161. RIS - Redwood Inspection Service; www.redwoodinspection.com.
162. SAE - SAE International; (Society of Automotive Engineers); www.sae.org.
163. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
164. SDI - Steel Deck Institute; www.sdi.org.
165. SDI - Steel Door Institute; www.steeldoor.org.
166. SEFA - Scientific Equipment and Furniture Association; www.sefalabs.com.
167. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
168. SIA - Security Industry Association; www.siaonline.org.
169. SJI - Steel Joist Institute; www.steeljoist.org.
170. SMA - Screen Manufacturers Association; www.smainfo.org.
171. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
172. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
173. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
174. SPIB - Southern Pine Inspection Bureau; www.spib.org.
175. SPRI - Single Ply Roofing Industry; www.spri.org.
176. SRCC - Solar Rating and Certification Corporation; www.solar-rating.org.
177. SSINA - Specialty Steel Industry of North America; www.ssina.com.
178. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
179. STI - Steel Tank Institute; www.steeltank.com.
180. SWI - Steel Window Institute; www.steelwindows.com.
181. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
182. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
183. TCNA - Tile Council of North America, Inc.; (Formerly: Tile Council of America); www.tileusa.com.
184. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
185. TIA - Telecommunications Industry Association; (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
186. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
187. TMS - The Masonry Society; www.masonrysociety.org.
188. TPI - Truss Plate Institute; www.tpinst.org.
189. TPI - Turfgrass Producers International; www.turfgrasssod.org.
190. TRI - Tile Roofing Institute; (Formerly: National Tile Roofing Manufacturing Association); www.tileroofing.org.
191. UBC - Uniform Building Code; (See ICC).
192. UL - Underwriters Laboratories Inc.; www.ul.com.
193. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
194. USAV - USA Volleyball; www.usavolleyball.org.
195. USGBC - U.S. Green Building Council; www.usgbc.org.
196. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
197. WASTEC - Waste Equipment Technology Association; www.wastec.org.
198. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
199. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
200. WDMA - Window & Door Manufacturers Association; www.wdma.com.
201. WI - Woodwork Institute; (Formerly: WIC - Woodwork Institute of California); www.wicnet.org.
202. WMMPA - Wood Moulding & Millwork Producers Association; (See MMPA).

203. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
204. WPA - Western Wood Products Association; www.wwpa.org.

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.
1. DIN - Deutsches Institut f?r Normung e.V.; www.din.de.
2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
3. ICC - International Code Council; www.iccsafe.org.
4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up-to-date as of the date of the Contract Documents.
1. COE - Army Corps of Engineers; www.usace.army.mil.
2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
4. DOD - Department of Defense; http://dodssp.daps.dla.mil.
5. DOE - Department of Energy; www.energy.gov.
6. EPA - Environmental Protection Agency; www.epa.gov.
7. FAA - Federal Aviation Administration; www.faa.gov.
8. FG - Federal Government Publications; www.gpo.gov.
9. GSA - General Services Administration; www.gsa.gov.
10. HUD - Department of Housing and Urban Development; www.hud.gov.
11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; http://eetd.lbl.gov.
12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
13. SD - Department of State; www.state.gov.
14. TRB - Transportation Research Board; National Cooperative Highway Research Program; www.trb.org.
15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
17. USDJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
18. USP - U.S. Pharmacopeia; www.usp.org.
19. USPS - United States Postal Service; www.usps.com.

E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
2. DOD - Department of Defense; Military Specifications and Standards; Available from Department of Defense Single Stock Point; http://dodssp.daps.dla.mil.
3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).

5. FS - Federal Specification; Available from Department of Defense Single Stock Point; http://dodssp.daps.dla.mil.
   a. Available from Defense Standardization Program; www.dsp.dla.mil.
   b. Available from General Services Administration; www.gsa.gov.
   c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org/ccb.
6. MILSPEC - Military Specification and Standards; (See DOD).
7. USAB - United States Access Board; www.access-board.gov.
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic Appliance and Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
2. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
3. CDHS; California Department of Health Services; (See CDPH).
4. CDPH; California Department of Public Health; Indoor Air Quality Program; www.cal-iaq.org.
5. CPUC; California Public Utilities Commission; www.cpuc.ca.gov.
6. SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.

**PART 2 PRODUCTS (Not Used)**

**PART 3 EXECUTION (Not Used)**

**END OF SECTION 01 42 00**

# SECTION 01 42 01 - REFERENCES

## PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. “Owner or County”: Are used interchangeably and refers to Solano County.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
   1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
   1. AABC - Associated Air Balance Council; www.aabc.com.
   2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
   3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
   4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
   5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
   6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
   7. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org.
   8. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
   9. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
   10. AF&PA - American Forest & Paper Association; www.afandpa.org.
   11. AGA - American Gas Association; www.aga.org.
   12. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
   13. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
   14. AI - Asphalt Institute; www.asphaltinstitute.org.
   15. AIA - American Institute of Architects (The); www.aia.org.
   16. AISC - American Institute of Steel Construction; www.aisc.org.
   17. AISI - American Iron and Steel Institute; www.steel.org.
   18. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
   19. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
   20. ANSI - American National Standards Institute; www.ansi.org.
   21. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
   22. APA - APA - The Engineered Wood Association; www.apawood.org.
   23. APA - Architectural Precast Association; www.archprecast.org.
   24. API - American Petroleum Institute; www.api.org.
   25. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
   26. ARI - American Refrigeration Institute; (See AHRI).
   27. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
   28. ASCE - American Society of Civil Engineers; www.asce.org.
   29. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
   30. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.

31. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
32. ASSE - American Society of Safety Engineers (The); www.asse.org.
33. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
34. ASTM - ASTM International; (American Society for Testing and Materials International); www.astm.org.
35. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
36. AWEA - American Wind Energy Association; www.awea.org.
37. AWI - Architectural Woodwork Institute; www.awinet.org.
38. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
39. AWPA - American Wood Protection Association; (Formerly: American Wood-Preservers' Association); www.awpa.com.
40. AWS - American Welding Society; www.aws.org.
41. AWWA - American Water Works Association; www.awwa.org.
42. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
43. BIA - Brick Industry Association (The); www.gobrick.com.
44. BICSI - BICSI, Inc.; www.bicsi.org.
45. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.com.
46. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
47. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bwfbadminton.org.
48. CDA - Copper Development Association; www.copper.org.
49. CEA - Canadian Electricity Association; www.electricity.ca.
50. CEA - Consumer Electronics Association; www.ce.org.
51. CFFA - Chemical Fabrics & Film Association, Inc.; www.chemicalfabricsandfilm.com.
52. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
53. CGA - Compressed Gas Association; www.cganet.com.
54. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
55. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
56. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
57. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
58. CPA - Composite Panel Association; www.pbmdf.com.
59. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
60. CRRC - Cool Roof Rating Council; www.coolroofs.org.
61. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
62. CSA - Canadian Standards Association; www.csa.ca.
63. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
64. CSI - Construction Specifications Institute (The); www.csinet.org.
65. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
66. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
67. CWC - Composite Wood Council; (See CPA).
68. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
69. DHI - Door and Hardware Institute; www.dhi.org.
70. ECA - Electronic Components Association; (See ECIA).
71. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
72. ECIA - Electronic Components Industry Association; www.eciaonline.org
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77. ESTA - Entertainment Services and Technology Association; (See PLASA).
78. EVO - Efficiency Valuation Organization; www.evo-world.org.
79. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
80. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
81. FM Approvals - FM Approvals LLC; www.fmglobal.com.
82. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
83. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridaroof.com.
84. FSA - Fluid Sealing Association; www.fluidsealing.com.
85. FSC - Forest Stewardship Council U.S.; www.fscus.org.
86. GA - Gypsum Association; www.gypsum.org.
87. GANA - Glass Association of North America; www.glasswebsite.com.
88. GS - Green Seal; www.greenseal.org.
89. HI - Hydraulic Institute; www.pumps.org.
90. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
91. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
92. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
93. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
94. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
95. IAS - International Accreditation Service; www.iasonline.org.
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99. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
100. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
101. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
102. IEC - International Electrotechnical Commission; www.iec.ch.
103. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
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105. IESNA - Illuminating Engineering Society of North America; (See IES).
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107. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
108. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
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111. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
112. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
113. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
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119. LPI - Lightning Protection Institute; www.lightning.org.
120. MBMA - Metal Building Manufacturers Association; www.mbma.com.
121. MCA - Metal Construction Association; www.metalconstruction.org.
122. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
123. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
124. MHIA - Material Handling Industry of America; www.mhia.org.
125. MIA - Marble Institute of America; www.marble-institute.com.
126. MMPA - Moulding & Millwork Producers Association; (Formerly: Wood Moulding & Millwork Producers Association); www.wmmpa.com.
127. MPI - Master Painters Institute; www.paintinfo.com.
128. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
129. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
130. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
131. NADCA - National Air Duct Cleaners Association; www.nadca.com.
132. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
133. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
134. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
135. NCMA - National Concrete Masonry Association; www.ncma.org.
136. NEBB - National Environmental Balancing Bureau; www.nebb.org.
137. NECA - National Electrical Contractors Association; www.necanet.org.
138. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
139. NEMA - National Electrical Manufacturers Association; www.nema.org.
140. NETA - InterNational Electrical Testing Association; www.netaworld.org.
141. NFHS - National Federation of State High School Associations; www.nfhs.org.
142. NFPA - NFPA; (National Fire Protection Association); www.nfpa.org.
143. NFPA - NFPA International; (See NFPA).
144. NFRC - National Fenestration Rating Council; www.nfrc.org.
145. NHLA - National Hardwood Lumber Association; www.nhla.com.
146. NLGA - National Lumber Grades Authority; www.nlga.org.
147. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
148. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
149. NRCA - National Roofing Contractors Association; www.nrca.net.
150. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
151. NSF - NSF International; (National Sanitation Foundation International); www.nsf.org.
152. NSPE - National Society of Professional Engineers; www.nspe.org.
153. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
154. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
155. NWFA - National Wood Flooring Association; www.nwfa.org.
156. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
157. PDI - Plumbing & Drainage Institute; www.pdionline.org.
158. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
159. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
160. RFCI - Resilient Floor Covering Institute; www.rfci.com.

161. RIS - Redwood Inspection Service; www.redwoodinspection.com.
162. SAE - SAE International; (Society of Automotive Engineers); www.sae.org.
163. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
164. SDI - Steel Deck Institute; www.sdi.org.
165. SDI - Steel Door Institute; www.steeldoor.org.
166. SEFA - Scientific Equipment and Furniture Association; www.sefalabs.com.
167. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
168. SIA - Security Industry Association; www.siaonline.org.
169. SJI - Steel Joist Institute; www.steeljoist.org.
170. SMA - Screen Manufacturers Association; www.smainfo.org.
171. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
172. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
173. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
174. SPIB - Southern Pine Inspection Bureau; www.spib.org.
175. SPRI - Single Ply Roofing Industry; www.spri.org.
176. SRCC - Solar Rating and Certification Corporation; www.solar-rating.org.
177. SSINA - Specialty Steel Industry of North America; www.ssina.com.
178. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
179. STI - Steel Tank Institute; www.steeltank.com.
180. SWI - Steel Window Institute; www.steelwindows.com.
181. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
182. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
183. TCNA - Tile Council of North America, Inc.; (Formerly: Tile Council of America); www.tileusa.com.
184. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
185. TIA - Telecommunications Industry Association; (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
186. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
187. TMS - The Masonry Society; www.masonrysociety.org.
188. TPI - Truss Plate Institute; www.tpinst.org.
189. TPI - Turfgrass Producers International; www.turfgrasssod.org.
190. TRI - Tile Roofing Institute; (Formerly: National Tile Roofing Manufacturing Association); www.tileroofing.org.
191. UBC - Uniform Building Code; (See ICC).
192. UL - Underwriters Laboratories Inc.; www.ul.com.
193. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
194. USAV - USA Volleyball; www.usavolleyball.org.
195. USGBC - U.S. Green Building Council; www.usgbc.org.
196. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
197. WASTEC - Waste Equipment Technology Association; www.wastec.org.
198. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
199. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
200. WDMA - Window & Door Manufacturers Association; www.wdma.com.
201. WI - Woodwork Institute; (Formerly: WIC - Woodwork Institute of California); www.wicnet.org.
202. WMMPA - Wood Moulding & Millwork Producers Association; (See MMPA).

203. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
204. WPA - Western Wood Products Association; www.wwpa.org.

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.
1. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
2. ICC - International Code Council; www.iccsafe.org.
3. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up-to-date as of the date of the Contract Documents.
1. COE - Army Corps of Engineers; www.usace.army.mil.
2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
4. DOD - Department of Defense; http://dodssp.daps.dla.mil.
5. DOE - Department of Energy; www.energy.gov.
6. EPA - Environmental Protection Agency; www.epa.gov.
7. FAA - Federal Aviation Administration; www.faa.gov.
8. FG - Federal Government Publications; www.gpo.gov.
9. GSA - General Services Administration; www.gsa.gov.
10. HUD - Department of Housing and Urban Development; www.hud.gov.
11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; http://eetd.lbl.gov.
12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
13. SD - Department of State; www.state.gov.
14. TRB - Transportation Research Board; National Cooperative Highway Research Program; www.trb.org.
15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
17. USDJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
18. USP - U.S. Pharmacopeia; www.usp.org.
19. USPS - United States Postal Service; www.usps.com.

E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
2. DOD - Department of Defense; Military Specifications and Standards; Available from Department of Defense Single Stock Point; http://dodssp.daps.dla.mil.
3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).

5. FS - Federal Specification; Available from Department of Defense Single Stock Point; http://dodssp.daps.dla.mil.
   a. Available from Defense Standardization Program; www.dsp.dla.mil.
   b. Available from General Services Administration; www.gsa.gov.
   c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org/ccb.
6. MILSPEC - Military Specification and Standards; (See DOD).
7. USAB - United States Access Board; www.access-board.gov.
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic Appliance and Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
2. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
3. CDHS; California Department of Health Services; (See CDPH).
4. CDPH; California Department of Public Health; Indoor Air Quality Program; www.cal-iaq.org.
5. CPUC; California Public Utilities Commission; www.cpuc.ca.gov.
6. SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.

**PART 2 PRODUCTS (Not Used)**

**PART 3 EXECUTION (Not Used)**

**END OF SECTION 01 42 01**

SECTION 01 51 00- TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 - SECTION INCLUDES

A. Furnish and install temporary facilities as hereunder specified, plus other unspecified temporary facilities, including labor, materials, services, utilities, and equipment, as may be required for proper performance of Contract, except as otherwise provided. The County and other authorities having legal jurisdiction shall approve temporary facilities. Materials may be new or used, and suitable for the purposes intended. Locate facilities where shown on drawings and as directed by Project Manager, and maintain in safe and sanitary condition at all times until completion of Work.

B. At completion of Contract, or sooner when no longer needed, remove all temporary facilities.

C. Contractor shall use a separate mailing address from the existing Stanton Correctional Facility for all USPS/UPS/FedEx or other delivery services for mail and package deliveries. No deliveries will be accepted at the existing facility under any circumstances.

1.02 RELATED REQUIREMENTS

A. Document 00 72 00: General Conditions of the Contract for Construction.

B. Section 01 31 00: Project Management and Coordination

C. Section 01 33 00: Submittal Procedures

D. Section 01 35 53: Project Security Procedures

E. Section 01 74 19: Construction Waste Management

F. Section 01 74 23: Cleaning

G. Section 01 77 00: Closeout Procedures.

1.03 FIELD OFFICE

A. Contractor shall furnish and install fully operational and equipped office trailer for the County's sole use, as described herein. The Contractor shall be required to furnish one construction trailer, all equipment and furnishings as indicated below, from the time period of the 'Notice to Proceed' through demobilization. The County trailers shall be installed adjacent to the Contractor's Field Office(s) and somewhere within the 'Limits of Work' in a designated staging/storage area. Contractor is responsible for the maintenance and daily housekeeping of all Contractor furnished field trailers. Contractor to provide submittals for office trailer prior to procurement and obtain approval by Project Manager for trailer to be furnished. This facility should be provided within 30 days following Notice to Proceed that assures the County that facilities will be available on-site for use by County.

B. Field Office for County Project/Construction Manager: Provide wheel mounted, office trailer in good shape, nominal box size 24 x 60 feet (double-wide) with vinyl composition flooring. Trailer shall display California Commercial Coach Insignia as evidence of meeting or exceeding minimum Construction and Fire Safety requirements of Title 25, California Code of Regulations (CCR), Chapter 3, Sub Chapter 2, and Article 3.

1. Wind load design requirements shall meet most stringent criteria for project location during Contract period. Design load criteria shall be posted within unit per Section 4360.1 of referenced CCR.

2. Partition trailer to provide three (3) private office, restrooms, conference room and open office space for administrative support and free standing plan tables.

3. Provide heating and air conditioning unit mounted on end of trailer; of sufficient function, capacity and ductwork for equal distribution of air conditioning to both rooms. Roof mounted units are not acceptable.

4. Install trailer as directed by County and in accordance with above referenced 25 CCR 3.2.3. Jack up trailer and level both ways; mount on concrete piers (with load off wheels). Furnish and install required tie down accessories per Section 4368 of referenced 25 CCR 3.2.3.

5. Provide exterior door, with steps/ramp and entry platform at each exterior door as required. Access must meet ADA accessibility requirements.

6. Windows, doors (lockable) and vents shall be provided with insect screens; maintain in good condition during Contract. Provide security bars on windows and exterior doors.

7. Provide furnishings in good condition, or built-in equivalents, as follows:

a. Private Offices- 3

Minimum 100 square feet per office. Duplex power receptacles (2 per office), and one computer network cable and outlet per office with high speed data line. Furniture as shown or equal:

| Item (per Office) | Description | Model No. | Dimensions |
|---|---|---|---|
| Desk | HON-Metro series steel | P3266-ML | 29 ½” x 66” x 30” |
| Return | HON- Metro series steel | P3236L-MR | 26 ½” x 42” x 24” |
| Chair | HON-Comfortask | 5903AB,72T | 40 ½” x 24” x 34 ¼” |
| File Cabinet | HON, legal size, putty | D562C-L | 29” x 18 ¼” x 25” |
| Dry Erase Board | Quartet, non magnetic dry erase | QRT-S537 | 4’ x 6’ with markers, eraser, cleaner |

| | | | |
|---|---|---|---|
| Waste Basket | | | |
| Guest Chair | Mat Tenex | FNX 11390 | |

b. Hoteling Desk/Work Area for 1.

Minimum 100 square feet. Duplex power receptacles (2 per support area), and one computer network cable and outlet per support area with high speed data line. Furniture as shown or equal):

| Item (per Area) | Description | Model No. | Dimensions |
|---|---|---|---|
| Desk | HON-Metro series steel | P3266-ML | 29 ½" x 66" x 30" |
| Return | HON- Metro series steel | P3236L-MR | 26 ½" x 42" x 24" |
| Chair | HON-Comfortask | 5903AB,72T | 40 ½" x 24" x 34 ¼" |
| File Cabinet | HON, legal size, putty | D562C-L | 29" x 18 ¼" x 25" |
| Waste Basket | | | |

Support Open Area for Plan Area, Files, Equipment, Supplies and Miscellaneous Items

| Qty | Item | Description | Model No. | Dimensions |
|---|---|---|---|---|
| 4 | Lateral files | HON-Series 500 Lateral | 584-L | 53 ¼" x 36" x 19 ¼" |
| 4 | Tables | Global folding table | VCE 3096 WWW-16G | 29 ½" x 72" x 36" |
| 1 | Bookcase | HON-Steel 4 shelves | S60ABC-L5 | 9" x 34 ½" x 12 5/8" |
| 2 | Dry erase board with pencil rail | Quartet, non magnetic dry erase | QRT-S537 | 4' x 6' with markers, eraser, cleaner |
| 1 | Storage Cabinet | HON, 5 Adjustable shelves | SC1872-L | 72" x18" x36" |
| 1 | Plan Rack | Brookside rolling plan racks with hangers | MR 1236 | |

Plan Table:
12ft long, 34in. high at front sloping at 12deg, 3/4in. laminate counter top, two continuous storage shelves, one below the plan table and one mounted above at 5ft 5in.

c. Conference Room

Room to accommodate 20 seated people with 4-duplex power receptacles, 2 telephone cables and outlets, and two computer network cable and outlets with high speed data lines.

Furniture: Conference folding table(s) and stackable chairs to seat 20 persons

d. Other Equipment Descriptions (Not Leased )
1 ea. desktop computer and 1 ea. tablet computer :
Desktop: DELL Quad Core i7-6700, 3.4Hz with 32GB Memory, Mini tower case
256GB Solid State Hard Drive, DVD/RW Drive, AMD 4GB Video Card
Dell 27 Ultra HD 4K Monitor, Sound Card/Sound Bar
Warranty: 4 years
Tablet Computer: Advanced Surface Pro 4 Book,
Microsoft Dual Core i7-6650U, 2.2 GHZ, 1.689lbs
16GB Memory, 512GB Solid State Hard Drive,
Wireless Card w/BT, WebCam, Microphone, Surface Pen,
Type Cover (Keyboard), Surface Pro Dock
Warranty: 4 years

e. 2 ea. Software licenses for: Windows 10, Office 365 2016, Adobe Professional

f. Hard wire or wireless networking system for each computer to connect to the copy workstation and internet service.

g. Other Equipment Description

Contractor shall furnish, and maintain equipment for County's site office as listed below:

1. Copy Workstation- fully networked printer, copier with faxing, scanning, collating and stapling capability, paper size up to 11" x 17"

h. One (1) Restroom each for Men and Women within County Trailer

i. Services: (continuous service until demobilization)
Janitorial Service (minimum twice per week)
- Clean/vacuum floors
- Empty waste baskets
- Remove trash from premises
- Clean restrooms and restock supplies

j. Utilities:
Contractor shall maintain and pay for all utilities, including but not limited to the following:
- Power
- Lights
- Air conditioned space (heat and cooling)
- Internet Access
- Water
- Sewer

8. Trailer office and 'leased' furnishings shall remain property of the Contractor, remove from site upon completion of Contract. Contractor to provide list of leased furnishings to Construction Project Manager before project starts. Furnishings and equipment purchased as part of bid cost shall be turned over to the County at final completion of Project.

9. Contractor's Field Office: Contractor may provide field office facilities for Contractor's use as desired. Contractor's field office shall be neat and substantial and Contractor shall pay all expenses. Remove from site upon completion of this Contract.

1.04 CONSTRUCTION EQUIPMENT

A. Erect, equip, operate, and maintain construction equipment in strict accordance with applicable statutes, laws, ordinances, rules, and regulations of authorities having jurisdiction.

B. Provide and maintain scaffolding, staging, runways, and similar equipment, as needed.

C. Provide and maintain hoists and related lift equipment, including equipment for hoisting workmen; complete with operators, power and signals, as required (per Safety Orders of State of California, Division of Industrial Safety) until completion of the Work under this Contract or until no longer required on jobsite.

1.05 SAFETY PRECAUTIONS

4

A. Provide and maintain barricades, fencing, shoring, pedestrian walkways, including attached lights, other lights, and other safety precautions to properly guard against personal injury and property damage as prescribed by authority having jurisdiction. (See also General Conditions, Article 10.). Provide and install privacy screen fabric at chain link fence per attached marked up Site Plan

B. Wood fences, barricades, walkways, and similar items shall be painted 2 coats; color as directed by the County.

D. In addition, Contractor for Work under this Contract shall provide such additional safety precautions as may be prescribed by the County of Solano. Fully inform each subcontractor and material supplier as to requirements of applicable Safety Orders. (See document 00 72 00/ General Conditions, Article 10, Protection of Persons and Property).

E. Attention is directed to Safety Orders issued by the State of California, Division of Industrial Safety. Contractor shall obtain and post copies of Safety Orders applicable to type of work to be performed, and shall be governed by requirements thereof in construction operations.

1.06 ROADS AND ACCESSWAYS

A. Entrance to Work Site: There is very limited access for the site. Contractor and Contractor's employees and subcontractors shall use certain access roads or entranceways as indicated on Plans or as directed by County. Contractor will be required to maintain all existing access to the existing detention facility to ensure complete, uninterrupted operations.

B. Maintain these roads in satisfactory condition during Contract time, and repair damages attributable to Work of this Project at intervals as needed**.** Contractor shall inspect roads after each rainfall measuring more the 0.10" and resurface as necessary**.** At completion of Contract, roads and entrance ways shall be left in condition at least equal to that existing at start of Contract, except as may be otherwise required by Contract documents.

C. Permanent Improvements: Where Contract calls for permanent sidewalk, road, and other ground improvements, and when such permanent improvements are completed, or essentially completed within construction period, Contractor does not have vested right to use such improvements as temporary facilities.

D. Contractor shall retain responsibility pursuant to General Conditions. Use of permanent improvements by Contractor shall be subject to approval by County.

1.07 USE OF COUNTY PROPERTY

A. On Site Storage and Work Areas: The County will allocate available on site storage and work areas to Contractor, subject to change as may be necessary by job progress, such as site development or other intervening work.

B. County Property: Except as otherwise shown or specified, Work operations shall be confined to County property and shall not encroach on areas other than those designated or approved for such use by County. (See General Conditions, Paragraph 3.14.).

C. Ascertain, observe, and comply with rules and regulations in effect at occupied County facilities, including, but not restricted to, parking and traffic regulations, security restrictions, hours of allowable ingress and egress as to main arteries, occupied buildings, and the like.

E. Use of Sidewalks and Streets: Contractor shall not make use of sidewalks and streets adjacent to the entrance to the Project site.

F. Parking and Traffic Regulations: All parking for this Project shall be confined to the Project site and within the 'Limits of Work' area. Contractor, subcontractors, material delivers, visitors, County personnel and consultants, and other parties shall not park on the existing Claybank Detention Facility site.

G. Existing Improvements in sidewalks and Streets: Existing street signs, electroliers, traffic signage, fire hydrants, underground valves and meter boxes, manholes, trees and other items occurring in sidewalk areas or in streets adjacent to the Project shall be left undisturbed, unobstructed, and easily accessible at all times during construction, except as otherwise indicated or agreed to between Contractor and County.

H. Covering, moving, trimming, or altering which may become necessary to complete construction operations shall be done only with consent of and in cooperation with County and others having jurisdiction. Contractor shall pay all costs, which may be incurred.

I. Contractor shall make detailed examination of such adjacent property at start of work and conditional shall be noted by Contractor and confirmed by the County.

1. Contractor, if damaged by this work, shall repair public and private streets, sidewalks and curbs, and other existing improvements therein adjacent to the site, at intervals as required to keep improvements functional. At completion of Project, all such items not include in Contract shall be left in condition equal to that at start of construction.

2. Repair work shall conform to requirements of public authorities having jurisdiction. This includes, but not limited to, temporary walks for pedestrians, cleaning of mud and debris, air pollution control, and traffic control.

J. Protection of County-Owned Trees and Shrubs: Existing County-owned trees and shrubs to remain shall not be injured during the course of this Work.

1. Irrigate trees and shrubs, which are to remain within 'Limits of Work' area, as directed by County.
2. It is agreed that the Contractor shall replace each damaged tree or shrub with like species and size should any tree or shrub be injured or damaged as a result of construction operations of the Project.

K. Protection of Existing Utilities: Utility service lines found entering site and not indicated to remain or to be incorporated in New Work, shall be plugged, capped, or otherwise abandoned by Contractor in a manner satisfactory to Utility Companies whose services are involved, except as otherwise required. See Section 00 72 00 - General Conditions of the Contract for Construction, Article 10, Protection of Persons and Property.

L. Protection of Existing Utilities: Protect from damage, existing utility lines not specified to be altered by Work of this Contract; any such features damaged shall be repaired or replaced to condition equal to that existing prior to commencing work of this Contract. See Section 00 72 00 - General Conditions of the Contract for Construction, Article 10, Protection of Persons and Property.

1.08 PROJECT IDENTIFICATION AND SIGNS

A. General:

1. Within 30 days of the Notice to Proceed provide and maintain one 8'x8' project identification; locate sign in location as directed by the County or Project Manager. County will provide Contractor a layout and image format for the sign.

2. Signs other than the specified Project sign will not be permitted except the Contractor's name may be placed on field office.

B. Materials:

1. Structure and Framing: New structurally sound, wood or metal; wood shall be nominal 2"x4" minimum size. Posts shall be 4"x4" minimum size as required.

2. Sign Surface: Minimum 3/4-inch exterior grade plywood.

3. Rough Hardware: Galvanized.

4. Paint: Exterior quality, of type and colors selected by the Architect.

C. Fabrication:

1. Fabricate to provide smooth, even surface for painting.

2. Size: 8' x 8' unless otherwise indicated.

3. Paint exposed surfaces of supports, framing, and surface material with one coat primer and one coat of finish paint.

4. Include the following text, painted as directed:

a. Name of building, County and exterior perspective of proposed Project.

b. Emblem selected by the County.

c. Project Manager's Company name and address.

d. Architect's and Engineer's name and address.

e. Contractor's name and address.

D. The County reserves the right to take possession of the Project identification sign at no cost.

## 1.09 CLEAN UP AND DISPOSAL OF TRASH

A. Contractor is directed to Section 00 72 00 - General Conditions of the Contract for Construction, Article 4.15, Cleaning Up. Keep work and storage areas clean and fee of rubbish, and perform protective and clean up work within one day of being notified by County.

B. Dispose of trash resulting from work, off County property, as it accumulates. Pay fees required for trash disposal. No burning on County property is allowed.

C. Refer to Section 01 79 19/ Construction Waste Management for related requirements that apply.

## 1.10 NOISE AND DUST ABATEMENT

A. Perform any noisy operations outside of regular working hours; include 'extra' cost in Bid Price. Such work shall be done at times convenient to County and shall be approved by County at least 72 hours in advance.

B. Control dust resulting from all construction operations by localizing it to the greatest practicable extent using temporary fencing, partitions, curtains, or other means which will prevent spread of dust beyond immediate work areas. Duct openings and other openings communicating with other portions of building or systems shall have effective temporary closures.

C. Use water wagons or spray from hoses to control dust created by outdoor work operations in areas on County property and within the 'Limits of Work' during the entire period of this Contract as directed by the County; also, satisfactory control dust created by construction operations on property used, other than County property, to satisfaction of County and other responsible parties.

D. Special dust control measures to be put into place by Contractor in addition to the Dust Fence shown on the Drawings, shall include a continuous watering of the site to prevent dust from construction operations to be airborne and effect existing operations at the Detention Facility. Contractor to provide a watering truck on stand-by at the site to provide these dust control measures for the duration of the Project.

1.11 TEMPORARY UTILITIES SERVICES PURCHASED FROM UTILITY COMPANIES

A. Where temporary utility services such as electric, water or telephone are available to the site, Contractor to pay for all utility use during entire Project duration. Contractor to make independent arrangements with Utility Company for purchase thereof.

B. In such cases, final payment on Contract for this Project will not be made until Contractor submits letter from Utility Company to County indicating that payment has been made for utilities services, or that adequate provisions have been made to ensure final payment.

1.12 SANITARY FACILITIES FOR WORKERS

A. Toilet Facilities: Provide sufficient suitably enclosed chemical toilets, conforming to ANSI Z4.3, with urinal for workers.

B. Washing Facilities: Provide properly mounted and adequate wash sinks connected to water supply and located for proper usage.

C. Drinking Water Facilities: Provide clean, sanitary and adequate potable drinking water accessible for workers use.

1.13 TEMPORARY WATER

A. Make arrangements for water required for construction purposes; furnish and install temporary piping or hose to carry water to every part of construction.

B. Water is available from existing sources at site (fire hydrants) and apply and pay for usage from City of Fairfield.

1.14 TEMPORARY ELECTRICAL FACILITIES

A. Provide such temporary electrical facilities as are necessary to supply temporary lighting for all work operations (inside and outside of building) and temporary power for portable power driven tools and other Contractor equipment, including all construction trailers and field offices.

B. Before Utility Company or Contractor installs temporary electrical facilities or extensions to other areas of Project, exact location of such facilities shall be agreeable to County. It is essential that temporary utilities be located so not to interfere with equipment placement, materials handling or storage operations, traffic areas, later Project construction or site development, other contracts, or subsequent work.

C. Construction Requirements: Construct and maintain temporary electrical facilities in accordance with CCR, Title 24, Part 3, Basic Electrical Regulations, all local codes and PG&E rules and regulations. Materials, devices, and equipment used for these facilities shall be in good and safe condition.

D. Temporary electrical materials and equipment furnished and installed by Contractor for required facilities

1.15 TEMPORARY HEAT

A. Provide and pay all costs for temporary heat, including equipment, fuel, and operators, which may be required during Contract time to provide adequate temperatures for storage, installation, application, and drying of installed materials.

B. Provide temporary closures for windows and doors, and temporary general building ventilation, for proper storage and drying of materials and safe working conditions.

C. Areas in which wood finishes, gypsum wallboard or other temperature sensitive materials will be stored or installed shall be properly ventilated and, if necessary, heated until ambient temperature is maintained, day and night/ 24 hours, between 60 and 70 degrees F for at least 10 days immediately prior to start of installation and continuing thereafter until final acceptance of Project.

D. Use of permanent heating for temporary heating: Permanent heating system shall not be used for temporary heat until it has undergone operational testing, commissioning and is approved by the County. No demand shall be made by the Contractor for use of permanent heating for temporary heating, except with consent of County and by agreement in writing for use mutually acceptable to County and Contractor.

E. Operation and maintenance: Provide operator, maintain permanent heating system, and continue to do so during entire time temporary heat is required, and until entire Work of this Contract is accepted by County. Maintenance shall include replacement of filters and other dispensable items. Refer to technical specifications for requirements relating to the replacement of filters and other items used during temporary heating operations.

F. Payment for use, including cost of fuel, operators, and maintenance for permanent heating system shall be borne by Contractor until acceptance of Project by County.

1.16 SECURITY

A. Contractor is responsible for security of buildings and grounds within the 'Limits of Work' involved in this Project, including other subcontractors and County facilities, during entire time of Contract. Make good all damages to work and loss of materials due to vandalism or theft, within this responsibility.

1.17 DEWATERING FACILITIES

A. Provide and maintain dewatering and pumping facilities to keep site reasonably dry, and to protect materials and installed work from water damage until dewatering is no longer required.

**1.18** MITIGATION MONITORING PROGRAM

A. Contractor shall participate and cooperate with Owner (Solano County) to implement all mitigation measures described in the Mitigation Monitoring and Reporting Program-MMRP (See Appendix B). The measures will be implemented through a combination of one or more of the following, as appropriate to the nature of the measure: (1) incorporation into project design; (2) incorporation into agreements with contractors and other parties concerning project design and construction; or (3) carried out directly by County staff. In the attachment, Table 1 contains the Mitigation Monitoring and Reporting Program for the Claybank Adult Detention Facility Expansion Project which the Project will be implementing.

**END OF SECTION 01 51 00**

# SECTION 01 53 69 - TEMPORARY TREE AND PLANT PROTECTION

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
   1. Section 015000 "Temporary Facilities and Controls" for temporary site fencing.
   2. Section 311000 "Site Clearing" for removing existing trees and shrubs.

### 1.3 DEFINITIONS

A. Caliper: Diameter of a trunk measured by a diameter tape at a height 6 inchesabove the ground for trees up to and including 4-inchsize at this height and as measured at a height of 12 inchesabove the ground for trees larger than 4-inchsize.
   1. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.
   2. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings.

B. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

### 1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For arborist and tree service firm.

B. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.

C. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.

D. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.

### 1.5 QUALITY ASSURANCE

A. Arborist Qualifications: Certified Arborist as certified by ISA

B. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed temporary tree and plant protection work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of the Work.

C. Quality-Control Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work without damaging trees and plantings. Include dimensioned diagrams for placement of protection zone fencing and signage, the arborist's and tree-service firm's responsibilities, instructions given to workers on the use and care of protection zones, and enforcement of requirements for protection zones.

1.6 FIELD CONDITIONS

A. The following practices are prohibited within protection zones:
1. Storage of construction materials, debris, or excavated material.
2. Moving or parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

B. Do not direct vehicle or equipment exhaust toward protection zones.

C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

**PART 2 - PRODUCTS**

2.1 MATERIALS

A. Backfill Soil: Planting soil of suitable moisture content and granular texture for placing around tree; free of stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth.

B. Protection-Zone Fencing: Fencing fixed in position and meeting the following requirements:
1. Plastic Protection-Zone Fencing: Plastic construction fencing constructed of high-density extruded and stretched polyethylene fabric with 2-inch maximum opening in pattern and weighing a minimum of 0.4 lb/ft.; remaining flexible from minus 60 to plus 200 deg F; inert to most chemicals and acids; minimum tensile yield strength of 2000 psi and ultimate tensile strength of 2680 psi; secured with plastic bands or galvanized-steel or stainless-steel wire ties; and supported by tubular or T-shape galvanized-steel posts spaced not more than 96 inches apart.
1. Height: 60 inches.
2. Color: High-visibility orange, nonfading.

C. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes prepunched and reinforced; legibly printed with nonfading lettering and as follows:
1. Lettering: 3-inch high minimum, black characters on white background.

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

B. Prepare written report, endorsed by arborist, listing conditions detrimental to tree and plant protection.

3.2 PREPARATION

A. Locate and clearly identify trees, shrubs, and other vegetation to remain. Flag each tree trunk at 54 inches above the ground.

B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

C. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas indicated. Do not exceed indicated thickness of mulch.
1. Apply 2-inchuniform thickness of organic mulch unless otherwise indicated. Do not place mulch within 6 inches of tree trunks.

3.3 PROTECTION ZONES

A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people from easily entering protected areas. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.

B. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by Architect.

C. Maintain protection zones free of weeds and trash.

3.4 EXCAVATION

A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Section 312000 "Earth Moving" unless otherwise indicated.

B. Trenching within Protection Zones: Where utility trenches are required within protection zones, excavate under or around tree roots by hand or with air spade, or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots.
   1. Root Pruning within Protection Zone: Clear and excavate by hand or with air spade to the depth of the required excavation to minimize damage to tree root systems. If excavating by hand, use narrow-tine spading forks to comb soil to expose roots. Cleanly cut roots as close to excavation as possible.

## 3.5 CROWN PRUNING

A. Prune branches that are affected by temporary and permanent construction. Prune branches as directed by arborist.
   1. Prune to remove only broken, dying, or dead branches unless otherwise indicated. Do not prune for shape unless otherwise indicated.
   2. Do not remove or reduce living branches to compensate for root loss caused by damaging or cutting root system.
   3. Pruning Standards: Prune trees according to ANSI A300 Part 1.

## 3.6 REGRADING

A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

B. Lowering Grade within Protection Zone: Where new finish grade is indicated below existing grade around trees, slope grade away from trees as recommended by arborist unless otherwise indicated.
   1. Root Pruning: Prune tree roots exposed by lowering the grade. Do not cut main lateral roots or taproots; cut only smaller roots. Cut roots as required for root pruning.

C. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

D. Minor Fill within Protection Zone: Where existing grade is 2 inches or less below elevation of finish grade, fill with backfill soil. Place backfill soil in a single uncompacted layer and hand grade to required finish elevations.

## 3.7 FIELD QUALITY CONTROL

A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

3.8 REPAIR AND REPLACEMENT

A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or to be relocated that are damaged by construction operations, in a manner approved by Architect.
   1. Submit details of proposed pruning and repairs.
   2. Perform repairs of damaged trunks, branches, and roots within 24 hours according to arborist's written instructions.
   3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.

B. Trees: Remove and replace trees indicated to remain that are more than 66 percent dead or in an unhealthy condition or are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern.

3.9 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove excess excavated material, displaced trees, trash, and debris and legally dispose of them off Owner’s property.

**END OF SECTION 01 53 69**

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# SECTION 01 57 23 - STORM WATER POLLUTION PREVENTION

## PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes
1. Administrative and procedural requirements for storm water pollution prevention.

B. Discharge of pollutants (any substance, material, or waste other than clear, uncontaminated storm water) from the project into the storm drain system is strictly prohibited.

C. Provide all material, labor, equipment for installation, implementation, and maintenance of all surface-water pollution prevention measures. This work includes the following:
1. Furnishing, placing, and installing effective measures for preventing runoff of soil, silts, gravel, hazardous chemicals or other materials prohibited by the Central Valley RWQCB from entering the storm water drainage system.
2. Management of on-site construction materials in such a manner as to prevent said materials from contacting storm water or wash water and running off into the storm drain system.
3. Complying with applicable standards and regulations specified herein.
4. Maintain the most current revised Storm Water Pollution Prevention Plan (SWPPP) at the Contractor's work site. Three copies of the original and each revision shall be forwarded to the Owner's Representative.
5. Review any changes in the SWPPP plan each week at the weekly meetings with Owner's Representative and others. At each weekly meeting, the Contractor shall submit a numbered checklist of the current status of each prevention measure on the job site

D. Contractor shall have storm water pollution prevention measures in place and conduct inspections year-round. It is the responsibility of the Contractor to be prepared for a rain event in the non-rainy season, and to be aware of weather predictions. The Owner is not responsible for informing the Contractor of rain predictions.

E. Contractor shall not allow any non-storm water from the project to enter the storm drain system. Examples of non-storm water include water used for dust suppression, pipe flushing and testing, and domestic supply water used to wash streets, painting and drywall equipment, vehicles, or other uses.

F. Water resulting from de-watering an excavation may be discharged to a storm drain only if it is free of pollutants, including sediment. Contractor shall use methods such as a settling basin or filter to ensure that dewatering discharges are free of pollutants.

1.2 RELATED DOCUMENTS AND SECTIONS

A. Related Sections:
1. Section 015639 – Temporary Tree and Plant Protection.
2. Section 015000 - Temporary Facilities and Controls.
3. Section 311100 – Clearing and Grubbing.
4. Section 312000 – Earth Moving.
5. Section 329200 – Turf and Grasses.

B. Related Documentation:
1. Geotechnical Investigation Report for Claybank Adult Detention Vocation Education Buildings prepared by Miller Pacific Engineering Group, February 8, 2015, reference number.

C. Applicable Regulations:
1. State Water Resources Control Board (2009). Order 2009-0009-DWQ, as modified by Order 2010-0014-DWQ (2010), NPDES General Permit No. CAS000002: National Pollutant Discharges Elimination System (NPDES) California General Permit for Storm Water Discharge Associated with Construction and Land Disturbing Activities. This document is hereinafter referred to as the "General Permit".

D. Contractor shall comply with the following standards and guidelines on storm drain pollution prevention:
1. California Storm water Quality Association Handbooks - Construction, Municipal, Industrial and Commercial, and New Development and Redevelopment. These documents can be viewed and downloaded from the Association's website at http://www.cabmphandbooks.org.

1.3 SUBMITTALS

A. Submittals shall comply with requirements specified in Division 01.

B. Submit a Storm Water Pollution Prevention Plan (SWPPP) using the SWPPP Template in Appendix B of the California Storm water Quality Association – Storm water Best Management Practice Handbook for Construction. This template can be downloaded from the California Storm water Quality Association website at http://www.cabmphandbooks.org/Construction.asp. The SWPPP must contain all required elements specified in the General Permit. The SWPPP shall be developed and revised as necessary to meet the following objectives:
1. To identify pollutant sources that may affect the quality of storm water discharges associated with construction activity from the construction site.
2. To identify non-storm water discharges.
3. To identify, construct, and implement storm water pollution prevention measures (Best Management Practices, or BMPs) to reduce or eliminate pollutants in storm water discharges from the construction site, both during construction and after construction is completed.
4. Develop a maintenance schedule for BMPs installed during construction designed to reduce or eliminate pollutants after construction is completed (post-construction BMPs).

5. Contractor shall amend the SWPPP whenever there is a change in construction or operations that may affect the discharge of pollutants to surface waters. All amendments should be dated and directly attached to the SWPPP.
6. The plan shall include a site map and site-specific written plan that describes pollution sources for the construction activity and the methods that will be used for erosion and sediment control, hazardous materials management, and any other construction activity that are sources of storm drain system pollution. The list of topics to be covered in the plan are included in Part 3 Execution of this Section.

C. Site work shall not commence until the SWPPP has been reviewed and accepted by the Owner.

**PART 2 - – PRODUCTS**

2.1 MATERIAL

A. General: Provide materials as required for execution of the work.

**PART 3 - – EXECUTION**

3.1 GENERAL

A. The Contractor will write and implement a SWPPP that includes a site map and written description of pollution prevention methods. The intent of this requirement is to ensure Contractor compliance with applicable regulations for the discharge of storm water from the project. The Contractor will choose the best available performance-based technology and methods to prevent storm water pollution for construction site activity. The method(s) chosen shall be appropriate for each specific site condition.

3.2 SWPPP TOPICS

A. Following are topics the Contractor shall address in the SW PPP:
1. Contractor Certification:
   a. In compliance with the General Permit, the SWPPP must have the following signed certification: "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."
   b. Introduction/Site Description:

1) The SWPPP shall include basic information about the project including: size of site, type of construction, location of site, project start date and estimated completion date.

c. Maps:
   1) The General Permit has specific map requirements, including a topographic map showing the location of nearby surface water bodies and the discharge location(s) for the site. A detailed site map is also required, which shall identify areas of soil disturbance, location of surface water bodies, areas of existing surface vegetation, location of sediment or pollutant control measures, site drainage patterns, areas used for storage of soils, waste, or materials, vehicle and equipment parking or service areas, existing paved areas and location of post-construction controls. The maps shall be updated as needed to reflect changes as the project progresses. The approved map and plan shall be kept onsite for reference by the Contractor, Owner's Representative or governmental agencies.

d. Description of Site and Soil Types:
   1) Include the following estimates:
      a) The size of the construction site (in acres);
      b) The runoff coefficient of the site before and after construction;
      c) The percentage of the area of construction that is impervious before and after construction.
      d) A general description of the types of soils encountered on the site. Attention is directed to the Geotechnical Report prepared for this project for additional information.

e. Pollutant Sources:
   1) List and describe pollutants that are likely to be present in storm water discharges from the site, such as sediment, waste materials, concrete, etc. Describe the locations of storage or use of such materials and the measures to prevent pollution.

f. Toxic Materials:
   1) Describe all toxic materials that will be used during construction, such as adhesive, paint, petroleum products, pesticides and vehicle fluids. Describe the locations of storage or use of such materials and measures to prevent pollution.

g. Erosion and Sediment Control:
   1) Provide a description of erosion and sediment control measures that will be used on the site, and correlate the description with the site map. Areas requiring erosion control measures and exposed soil such as soil piles, bare soil, sloped soil, and any area of disturbed soil. Erosion control measures include paving, tarp placement, soil blankets, mulching, seeing, hydro-mulching, and spreading straw. Sediment control measures include drain inlet protection, filter fabric, geo-textile silt fencing, gravel placement, gravel or sand bag placement, and straw wattle placement. This list is not all inclusive and the Contractor should refer to the resources listed in this section to identify the best measures for the project. Describe measures to reduce the tracking of sediment from the site. Describe waste disposal practices and methods to prevent waste materials from polluting storm water.

Indicate the location of concrete washout areas. Both erosion and sediment control practices are designed to be implemented as an integrated system if pollution control. Without erosion controls, sediment controls are easily overwhelmed and will not prevent pollution.

h. Non-Storm Water Management:
   1) Describe all non-storm water discharges that may occur on site. Examples of non-storm water discharges include irrigation runoff, street cleaning, spills, or leakage from storage tanks. Non-storm water discharges should be eliminated or reduced to the extent feasible. Discharges from dewatering are allowed only if they are free of pollutants, including sediment.

i. Maintenance, Inspection and Repair of Controls:
   1) Structural pollution controls require ongoing inspection, maintenance and repair. Contractor shall maintain all pollution control measures to achieve compliance with the SWPPP and General Permit. Describe procedures for responding to failure of any structural controls and indicate the persons responsible for inspection, maintenance and repair.

j. Spill Prevention and Control:
   1) Measures to prevent, control and respond to spills shall be described in the SWPPP. Contractor shall take precautions to prevent accidental spills of pollutants, including hazardous materials brought onsite by the Contractor. However, in the event of a spill, the Contractor shall be responsible for the following:
      a) Immediately contain and prevent leaks and spills of prohibited pollutants from entering the storm drain system. Clean up the spill and label the contained material. Store the container in a safe place and contact the Owner's Representative prior to disposal of the waste by the Contractor. Contractor shall keep a spill kit on site at all times for this purpose.
      b) Contractor shall comply with all federal, state, and local hazardous waste requirements. Ensure that no spilled materials are washed into the streets, gutters, storm drains, or creeks.
      c) Report any hazardous or unknown material spills immediately to Owner and [local authorities having jurisdiction] at [contact phone number(s)].

k. Post-Construction Storm Water Management:
   1) Describe all the control practices to reduce pollutants in storm water discharges after the construction activities are completed at the site. Post-constructions BMPs include: minimizing land disturbance, minimizing impervious surfaces, treatment of storm water runoff using filtration, use of efficient irrigation systems, and planting to reduce erodable surfaces.
   2) Attention is directed to Section 329200 – Turf and Grasses, for acceptable seed mixes for permanent site stabilization.

l. Personnel:
   1) Identify and describe the training of the personnel responsible for the implementation and monitoring of the SWPPP and BMPs. These activities must be performed by trained, competent personnel. Documentation of training shall be available upon the request of the Owner's Representative or a regulatory agency;

m. Notification List:

1) Provide the company's name, address and telephone number, along with a contact person's name and telephone number for everyone responsible for implementation of the SWPPP. The Contractor shall inform all subcontractors (if any) of the water pollution prevention requirements contained in this specification and the site-specific SWPPP and include appropriate subcontract provisions to ensure that these requirements are met.

n. Monitoring and Reporting:

1) The SWPPP shall describe the monitoring program to ensure compliance with the General Permit. The monitoring plan shall include site inspections and the Contractor shall conduct inspections of the construction site weekly, prior to anticipated storm events, during extended storm events, and after actual storm events to identify areas contributing to a discharge of storm water associated with construction activity. The name(s) and contact number(s) of the assigned inspection personnel shall be listed in the SWPPP. Weekly and pre-storm inspections are to ensure that BMPs are properly installed and maintained; post-storm inspections are to assure that the BMPs have functioned adequately. During extended storm events, inspections shall be required each 24-hour period. BMPs shall be evaluated for adequacy and proper implementation and whether additional BMPs are required in accordance with the terms of the General Permit. The Contractor shall submit a copy of all inspection reports to the Owner's Representative for review.

2) Inspections must be documented and the records maintained onsite for review by the Owner's Representative or regulatory agencies. If instances of non-compliance with the General Permit are identified, the Contractor shall notify the Owner's Representative immediately. Corrective measures should be implemented immediately following discovery of an exceedance of water quality standards or other instance of non-compliance.

## 3.3 ENVIRONMENTAL ENFORCEMENT

A. The [list specific section] RWQCB has authority to enforce, through codified regulations, any portions of this Section that may violate applicable regulations. Agency enforcement may include but is not limited to: citations, orders to abate, bills for cleanup costs and administration, civil suits, and criminal charges. Contract compliance action by the Owner shall not be construed to void or suspend any enforcement actions by these or other regulatory agencies.

B. Contractor shall notify the Owner's Representative within 24 hours after issuance of any citation(s) issued by any regulatory agency and shall be responsible for all fines and costs necessary to correct the conditions listed in the citation(s) to include all legal fees and Owner expenses.

**END OF SECTION 01 57 23**

# SECTION 01 60 00 - MATERIALS AND EQUIPMENT

## PART 1 - GENERAL

### 1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

### 1.02 SUMMARY

A. This Section specifies administrative and procedural requirements governing the Contractor's selection of products for use in the Project.

B. The Contractor's Construction Schedule is included in Section 0132 16, "Progress Schedules and Reports"; and the Schedule of Submittals is included under Section 0133 00, "Submittals."

C. Standards: Refer to Section 01 42 00, "Definitions and Standards" for applicability of industry standards to products specified.

D. Administrative procedures for handling requests for substitutions made after award of the Contract are included under Section 01 25 13, "Product Substitutions."

### 1.03 DEFINITIONS

A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms are self-explanatory and have well recognized meanings in the construction industry.

1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

    a. "Named Products" are items identified by manufacturer's product name, including make or model designation, indicated in the manufacturer's published product literature, that is current as of the date of the Contract Documents.

2. "Materials" are products that are substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.

3. "Equipment", is a product with operational parts, whether motorized or manually operated, that requires service connections such as wiring or piping.

1.04 DESCRIPTION

A. Material and equipment incorporated in the Work shall be:

1. New, unless otherwise specified.

2. In a condition acceptable to the County and the Architect.

3. Suitable for the use intended.

4. In conformance with EPA codes and regulations and applicable air quality control district.

B. No material or equipment shall be used for any purpose other than that for which it is designed or specified.

C. No material shall contain asbestos.

D. No materials or products shall contain formaldehyde in excess of the amount recommended by the State of California Department of Health Services (DOHS).

1.05 TRANSPORTATION AND HANDLING

A. Deliver manufactured products in the manufacturer's original, unbroken containers or packaging, with identifying labels intact and legible.

B. Immediately on delivery, inspect shipments to assure compliance with the requirements of the Contract Documents and reviewed submittals, and to verify that products are properly protected and undamaged.

C. Handle products in a manner to avoid soiling and damaging the products and their packaging.

D. Promptly remove damaged and defective products from the site, and replace at no increase in Contract Sum.

1.06 STORAGE

A. Store manufactured products in accordance with the manufacturers' printed instructions, with seals and labels intact and legible.

1. Store products subject to damage by the elements in weather tight enclosures.

2. Maintain temperature and humidity within the ranges specified by the manufacturers.

B. Exterior Storage:

1. Store fabricated products above the ground, on blocking or skids, to prevent

soiling and staining.

2. Cover products which are subject to deterioration with impervious sheet coverings; provide adequate ventilation to avoid condensation.

3. Store loose granular material in a well-drained area on solid surfaces to prevent mixing with foreign matter.

C. Arrange storage to facilitate inspection.

D. Periodically inspect stored products to assure that products are maintained under specified conditions and free from damage and deterioration.

E. Protection After Installation:

1. Provide substantial coverings as necessary to protect installed products from damage from traffic and construction operations. Remove coverings when no longer needed.

2. Maintain temperature and humidity conditions for interior equipment and finish products in accordance with the manufacturers' printed instructions.

1.07 PRODUCT OPTIONS

A. For products indicated or specified only by reference standard, select any product meeting such standard.

B. For products indicated or specified by naming several products or manufacturers, select any one of the products or manufacturers named which complies with the specified requirements.

C. For products indicated or specified by naming only one product and manufacturer, there is no option.

D. Products not meeting the criteria hereinabove, shall be considered Substitutions, and shall be submitted as specified under "Substitution Procedure" Section 01630.

E. "Or accepted equal" means a product accepted by the Architect for use in the Work as being equivalent in essential attributes to the product indicated or specified in the Contract Documents. Reference product substitution procedure Section 01630.

1.08 QUALITY ASSURANCE

A. Source Limitations: To the fullest extent possible, provide products of the same kind, from a single source.

B. Compatibility of Options: When the Contractor is given the option of selecting between two or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

C. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface that is not conspicuous.

2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface, which is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:

a. Name of product and manufacturer

b. Model and serial number

c. Capacity

d. Speed

e. Ratings

1.09 SUBSTITUTION PROCEDURE

A. Substitute Products: When the naming of one or more products is followed by "or accepted equal," a substitute product may be offered for consideration. A substitute product is a product other than those specified.

1. Submit offer of substitute product with Bid as an Alternate to Base Bid. List on an Alternate Proposal Sheet; show amount Base Bid will be decreased or increased if alternate is accepted.

2. If informed that a substitution is being considered, drawings, specifications, tests, performance data, and other pertinent information required to substantiate the equality of each substitute product.

**OR**

3. For a period 30 days after the execution of the Agreement, other products may be proposed in lieu of products identified in the Contract Documents.
4. After such time other products may be proposed only if a product indicated or specified can be proved to have subsequently become unavailable.

5. Whenever a product is identified in the Contract Documents by reference to manufacturer's name, trade name, catalog number, or the like, it is so identified for the purpose of establishing a standard, and products of other manufacturers may be equally acceptable, provided the proposed products are, in the opinion of the Architect, of equal quality, utility, and appearance.

6. In requesting acceptance of a product other than that identified in the Contract Documents, the Contractor represents that he:

   a. Has investigated the proposed product and determined that it is equal to or superior in all respects to that indicated or specified.
   b. Will furnish the same guarantees/warranties or bonds for the proposed product as for the product indicated or specified.

   c. Will coordinate the installation of the proposed product into the Work, and make such other changes as required to make the Work complete and in compliance with the Contract Documents and applicable regulatory requirements.

   d. Waives claims for additional costs associated with the proposed product that may subsequently become apparent.

B. Request for acceptance of a product other than that indicated or specified in the Contract Documents shall be submitted ((to the County and)) the Architect in written form and accompanied by sufficient information to enable proper evaluation to be made. Only one product may be proposed for a product identified in the Contract Documents. Submit with request:

1. Complete technical data, including drawings, performance specifications, cost data, samples, and test reports of the product proposed. Submit additional information, if required by the Architect.

2. Data similar to that specified for the item for which the product is proposed.

3. Effect on the construction schedule.

4. Complete breakdown of costs indicating the amount to be deducted from the Contract Sum if the proposed product is accepted.

5. Signed statement that the proposed product is in full compliance with the Contract Documents and applicable regulatory requirements.

6. List of other Work, if any, which may be affected by the proposed product. Be responsible for the effect of a proposed product upon related Work in the Project, and pay the additional costs generated by the product if it is accepted, including the cost of the Architect's additional services associated therewith.

7. Information on availability of maintenance service, and source of replacement materials.

8. Sample of manufacturer's standard form of guarantee or warranty for proposed product.

C. The Architect will review requests for proposed products with reasonable promptness and

notify the Contractor, in writing, of his decision to accept or reject such products.

D. The Architect at his sole discretion will determine the acceptability of proposed products, and his determination shall be final.

E. Architect's Action: No consideration will be given to a substitute product unless, in the Architect's judgment, it complies with the following conditions.

1. It is equal in quality and serviceability.

2. Its use does not entail changes in details or related construction.

3. It is acceptable in regards to design and artistic effect.

4. There is cost, time, or both, advantage to County.

F. Notification: Written notification of decision will be given within a reasonable time after receiving the required technical data. Acceptable substitutions will be processed as Change Orders.

G. Acceptance of a product shall not relieve the Contractor from responsibility for the proper execution of the Work and any other requirements of the Contract Documents.

H. If a proposed product is not accepted, use the product originally specified or indicated.

I. No products other than those indicated or specified in the Contract Documents shall be purchased or incorporated in the Work without the Architect's prior written acceptance.

PART 2 - PRODUCTS

2.01 PRODUCT SELECTION

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and unused at the time of installation.

1. Provide products complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.

2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

B. Product Selection Procedures: Product selection is governed by the Contract Documents and governing regulations, not by previous Project experience.

1. Visual Matching: Where Specifications require matching an established Sample, the Architect's decision will be final on whether a proposed product matches satisfactorily.

a. Where no product available within the specified category matches satisfactorily and also complies with other specified requirements, comply with provisions of the Contract Documents concerning "substitutions" for selection of a matching product in another product category, or for noncompliance with specified requirements.

2. Visual Selection: Where specified product requirements include the phrase "...as selected from manufacturer's standard colors, patterns, textures..." or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Architect will select the color, pattern and texture from the product line selected.

PART 3 - EXECUTION

3.01 INSTALLATION OF PRODUCTS

A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.

1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

**END OF SECTION 01 60 00**

SECTION 01 71 23 - FIELD ENGINEERING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Layout and install the Work to the lines and grades indicated and specified.

B. Retain and pay expenses of a qualified civil engineer or land surveyor to establish on the site the required reference points and bench marks, establish building lines and elevations, check structural steel framework for plumpness, and establish on steel frame the required basic grid lines from which Work of other SECTIONS shall be laid out.

C. The Project Manager will identify existing control points and property line corner stakes.

1.2 QUALIFICATIONS OF ENGINEER OR SURVEYOR

A. The engineer or land surveyor shall be licensed in the State of California and shall be acceptable to the County.

1.3 SURVEY REFERENCE POINTS

A. Existing basic horizontal and vertical control points for the project are indicated.

B. Locate and protect control points prior to starting site Work, and preserve permanent reference points during construction.

1. Make no changes or relocations without prior notice to the Architect.

2. Report to the Project Manager if a reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.

3. Require civil engineer or land surveyor to replace control points which become lost or destroyed; base replacements on original survey control.

1.4 PROJECT SURVEY REQUIREMENTS

A. Establish lines and levels; locate and layout:

1. Site Improvements:

a. Stakes for grading, fill and topsoil placement.

b. Utility slopes and invert elevations.

2. Batter boards for structures.

3. Building foundations, column locations.

4. Controlling lines and levels required for mechanical and electrical work.

B. From time to time verify layouts to ensure accuracy.

1.5 RECORDS

A. Maintain a complete, accurate log of control and survey Work as it progresses.

1.6 SUBMITTALS

A. Submit name and address of civil engineer and land surveyor.

B. Upon request, submit documentation to verify accuracy of field engineering Work.

C. Submit record documents under provisions of Section 017700.

PART 2 - PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

**END OF SECTION 01 71 23**

SECTION 01 73 29 – CUTTING AND PATCHING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This SECTION describes the requirements for performing cutting and patching; patching includes the insertion or projection of other products in or from a surface.

1.2 QUALITY ASSURANCE

A. Design Criteria:

1. Patching shall achieve security, strength, and weather protection, as applicable, and shall preserve continuity of existing fire ratings.

2. Patching shall successfully duplicate undisturbed adjacent finishes, colors, textures, and profiles. Where there is dispute as to whether duplication is successful or has been achieved to a reasonable degree, the County's design consultant and County Project Manager's judgment shall be final.

1.3 COORDINATION AND PROTECTION

A. Protect from damage all portions of the Work or work of the County or separate contractors adjacent to cutting or patching operations, including excavation.

B. Obtain written permission prior to commencing cutting, patching or excavation operations on the work of the County or any separate contractors.

C. Protect adjacent occupied spaces, roof membranes, and building envelope systems from damage during concrete cutting and coring.

D. Security of facility to be maintained at all times.

E. When requested in writing, allow the County or any separate contractor to perform reasonable cutting, patching or excavation operation on the Work.

1.4 SUBMITTALS

A. Cutting and Patching Proposal: Where approval of procedures for cutting and patching is required before proceeding, submit a proposal describing procedures well in advance of the time cutting and patching will be performed and request approval to proceed. Include the following information, as applicable, in the proposal:

1. Describe the extent of cutting and patching required and how it is to be performed; indicate why it cannot be avoided.

2. Describe anticipated results in terms of changes to existing construction; include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.

3. List products to be used and firms or entities that will perform Work.

4. Indicate dates when cutting and patching is to be performed.

5. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.

6. Where cutting and patching involves addition of reinforcement to structural elements, submit details and engineering calculations to show how reinforcement is integrated with the original structure.

7. Approval by the Designer to proceed with cutting and patching does not waive the Designer's right to later require complete removal and replacement of a part of the Work found to be unsatisfactory.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials shall be as specified in the applicable, individual SECTIONS of the Specifications and as required to match existing construction. Use materials that are identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials whose installed performance will equal or surpass that of existing materials.

PART 3 - EXECUTION

3.1 GENERAL

A. Perform cutting associated structural reinforcing, and patching in a manner to prevent damage to other Work and to provide proper surfaces for the installation of materials, equipment, and repairs.

B. Do not cut or alter structural members without prior consultation with the Project Manager.

C. Wherever practicable, employ original installer or fabricator providing Work under this Contract to perform cutting and patching for new:

1. Weather-exposed and moisture-resistant products.

2. Fireproofing.

3. Finished surfaces exposed to view.

D. Adjust and fit products to provide a neat installation.

E. Finish or refinish, as required, cut and patched surfaces to match adjacent finishes. Paint over complete surface plane, unless otherwise indicated. Over patched wall or ceiling surfaces, paint to nearest cutoff line for entire surface, such as intersection with adjacent wall or ceiling, beam, pilasters or to nearest opening frame, unless otherwise indicated. Painted surfaces shall not present a spotty, touched-up appearance.

3.2 INSPECTION

A. Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.

1. Before proceeding, meet at the site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.3 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.

C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Take all precautions necessary to avoid cutting existing pipe, conduit or ductwork serving the building, but scheduled to be removed or relocated until provisions have been made to bypass them.

3.4 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

B. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible review proposed procedures with the original installer; comply with the original installer's recommendations.

1. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to

size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.

3. Cut through concrete and masonry using a cutting machine such as a Carborundum saw or diamond core drill.

4. Comply with requirements of applicable Sections of Division-7 where cutting and patching requires repair of weather barriers, sheet metal flashing and trim, joint sealants.

5. By-pass and safe-off utility services such as pipe or conduit, before cutting, where services are shown or required to be removed, relocated or abandoned. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.

2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

3. Where removal of walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary to achieve uniform color and appearance.

a. a. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken area containing the patch, after the patched area has received primer and second coat.

4. Patch, repair or rehang existing ceilings as necessary to provide an even plane surface of uniform appearance.

3.5 CLEANING

A. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

**END OF SECTION 01 73 29**

SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT

PART I - GENERAL

1.0 1 WORK INCLUDED

A. Waste Management Objective for the Project:

1. The County has established construction waste management goals that require this Project to minimize the generation of construction and demolition waste at the site. Factors that contribute to waste, such as over-packaging, improper storage, ordering error, poor planning, breakage, mishandling, and contamination shall be minimized.

2. Waste disposal in local landfills shall be minimized and of the inevitable waste that is generated, as much of the waste materials as economically feasible shall be reused or recycled.

3. The expressed Construction Waste Management objective requires 'mandatory' participation by the Contractor.

B. Diversion from Landfill: Waste categories appropriate for diversion from landfill shall include, but not be limited to, the following:

1. Land clearing debris

2. Soil

3. Wood: Clean dimensional wood, palette wood

4. Sheet Wood: Plywood, OSB and particle board

5. Concrete

6. Concrete Masonry Units (CMU)

7. Asphalt Concrete

8. Paper

a. Bond

b. Newsprint

c. Cardboard and paper packaging materials

9. Cement Fiber Products: Shingles, panels, and siding

10. Metals

a. Ferrous

b. Non-ferrous

11. Paint

12. Rigid Foam

13. Glass

14. Plastics

15. Carpet and pad

16. Beverage containers

17. Insulation

18. Gypsum Board

19. Porcelain Plumbing Fixtures

20. Fluorescent Light Tubes (per Dept. of Toxic Substances Control regulations)

1.02 RELATED REQUIREMENTS

A. Section 01 33 00: Submittal Procedures.

B. Section 01 71 23: Field Engineering

C. Section 01 77 00: Closeout Procedures.

D. Section 01 51 00: Temporary Facilities and Controls.

1.03 REFERENCES

A. The California Integrated Waste Management Board (CIWMB); including the California Materials Exchange (CalMAX), Telephone 877-520-9703; www.ciwmb.ca.gov/calmax/.

B. Local Integrated Waste Management Programs and Re-Use Programs in the Project area.

C. The Department of Toxic Substances Control (DTSC)

D. Republic Garbage Services

E. Potrero Hills Landfill

1.04 DEFINITIONS

A. Construction, Demolition, and Land Clearing (CDL) Waste: Includes all non-hazardous solid wastes resulting from construction, remodeling, alterations, repair, demolition and land clearing, and material that is recycled, reused, salvaged or disposed as garbage.

B. Salvage: Recovery of materials for reuse.

C. Reuse: making use of a material without altering its form. Materials can be reused on-site or reused on other projects off-site. Grinding of existing removed concrete for use as sub base road material would be an example.

D. Recycling: Process of sorting, cleaning, treating, and reconstituting materials for the purpose of using the material in the manufacture of a new product.

E. Source-Separated CDL Recycling: Process of separating recyclable materials in separate containers as they are generated on the job-site. The separated materials are hauled directly to a recycling facility or transfer station.

F. Co-mingled CDL Recycling: Process of collecting mixed recyclable materials in one container on-site. The container is taken to a material recovery facility where materials are then separated for recycling.

G. Approved Recycling Facility:

I. A facility that can legally accept CDL waste materials for the purpose of processing the materials into an altered form for the manufacture of a new product.

2. Material recovery Facility: General term used to describe a waste-sorting facility. Mechanical, hand separation, or a combination of both procedures, is used to recover recyclable materials.

1.05 WASTE MANAGEMENT

A. Manager: Contractor shall designate an on-site party (or parties) responsible for instructing workers and subcontractors, and overseeing and documenting results of Waste Management for the Project.

C. The Contractor shall develop a Waste Management Plan and review with Owner to obtain Owner's approval. Waste Management Plan to be prepared within thirty (30) days following Notice to Proceed.

C. Meetings: Contractor shall conduct Waste Management meetings with subcontractors who generate construction waste. Contractor shall present current status of the Waste Management at regular job-site meetings.

D. Materials Handling Procedures: Provide means by which waste materials will be protected from contamination and means to be employed in reuse or recycling of waste material consistent with requirements for acceptance by receiving facilities.

1. Separation Facilities: Contractor shall lay out and label a specific area to facilitate separation of materials for reuse and recycling. Recycling and waste bin areas shall be kept neat and clean and clearly marked in order to avoid contamination of materials.

2. Hazardous Wastes: Hazardous wastes shall be separated, stored, and disposed of according to local regulations, and in accordance with specifications for such work as may be included in this Project.

3. Instruction: Contractor shall provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at appropriate stages of the Project.

1.06 WASTE MANAGEMENT REPORT

A. Upon completion of Work, including final cleanup, provide a final Waste Management Report containing the information listed below.

1. The total quantity of each waste material generated; and the date(s) removed from the job-site.

2. The percent of the total quantity generated of each material sent to landfill, the identity of the landfill (receiving facility), handling costs, transport costs, tipping fees paid at the landfill, and total landfill costs. Attach copies of manifests, weight tickets, receipts, and invoices.

3. For each material reused or recycled from the Project, include the percent of the total quantity generated, the identity of the receiving facility, the total costs of handling and transportation, and income. Attach manifests, weight tickets, receipts, and/or invoices.

4. Contractor shall develop forms to document Waste Management Report for the basis of documenting.

B. Submit final Waste Management Report at completion of Project to document.

**END OF SECTION 01 74 19**

# SECTION 01 77 00 - CONTRACT CLOSEOUT PROCEDURES

## PART 1 - GENERAL

### 1.1 DESCRIPTION

A. This SECTION describes the requirements for Contract closeout, including provisions for final cleaning, project record documents, operating and maintenance data, instruction of County's personnel, guarantees/warranties and bonds, service and maintenance contracts, preparation for final inspection, restoration of damaged Work, remedial Work, and extra materials.

### 1.2 RELATED REQUIREMENTS

A. Documents 00 72 00/General Conditions of the Contract for Construction and 00 73 00/ Supplementary Conditions including all fiscal provisions, legal submittals and other administrative requirements.

B. Section 01 11 00/ Summary of Work

C. Section 01 31 00 Project Management and Coordination.

D. Section 01 33 00/ Submittal Procedures.

E. Section 01 51 00/ Temporary Facilities and Controls.

F. Section 01 71 23/ Field Engineering

G. Any other applicable Section containing Closeout provisions and Commissioning.

### 1.3 CLOSEOUT PROCEDURES

A. Comply with procedures stated in Document 00 72 00/ General Conditions of the Contract for Construction, Article 9/ Payments and Completion for final inspection, Completion of the Work, Acceptance of the Work payment and retention procedures.

B. Contractor shall start developing and completing punch list items a minimum of 45 calendar days prior to the end of the Contract Time as specified Document 00 73 00/ Supplementary Conditions, Article 1.3, Time of Completion and Section 01 32 16/ Construction Progress Schedules and Reports.

C. When Contractor considers the Work complete, the Contractor shall request, in writing, a final inspection to be conducted by the County Project Manager. The County Project Manager shall conduct a final inspection within 14 days of receipt of the written request. Prior to requesting a final inspection, the Contractor shall have the entire Work completed in accordance with all Contract Requirements, including, but not limited to, all punch list items, and submittal of all documents and products listed in this section and other sections of the Project Manual. It is recommended that the Contractor request the final inspection as early as

possible, and prior to the end of Contract Time, to allow for completion of punch list items discovered to be incomplete during the final inspection and for a final re-inspection, to avoid assessment of liquidated damages.

D. The date of Substantial Completion of the Work and Beneficial Occupancy will be determined as specified in Document 00 72 00, Article 9, Payments and Completion.

E. Final cleaning shall be completed prior to occupancy or requesting a final inspection, whichever comes first.

1.4 FINAL CLEANING

A. Comply with applicable regulatory requirements during the conduct of cleaning and disposal operations. Special cleaning requirements for specific elements of the Work are included in appropriate Sections of Division 2 through 33.

B. Use cleaning materials that will not create hazards to health or property or cause damage to products or Work. Conduct cleaning and waste disposal operations in compliance with local laws and ordinances. Comply fully with federal and local environmental and anti-pollution regulations.

1. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary drains.

2. Burning or burying of debris, rubbish or other waste material on the premises will not be permitted.

C. Use cleaning materials and methods recommended by the manufacturers of the products to be cleaned.

D. Schedule operations to prevent dust and other contaminants resulting from cleaning operations from adhering to wet or newly finished surfaces.

E. Perform the following cleaning operations as applicable to the Work of this Contract:

1. Remove dust, dirt, grease, stains, fingerprints, labels, spilled and spattered, and other foreign materials from interior and exterior surfaces exposed to view.

2. Wash and shine glazing and mirrors.

3. Polish glossy surfaces to a clear shine.

4. Ventilating Systems:

a. Clean permanent filters and replace disposable filters of units operated during construction.

b. Clean ducts, blowers, and coils if units were operated without filters during construction.

5. Vacuum and wipe insides of electrical panels and cabinetwork.

6. Broom-clean interior spaces.

7. Rake clean ground surfaces.

8. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics and similar spaces.

9. Remove labels that are not permanent labels.

10. Touch-up and otherwise repair and restore marred exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored, or that show evidence or repair or restoration. Do not paint over "UL" and similar labels, including mechanical and electrical name places.

11. Wipe surfaces of mechanical and electrical equipment, elevator equipment and similar equipment. Remove excess lubrication, paint and mortar droppings and other foreign substances.

1.5 PROJECT RECORD DOCUMENTS

A. Maintenance of Documents and Samples:

1. Store Project record documents and samples in field office apart from documents used for construction.

2. Maintain Project record documents in a clean, dry, legible condition and in good order.

3. Do not use Project record documents for construction.

B. Recording:

1. Record information carefully and neatly, with felt-tip pens, in color code designated, and in the manner approved in advance by the Architect.

2. Label each document "PROJECT RECORD" in large, neat, printed letters.

C. Record Drawings:

1. Record the following kinds of information on prints:

a. Changes made by Change Orders and other modifications described in the GENERAL CONDITIONS.

b. Locations of significant Work concealed inside the building whose general locations have been changed from those shown on the Contract

Documents.

c. Locations of items, not necessarily concealed, which have been changed, with the Architect's prior acceptance, from the locations shown on the Contract Documents.

d. Revisions to routing of piping and conduit.

e. Revisions to electrical circuitry.

f. Actual equipment locations.

g. Duct size and routing.

h. In addition to the previously specified requirements for record drawings:

1. Keep up to date during the entire progress of the Work, and make available to the Architect and the Project Manager at any time.

2. Furnish additional drawings as necessary for clarification.

3. Record deviations from the sizes, locations, and other features of installations shown in the Contract Documents.

4. Establish locations of underground Work by dimensions to column lines or walls, locating turns, and by referenced centerline or invert elevations and rates of fall.

5. Give sufficient information to locate Work concealed in the building.

6. Drawing to Scale:

(a) Locate main runs of piping, conduit, ductwork, and similar items by dimensions.

(b) Locate other items either by dimensions or in relation to spaces within the building.

2. Furnish reproducible record drawings, made from final Shop Drawings which have been updated to show actual conditions, for Work specified in the individual Specification SECTIONS.

3. Mark completely and accurately record prints of Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions. Where Shop Drawings are marked, show cross-reference on Contract Drawing location.

4. Mark record sets with red non-erasable colored pencil/pen; use other colors to distinguish between changes for different categories of the Work at the same location.

5. Note Change Order numbers, Work Authorization numbers, and similar identification.

6. Responsibility for Mark-up: Where feasible, the individual or entity who obtained record data, whether the individual or entity is the installer, subcontractor, or similar entity, is required to prepare the mark-up on record Drawings.

   a. Accurately record information in an understandable Drawing technique.

   b. Record data as soon as possible after it has been obtained. In the case of concealed installation, record and check the mark-up prior to concealment.

D. "As-Built" Drawings:

1. At time of acceptance of the Work and prior to final payment, using the record drawings for reference, prepare electronic "As-Built" drawings using AutoCAD 2007 plan backgrounds furnished by Architect.

2. Employ and pay a professional draftsman to prepare the "As-Built" drawings from the record drawings, using AutoCAD 2007 .

3. After completing the preparation of electronic record drawings, print one full-size format image in Adobe Acrobat PDF file format of each Drawing, files shall be named to match the drawing sheet number as represented in the original Contract Documents set. Files shall be arranged in separate folders by discipline and shall be copied to USB flash drives. AutoCAD files shall be placed in separate folders from Adobe Acrobat PDF files. Each drives shall be clearly labeled identifying the Project, contents and date. Provide four (4) copies to Project Manager.

4. After completing the preparation of the Record Drawings, print on bond paper one (1) full size and three (3) half-size sets of each drawing set. Drawing sets shall be complete and include every sheet in the drawing set, whether or not changes and additional information were recorded. Organize the copies into manageable sets. Bind each set with durable paper covers sheets, with appropriate identification, including titles, dates and other information on cover sheets.

5. Organize and bind original marked-up set of prints that were maintained during the construction period in the same manner.

6. Submit the marked-up record set, and copy onto USB flash drive media. Provide three (3) copies to the Project Manager for County's records.

E. Specifications and Addenda:

1. Mark each Specification SECTION to record:

a. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually incorporated in the Work.

b. Changes made by Change Order and other modifications described in the GENERAL CONDITIONS.

c. Edit original Adobe Acrobat PDF document specification files provided by Architect; strike out materials/manufacturers not used and insert text boxes to indicate all changes. When completed with the Record Specifications, copy onto USB flash drive media. Each drive shall be clearly labeled with identifying the Project, contents and date. Provide three (3) copies to Project Manager.

F. Large-Scale Coordination Drawings:

1. The preparation of large-scale, detailed coordination drawings may be required for the Work of DIVISIONS 03, 04, 05, 21, 22, 23, 26, 27, 28 and 33 of these Specifications, other Sections may also be applicable. These coordination drawings are not Shop Drawings as defined by the GENERAL CONDITIONS, but, together with Shop Drawings or coordination drawings of other affected Work, are used to check, coordinate, and integrate the various types of Work.

2. If furnished, include the coordination drawings as part of the Project record documents.

G. As-Built Construction Schedule: Using as a basis the latest, updated Progress Schedule required by SECTION 01 33 00 "SUBMITTAL PROCEDURES," prepare and transmit a Record Construction Schedule to indicate the actual dates and durations of the various construction activities.

H. Sign and date the completed Project record documents and transmit them to the Architect, who will forward them to the County after final acceptance of the Work.

1.6 OPERATION TESTS

A. Reference all Specification Section 01 91 00/ Commissioning and other Sections that provide for Commissioning.

B. Conduct operational tests as required to demonstrate that all systems have been completed and are in compliance with all requirements.

C. Furnish a written record of test results using recording type instruments where applicable.

RFI 0576 GEN - O&M Specification Clarification

Cost/source removed & two hard copies 1 digital copy in lieu of three

1.7 OPERATING, MAINTENANCE, AND PRODUCT DATA

A. Reference all Specification Section 01 91 00/ Commissioning and other Sections that provide for Commissioning.

B. General: Where maintenance manuals, record data, and operating instructions are required in the individual Specification SECTIONS; and manufacturers' product data, specifications, installation instructions, and maintenance instructions for products incorporated in the Work; prepare such in three-ring, durable, plastic binders sized for 8-1/2" x 11" sheets and including at least the following:

1. Identification on, or readable through, the front cover with the Project name and address and the general subject matter contained in the manual.

2. Neatly typewritten index near the front of the manual furnishing immediate information as to locations in the manual of all emergency data regarding the equipment included in the manual.

3. Complete instructions regarding operation and maintenance of the equipment included in the manual.

4. Complete nomenclature of replaceable parts, their part numbers, ~~current cost, and name and address of nearest source of parts.~~

5. Copy of each guarantee/warranty and service contract issued for the equipment included in the manual.

6. Prepare and include additional data as required for the instruction of the County's operating and maintenance personnel.

C. Extraneous Data: Where contents of manuals include manufacturers' catalog pages, clearly indicate the items included in this installation and delete, or otherwise clearly indicate, data, which is not applicable to this installation.

D. Shop Drawings: With each copy of the manual, furnish one set of applicable reviewed Shop Drawings showing changes made during construction.

E. Number of Copies Required:

1. Transmit manuals in the quantity which is required to be returned, plus the following, unless otherwise specified, which will be retained by the Architect for forwarding to the County after acceptance of the Work.

a. TWO ~~Three~~ hard copies and digital file of Mechanical, Security, Building Management System and Electrical manuals.

b. Digital file copies of all other manuals.

F. Submittal Schedule: Comply with the following schedule for submittal of operating and

maintenance manuals.

1. Before submittal of Request for Final Payment, when each installation that requires submittal of operating and maintenance manuals is nominally complete, submit two copies of each manual to the Architect for review. Include a complete index or table of contents of each manual.

2. The Architect will return one copy with comments within fifteen days of receipt.

3. Submit one copy of the manuals in final form at least fifteen days before Final Inspection. This copy will be returned within fifteen days after Final Inspection, with comments.

4. After Final Inspection make corrections or modifications to comply with the Architect's comments. Submit the specified number of copies of each approved manual to the Architect within fifteen days of receipt of the Architect's comments.

1.8 INSTRUCTION OF THE COUNTY'S PERSONNEL

A. Where specified in the individual Specification SECTIONS, furnish qualified personnel for on-the-job instruction of the County's operating and maintenance personnel.

B. Furnish instruction, including special start-ups and running time, changing from heating to cooling cycles, prior to occupancy of the building, at no additional expense to the County.

C. Training:

1. Schedule training to conform to personnel availability at the facility and to conclude prior to start up of system. The base duration of training shall be determined by the complexity of the system or equipment and shall be done by qualified instructors from the manufacturer or contractor.

2. As part of the operator's training, one lesson plan shall be devoted to reviewing of videotape that shall be incorporated into the training program to allow new employees to view the tape at their own convenience and be able to comprehend the system without the need for an instructor in attendance.

3. Prepare videotapes to assist maintenance personnel in trouble- shooting the systems and making routine repairs. All videotapes shall be made at the Project facility to ensure that the video portrayal is representative of the true systems.

4. In addition to written technical descriptions, the training shall lay out prescribed hands-on-training under the supervision of others who have previously completed the training program. The foregoing techniques are to be developed to produce a program that is self-perpetuating and permits a high level of operator training in the event of high turnover rates among those who are assigned to duties in maintenance.

1.9 GUARANTEES/WARRANTIES AND BONDS

A. General:

1. Manufacturers' warranties notwithstanding warrant the entire Work against defects in materials and workmanship for 12 months from the date of Beneficial Occupancy if earlier, otherwise from day of recordation of the Notice of Completion of the Project. Other specified warranties may call for longer warranty period and should be submitted as such.

2. Guarantee/warranty or bond Work as required in the individual Specification SECTIONS.

3. Warranties between the Contractor and manufacturers, and the Contractor and suppliers, shall not affect guarantees/ warranties between the Contractor and the County.

4. The Contractor will not be held responsible for defects due to misuse, negligence, willful damage, improper maintenance, or accident caused by others, nor shall he be responsible for defective parts whose replacement is necessitated by failure of the County's maintenance forces to properly clean and service them, provided the Contractor has furnished complete maintenance instructions to the County.

5. Compile specified guarantees/warranties and bonds.

6. Co-execute as required.

7. Review guarantees/warranties and bonds to verify compliance with Contract Documents.

8. Transmit to the Architect for review. The Architect will forward guarantees/warranties and bonds to the County after acceptance of the Work.

B. Form of Guarantee/Warranty:

1. Submit the guarantees/warranties, typed on the Contractor's letterhead if for the entire Work, or on the Subcontractor's letterhead if for the Work of a Specification Section.

2. Provide guarantee/warranty verbiage in compliance with the standard guarantee/warranty form provided at the end of this section.

C. Submittal Requirements:

1. Time of Submittal:

a. For equipment or component parts of accepted equipment put into service for the County's benefit during the progress of the Work, submit guarantees/warranties within 10 days after beneficial occupancy.

b. Otherwise, submit guarantees/warranties within 10 days after date of Substantial Completion, prior to request for Final Payment.

c. For items of Work where acceptance is delayed materially beyond the date of Substantial Completion, furnish updated submittal within 10 days after such delayed acceptance, listing the date of delayed acceptance as the start of the guarantee/warranty period.

2. Form:

a. Assembled in durable, three-ring plastic binders sized for 8-1/2" x 11" sheets. Fold larger sheets to fit into binders.

b. Identification on, or readable through, the front cover with the Project name and address, the Contractor's name and address, and the title "GUARANTEES/WARRANTIES AND BONDS".

3. Number of Original Signed Copies Required: Two each.

D. Review Meeting: 11 months following date of acceptance, hold a meeting for the purpose of review of, and action upon, guarantees/ warranties, bonds, and service and maintenance contracts, as specified in SECTION 01 31 19 "PROJECT MEETINGS" for follow-up meeting.

E. WARRANTY REQUIREMENTS

1. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.

2. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

3. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the County has benefited from use of the Work through a portion of its anticipated useful service life.

4. County's Recourse: Written warranties made to the County are in addition to implied warranties, and shall not limit the duties, obligations, right and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the County can enforce such other duties, obligations, rights, or remedies.

a. Rejection of Warranties: The County reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.

5. The County reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to counter-sign such commitments are willing to do so.

1.10 SERVICE AND MAINTENANCE CONTRACTS

A. Compile, review, and transmit specified service and maintenance contracts as specified for guarantees/warranties and bonds.

1.11 PREPARATION FOR FINAL INSPECTION

A. Perform final cleaning as specified hereinbefore.

B. Assemble guarantees/warranties, service and maintenance contracts, operating and maintenance instructions, and other items as specified, and transmit to the Architect, who will forward them to the County after final acceptance of the Work.

1.12 RESTORATION OF DAMAGED WORK

A. Restore or replace, as specified or determined by the Architect, material and finishes damaged from construction activities at no additional expense to the County.

B. Restoration shall be equal to the original Work, and finishes shall match the appearance of existing adjacent Work.

1.13 REMEDIAL WORK

A. Remedial Work necessary owing to faulty workmanship or materials shall be at no additional expense to the County.

B. Work shall be coordinated with the County and performed at such time and in such manner to cause minimal interruption and inconvenience to the County's operations.

1.14 SPARE PARTS and EXTRA MATERIALS

A. Where required in the individual Specification SECTIONS, furnish spare parts and extra materials in the quantities and manners specified. Prior to submitting any parts and materials submit a list of all extra parts and materials required in the specification sections.

B. Delivery and certification of such extra spare parts and materials shall be a prerequisite to Substantial Completion. Deliver to Project Manager for sign-off.

C. Package in clearly identifiable boxes.

1. Indicate manufacturer's name, part name, and stock number.

2. Indicate piece of equipment part or tool is for.

3. Indicate name, address and phone number of closest supplier.

1.15 MISCELLANEOUS RECORD SUBMITTALS

A. Refer to other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Immediately prior to Final Acceptance, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for use and reference. Submit to the Project Manager for the County's records.

1.14 WARRANTY BOND

A. Prior to Final Payment, Contractor shall post a one-year Warranty Bond in the amount of 10% of the Final Contract Price.

**END OF SECTION 01 77 00**

**NOTE**: GUARANTEE/WARRANTY FORM FOLLOWS

# GUARANTEE/WARRANTY.

_____ (Contractor) hereby unconditionally guarantees that the

_____Work described in SECTIONS _____performed pursuant to the SB1022 Classroom and Vocational Training Center project has been done in accordance with the requirements of the Contract Documents and further guarantees the Work of the contract to be and remain free of defects in workmanship and materials for a period of _____ year(s) from the date of recordation of a Notice of Completion, Notice of Cessation, or actual cessation of Work, whichever is longer. The Contractor hereby agrees to repair or replace any and all Work, together with any adjacent Work which may have been damaged or displaced in so doing, that may prove to be defective in its workmanship or material within the guarantee period specified, without any expense whatsoever to Solano County; ordinary wear and tear, and unusual abuse and neglect only excepted. The Contractor has provided Contract bonds which will remain in full force and effect during the guarantee period.

The Contractor agrees that within ten (10) calendar days after being notified in writing by Solano County of any Work not in accordance with the requirements of the Contract or any defects in the Work, he will commence and prosecute with due diligence all Work necessary to fulfill the terms of this guarantee, and to complete the Work within a reasonable period of time. In the event he/she fails to so comply, he/she does hereby authorize Solano County to proceed to have such Work done at the Contractor's expense and he/she will pay the cost thereof upon demand. The County shall be entitled to all costs, including reasonable attorney fees, necessarily incurred upon the Contractor's refusal to pay the above costs.

Notwithstanding the foregoing paragraph, in the event of an emergency constituting an immediate hazard to the health or safety of the employees or property of Solano County, the County may undertake at the Contractor's expense without prior notice, all Work necessary to correct such hazardous condition when it was proven to be defective in its workmanship or materials, and to charge the same to the Contractor as specified in the preceding paragraph.

The guarantee set forth herein is not intended by the parties, nor shall it be construed, as in any way limiting or reducing Solano County’s rights to enforce all terms of the Contract Documents referenced hereinabove or the time for enforcement thereof. This guarantee is in addition to, and not in lieu of, the County's rights on all other guarantees and warranties required by the Contract Documents.

| | | |
|---|---|---|
| Subcontractor Signature | Address, License Number | Date |
| Countersigned<br>By General Contractor | Address, License Number | Date |

# WARRANTY BOND

KNOW ALL THESE MEN BY THESE PRESENTS:

That, _____(hereinafter called the Principal), as Principal, and _____, a corporation organized and existing under the laws of the State of _____, with its principal office in the City of _____ (hereinafter called the Surety), as Surety, are held and firmly bound unto SOLANO COUNTY (hereinafter called the Obligee), in the amount of _____Dollars ($_____)for the payment whereof, well and truly be made, the said Principal and Surety bind themselves, and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written contract with the Obligee, dated the_____ day of _____, 2017, to the SB1022 Classroom and Vocational Training Center Project , which contract is hereby referred to and made a part hereof as fully and to the same extent as if copies at length herein.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the said Principal Shall maintain and remedy said work free from defects in materials and workmanship for a period of ____ year(s) effective _____. Then this obligation shall be null and void; otherwise remain in full force and effect.

Witness our hands this _____ day of _____, 2017.

_____
Principal Seal

_____
By

_____
Surety Seal

_____
By

_____
Agency of Record

_____
Agency Address

# SECTION 01 81 00 - SUSTAINABLE DESIGN REQUIREMENTS

## PART 1 - GENERAL

1.1 SUMMARY

1. This section includes general requirements and procedures for compliance with certain U.S. Green Building Council (USGBC) LEED® prerequisites and credits needed for the Project to obtain LEED Silver Certified certification.
   a. Other LEED prerequisites and credits needed to obtain LEED Certification are dependent on material selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests.
   b. Additional LEED prerequisites and credits needed to obtain the indicated LEED certification are dependent on the Architect's

B. RELATED SECTIONS
   1. Section 01 74 19 - Construction Waste Management and Disposal.

1.2 REFERENCES

A. LEED-NC v3.3: Leadership in Energy and Environmental Design 2009 – New Construction and Major Renovations version 3.0. LEED is a national rating system for green buildings created by the US Green Building Council. All references to LEED throughout the Construction Documents shall mean LEED-NC v3.3.

B. Reused Material: Salvaged, refurbished or reused materials, products and furnishings that have been returned to active use in the same or related capacity as their original use.

C. Recycled Content: The percentage by weight of constituents that have been recovered or otherwise diverted from the solid waste stream, either during the manufacturing process (pre-consumer or post-industrial), or after consumer use (post-consumer).
   1. Scraps, spills or other waste from the original manufacturing process that are combined with other constituents after a minimal amount of reprocessing for use in the further production of the same product are not recycled materials.
   2. Discarded materials from one manufacturing process that are used as constituents in another manufacturing process are pre-consumer recycled materials.

D. Regionally Manufactured Materials: Materials that are manufactured within a radius of 500 miles from the Project location. Manufacturing refers to the final assembly of components into the building product that is delivered and installed at the Project location.

E. Regionally Extracted Materials: Constituent materials that are extracted, harvested or recovered (from salvage or recycling) and manufactured within a radius of 500 miles from the Project location.

F. Rapidly Renewable Materials: Materials made from agricultural products that are typically harvested within a ten-year or shorter cycle. Rapidly renewable materials include products made from straw, jute, flax, bamboo, cotton, vegetable oil, wool or sunflower seed hulls.

G. Composite Wood and Agri-fiber Board: Manufactured materials made from wood or agricultural fibers manufactured with bonding agents. Composite wood materials include particle board, OSB, MDF, strawboard, plywood and wheat board. Composite wood components used in assemblies are also controlled (e.g. door cores, panel substrates, plywood section of I-beams, etc.). Adhesive used in wood/agrifiber assemblies (veneered panels, composite wood products contained in engineered lumber, door assemblies, etc.) is not controlled in version LEED-NC (v3.3).

1.3 SUBMITTALS

A. General: Submit additional LEED related submittals included in other Sections of the Specifications and complete LEED Product Form Template in Appendix D.

B. LEED submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated LEED requirements.

C. Project Materials Cost Data: Provide the necessary cost data requested on the LEED Materials Calculator (The Material Calculator in Excel Spread Sheet Format will be provided to contractor during construction), including the total Project materials cost and itemized costs of specific materials being tracked for LEED credits. All material costs exclude labor and equipment and the total materials cost is exclusive of Specialties, Conveying Systems and Mechanical and Electrical components. See LEED Material Calculator attached at end of this section.

D. LEED Action Plans: Within 30 days of Notice to Proceed submit the following action plans:
1. Credit MRc2: Construction waste management plan complying with Section 01 74 19 - Construction Waste Management.
2. Credit IEQc3.1 & 3.2: Construction indoor air quality management plan complying with Section 01 91 01 - Construction IAQ Management.

E. LEED Progress Reports: Concurrent with each Application for Payment, submit reports summarizing progress in construction and purchasing activities related to the following credits:
1. Credit MRc2.1: Construction waste reduction progress reports complying with Section 01 74 19 - Construction Waste Management.
2. Credit MRc4: Summary of product data and material costs collected for all recycled content materials that have been purchased or installed.
3. Credit MRc5: Summary of manufacturer’s information and material costs collected for all regionally manufactured materials and regionally extracted, harvested or recovered materials that have been purchased or installed.
4. Credit IEQc3.1: Construction indoor air quality management reports complying with Section 01 91 01 - Construction IAQ Management.
5. Credit IEQc4.1: Summary of product data collected for all adhesives, sealants, paints, coatings, carpeting, and composite wood materials purchased and installed inside of the building’s moisture barrier.

F. LEED Documentation Submittals: For each Section of the Specification, submit the following for each applicable LEED Credit.
   1. Credit SSc4.2: Alternative Transportation, Bicycle Storage and Changing Rooms: Cut-sheets of installed bicycle securing apparatus.
   2. Credit SSc7.2: Heat Island Effect, Roof: Cut-sheets and product data for roofing materials indicating Energy Star rating and tested initial solar reflectance, 3-year- aged reflectance (per ASTM E903-96) and emissivity (per ASTM E408-71).
   3. Credit WEc2: Innovative Wastewater Technologies: Cut-sheets for toilets and urinals indicating flush volumes (gallons/flush).
   4. Credit WEc3: Water Use Reduction: Cut-sheets for all faucets, showers, toilets and urinals indicating flow rates (gallons/minute) and flush volumes (gallons/flush).
   5. Credit EAc2: Renewable Energy: Cut-sheets for on-site renewable energy systems installed.
   6. Credit EAc4: Enhanced Refrigerant Management: Cut-sheets for HVAC equipment indicating refrigerant type.
   7. Credit MRc2: Construction Waste Management:
      a. Comply with Section 01 74 19 - Construction Waste Management.
      b. Construction waste management plan.
      c. Complete LEED construction waste calculations.
      d. Itemized waste hauling certificates/receipts for all waste removed from the Project site and documentation of recycling recovery rate for off-site sorting facilities (if waste is commingled).
   8. Credit MRc4: Recycled Content:
      a. Cut-sheet, product literature or letter from manufacturer that clearly indicates the percentage by weight of post-consumer and pre-consumer (post-industrial) recycled content.
      b. Material cost.
   9. Credit MRc5: Regional Materials, Extracted Regionally:
      a. Cut-sheet, product literature or letter from manufacturer indicating the location of manufacturer and extraction, harvest or recovery of each material constituent. If only some of the constituents are extracted, harvested or recovered regionally, provide the approximate percentage by weight.
      b. Material cost.
   10. Credit IEQc1: Carbon Dioxide Monitoring: Cut-sheets for installed carbon dioxide monitoring system.
   11. Credit IEQc3.1: Construction IAQ Management, During Construction:
      a. Comply with Section 01 91 01 - Construction IAQ Management.
      b. Cut-sheets indicating MERV values for filtration media used during construction and installed immediately before occupancy.
   12. Credit IEQc3.2: Construction IAQ Management, After Construction:
      a. Narrative outlining the building flush-out procedures, including start and finish dates and mechanical system settings. If possible, provide trend log from DDC system for flush-out period.
      b. Cut-sheets indicating MERV values for filtration media replaced after flush-out, except filters solely processing outside air.
      c. If IAQ testing is performed in place of building flush-out, provide specifications and documentation demonstrating conformance with IAQ testing procedures per credit requirements.
   13. Credit IEQc4.1: Low-Emitting Materials, Adhesives and Sealants:

a. Product data and Material Safety Data Sheets (MSDS) for all adhesives and sealants used inside the building's moisture barrier indicating the Volatile Organic Compound (VOC) content of each product and verifying that each product meets the LEED requirements (Refer to "Low Emitting Materials" paragraph in Part 2). Indicate VOC content in grams/liter (g/l) calculated according to 40 CFR 59, Subpart D (EPA method 24).
b. List of all installed adhesives and sealants including manufacturer, quantity used in gallons and VOC content.

14. Credit IEQc4.2: Low-Emitting Materials, Paints and Coatings:
    a. Product data and Material Safety Data Sheets (MSDS) for all paints used inside the building's moisture barrier indicating the VOC content of each product and verifying that each product meets the LEED requirements (Refer to "Low Emitting Materials" paragraph in Part 2). Indicate VOC content in grams/liter (g/l) calculated according to 40 CFR 59, Subpart D (EPA method 24).
    b. List of all installed paints including manufacturer, quantity used in gallons and VOC content.
15. Credit EQc4.3: Low-Emitting Materials, Carpet: Cut-sheets of letter from manufacturer clearly indicating that all carpet products meet the CRI Green Label Test Program requirements.
16. Credit EQc4.4: Low-Emitting Materials, Composite Wood: Cut-sheets clearly indicating the bonding agents used for each composite wood and agri-fiber product used in the project and demonstrating that no added urea-formaldehyde resins are used in these products.
17. Credit EQc5: Chemical and Pollutant Source Control:
    a. Cut-sheet of permanent entryway systems (grills, grates, walk-off mats, etc.).
    b. Cut-sheet of drainage system installed in janitor's closet.
18. Credit EQc7.2: Thermal Comfort, Permanent Monitoring System: Cut-sheets of installed permanent temperature and humidly monitoring system.

## PART 2 - PRODUCTS

### 2.1 LOW-EMITTING MATERIALS

A. Credit EQc4.1: For interior applications use adhesives and sealants that comply with the following limits for VOC content when calculated according to 40 CFR 59, subpart D (EPA method 24):

| **PRODUCT TYPE** | **VOC Limit G/L** |
|---|---|
| ***Sealants*** | |
| Architectural | 250 |
| Porous Architectural Sealant Primer | 775 |
| Non-porous Architectural Sealant Primer | 250 |
| ***Architectural Adhesives Applications*** | |
| Indoor Carpet Adhesives | 50 |
| Carpet Pad Adhesives | 50 |
| Outdoor Carpet Adhesives | 150 |
| Wood Flooring Adhesives | 100 |

| PRODUCT TYPE | VOC Limit G/L |
|---|---|
| Rubber Floor Adhesives | 60 |
| Subfloor Adhesives | 50 |
| Ceramic Tile installation | 65 |
| VCT and Asphalt Tile Adhesives | 50 |
| Dry Wall and Panel Adhesives | 50 |
| Cove base installation | 50 |
| Multipurpose Construction Adhesive | 70 |
| Structural Glazing Adhesives | 100 |
| ***Substrates*** | |
| Metal to metal | 30 |
| Plastic foams | 50 |
| Porous material except wood | 50 |
| Wood | 30 |
| Fiberglass | 80 |
| ***Welding & Installation*** | |
| PVC welding | 510 |
| CPVC welding | 490 |
| ABS welding | 400 |
| Plastic cement welding | 350 |
| Adhesive primer for plastic | 650 |
| Contact Adhesive | 80 |
| Special Purpose Contact Adhesives | 250 |
| Structural Wood Member Adhesives | 140 |
| Sheet Applied Rubber Lining Operations | 850 |
| Top and Trim Adhesive | 250 |
| ***Sealant Primer*** | |
| Architectural (non-porous) | 250 |
| Architectural (porous) | 775 |
| Other | 750 |
| ***Aerosol Adhesives*** | |
| General purpose mist spray | 65-percent VOCs by weight |
| General purpose web spray | 55-percent VOCs by weight |
| Special purpose aerosol adhesives (all types)<br>Waterproofing concrete/masonry sealers | 70-percent VOCs by weight |

B. Credit IEQc4.2: For interior applications use paints that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA method 24).

| | VOC Limit (g/L) |
|---|---|
| ***Interior Coatings*** | |
| Non-flat | 150 |

| | |
|---|---|
| Flat | 50 |
| ***Exterior Coatings*** | |
| Non-flat | 200 |
| Flat | 100 |
| ***Anti-Corrosive*** | |
| Gloss | 250 |
| Semi-Gloss | 250 |

C. Credit IEQc4.3:Provide carpets that comply with the following limits as established by the Carpet and Rug Institute:

| | **Emission factor limit (mg/m2/hr)** |
|---|---|
| **Carpets** | |
| Total VOCs | 0.5 |
| 4 – Phenylcyclohexane | 0.05 |
| Formaldehyde | 0.05 |
| Styrene | 0.4 |
| **Cushion** | |
| Total VOCs | 1 |
| 4 – Phenylcyclohexane | 0.3 |
| Formaldehyde | 0.05 |
| Styrene | 0.05 |
| **Adhesives** | |
| Total VOCs | 10 |
| Formaldehyde | 0.05 |
| 2 - Ethyl - 1 – Hexanol | 3 |

D. Credit IEQc4.4: For all interior applications, do not use wood or agri-fiber products that contain urea-formaldehyde resin.

**PART 3 - EXECUTION (NOT USED)**

**END OF SECTION 01 81 00**

# SECTION 01 91 01 - CONSTRUCTION INDOOR AIR QUALITY MANAGEMENT

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:
   1. Submittals.
   2. Construction Air Quality Management Plan
   3. This Section describes construction Indoor Air Quality (IAQ) goals and includes administrative and procedural requirements for the development and execution of a construction air quality management plan.
      a. County has established that the contractor shall prevent indoor air quality problems resulting from the construction process, to sustain long term installer and occupant health and comfort.
      b. Protect the ventilation system components during construction and clean contaminated components after construction is complete.
      c. Control sources of potential IAQ pollutants by controlling selection of materials and processes used in project construction.

B. Related Sections include the following:
   1. Section 01 81 00 - LEED Requirements for special requirements for LEED certification
   2. Division 23: Material and Equipment procedures for storage of interior materials to prevent exposure to moisture and pollutants.
   3. Division 23: Basic Mechanical Requirements for duct cleaning procedures.

### 1.2 SUBMITTALS

A. IAQ Management Plan.

B. Photographs documenting construction IAQ management measures implemented during construction.

C. Manufacturer’s Product Information stating Minimum Efficiency Reporting Valves (MERV).

### 1.3 CONSTRUCTION AIR QUALITY MANAGEMENT PLAN

A. Develop a Draft Indoor Air Quality (IAQ) Management Plan for the construction and pre-occupancy phases of the building as follows:
   1. During construction meet or exceed the minimum requirements of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, Chapter 3,
   2. Protect stored on-site or installed absorptive materials from moisture damage.
   3. Conduct a minimum two-week long building flush-out after construction ends and prior to occupancy.

B. The SMACNA IAQ Guidelines for Occupied Buildings under Construction provides an overview of air pollution associated with construction, control measures, construction process management, quality control, communicating with occupants, and case studies. These guidelines can be accessed at www.smacna.org. Chapter 3 of the SMACNA Guidelines recommends Control Measures in five areas: HVAC protection, source control, pathway interruption, housekeeping, and scheduling. Review the applicability of each Control Measure and include those that apply in the Draft IAQ Management Plan.

1. HVAC Protection: Shut down the return side of the HVAC system whenever possible during heavy construction. If the system must remain operational during construction include the following strategies that apply:
   a. Fit the return side of the HVAC system with temporary filters with a Minimum Efficiency Reporting Value (MERV) of 8.
   b. Isolate the return side of the HVAC system from the surrounding environment as much as possible (e.g., place all tiles for the ceiling plenum, repair all ducts and air handler leaks).
   c. Damper off the return system in the heaviest work areas and seal the return system openings with plastic.
   d. Upgrade the filter efficiency where major loading is expected to affect operating HVAC system.
   e. Clean permanent return air ductwork per National Air Duct Cleaning Association standards upon completion of all construction and finish installation work.
   f. Install new clean media just prior to substantial completion and occupancy that has a Minimum Efficiency Reporting Value (MERV) of 13 as determined by ASHRAE 52.2.
2. Source Control: Propose the substitution of non-toxic formulations of materials that are generally the responsibility of the contractor such as caulks, sealants, and cleaning products.
3. Pathway Interruption: Prevent contamination of clean spaces. Include the following strategies that apply:
   a. Use 100-percent outside air ventilation (when outside temperatures are between 55 degrees F and 85 degrees F and humidity is between 30 percent and 60 percent) with air exhausted directly to the outside during installation of finishes and other VOC emitting materials.
   b. Erect barrier between work areas or between the inside and outside of the building to prevent unwanted airflow from dirty to clean areas.
4. Housekeeping: Reduce construction contamination in the building prior to occupancy through HVAC and regular space cleaning activities.
   a. Store building materials in a weather tight, clean area prior to unpacking for installation.
   b. Check for possible damage to building materials from high humidity.
   c. Clean all coils, air filters, and fans before testing and balancing procedures are performed.
5. Scheduling: Specify construction sequencing to reduce absorption of VOC’s by construction finish materials that may act later as contaminant sources. Complete application of wet and odor-emitting materials such as paints, sealants, and coatings before installing absorbtive finish materials such as ceiling tiles, carpets, insulation, gypsum products, and fabric-covered furnishings are installed.

a. Protect stored on-site or installed absorptive materials from exposure to moisture from precipitation, plumbing leaks, or condensation from the HVAC system to prevent microbial contamination.
b. Conduct a two-week building flush-out with new filtration media at 100-percent outside air after construction ends and prior to occupancy. Filtration media shall have a Minimum Efficiency Reporting Value (MERV) of 13 as determined by ASHRAE 52.2. Replace filtration media used during flush-out prior to occupancy.

C. Draft IAQ Management Plan Review Meeting: Once the County Representative and Architect have reviewed the Draft IAQ Management Plan and prior to construction at the site, schedule and conduct a meeting to review the Draft IAQ Management Plan and discuss procedures, schedules and specific requirements for IAQ during the construction and pre-construction phases of the building. Discuss coordination and interface between the Contractor and other construction activities. Identify and resolve problems with compliance to the requirements. Record minutes of the meeting; identify all conclusions reached and matters requiring further resolution.
1. Attendees: The Contractor and related Contractor personnel associated with the work of this section, including personnel to be in charge of the IAQ management program, Architect, County Representative, Inspector, and such additional personnel as the Architect or County Representative deem appropriate.

D. Final IAQ Management Plan: Make any revisions to the Draft IAQ Management Plan agreed upon during the meeting identified in item (C) above and incorporate resolutions agreed to be made subsequent to the meeting. Submit the revised plan to the County Representative for approval within 10 calendar-days of the meeting.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION**

3.1 IMPLEMENTATION OF IAQ MANAGEMENT PLAN

A. Manager: The Contractor shall designate an on-site party (or parties) responsible for instructing workers and overseeing the IAQ Management Plan for the Project.

B. Progress Meetings: Construction related IAQ procedures shall be included in the pre-construction and construction progress meeting agendas.

C. Distribution: The Contractor shall distribute copies of the IAQ Management Plan to the Job Site Foreman, each Subcontractor, the County Representative, and the Architect.

D. Instruction: The Contractor shall provide on-site instruction of the IAQ procedures and ensure that all participants in the construction process understand the importance of the goals of the IAQ Management Plan.

**END OF SECTION 01 91 01**

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**SECTION 01 91 13 - COMMISSIONING** REQUIREMENTS
**PART 1 GENERAL**

1.1 SUMMARY

A. Section Includes

This section includes overview of the commissioning process. (Fundamental and Enhanced Commissioning).

B. Related Sections

1. Section 01 33 00 - Submittal Requirements
2. Section 01 40 00 – Quality Control and Quality Assurance
3. Section 01 77 00 – Contract Closeout Procedures
4. Section 01 81 00 - Sustainable Design Requirements
5. Division 22 – Plumbing
6. Division 23 – Heating Ventilating, and Air-Conditioning (HVAC)
7. Division 26 – Electrical
8. Section 27 51 23 – Intercom System
9. Division 28 – Electronic Safety and Security

C. Related Documents

1. Commissioning Plan

1.2 DESCRIPTION

A. Commissioning

1. This project will have selected building systems commissioned. The commissioning process will be directed by a Commissioning Agent, hired and paid for by the County.
2. Commissioning is a systematic process of ensuring that all building systems perform interactively according to the design intent and Owner's operational needs. This is achieved by actual verification of performance. The commissioning process encompasses and coordinates the functions of system documentation, equipment start-up, control system calibration, testing and balancing, performance testing and training. Commissioning during the

construction phase is intended to achieve the following specific objectives according to the Contract Documents:

a. The commissioning efforts shall be integrated with the Quality Plan. Specifically, the requirements of the Quality Plan shall be satisfied prior to the inception of functional testing. Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by Contractor.

b. Verify and document proper performance of equipment and systems.

c. Verify that O&M documentation is complete.

d. Verify that the County's operating personnel are adequately trained.

B. The commissioning process does not reduce the responsibility of the installing contractors to provide a finished and fully functioning product in accordance with the Contract Documents.

1.3 DEFINITIONS

A. Approval acknowledgement that a piece of equipment or system has been properly installed and is functioning in the tested modes according to the Contract Documents.

B. Basis of Design (BOD) - The basis of design is the documentation of the primary thought processes and assumptions behind design decisions that were made to meet the design intent. The basis of design describes the systems, components, conditions and methods chosen to meet the intent. Some reiterating of the design intent may be included.

C. Commissioning Agent (CxA) - An independent agent, not otherwise associated with the A/E team members or the Contractor. The CxA directs and coordinates the commissioning activities. Final documents will be subject to review and approval by the CxA to achieve project completion.

D. Commissioning Plan - An overall plan, developed before or after bidding, that provides the structure, schedule and coordination planning for the commissioning process.

E. Contract Documents –the documents binding on parties involved in the construction of this project (drawings, specifications, change orders, amendments, contracts, etc.)

F. Contractor – the General Contractor or authorized representative and the subcontractors.

G. Contractor's Commissioning Coordinator (CCxC) – a representative of the Contractor. The CCxC duties include managing the contractors commissioning team, and scheduling the work of the various subcontractors. The CCxC is part of the Contractor's Commissioning Team and reports to the Commissioning Agent.

H. Control System – the Temperature Control System (TCS) and Building Management System (BMS) using Direct Digital Controls.

I. Datalogging - Monitoring flows, currents, status, pressures, etc. of equipment using stand-alone dataloggers separate from the control system.

J. Deferred Functional Performance Tests (FT) that are performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions that disallow the test from being performed.

K. Deficiency - A condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents (that is, does not perform properly or is not complying with the design intent).

L. Factory Testing – testing of equipment on-site or at the factory-by-factory personnel with an Owner's representative present.

M. Functional Test (FT) - Test of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to be responding as the sequences state. Traditional air or water test and balancing is not functional testing. TAB's primary work is setting up the system flows and pressures as specified, while functional testing is verifying that which has already been set up. The CxA develops the functional test procedures in a sequential written form, coordinates, oversees and documents the actual testing, which is usually performed by the installing Contractor or vendor. FT's are performed after prefunctional checklists and start-up are complete.

N. Indirect Indicators - Indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100-percent closed.

O. Manual Test - Using hand-held instruments, immediate control system readouts or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the "observation").

P. Monitoring - The recording of parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of control systems.

Q. Non-Compliance – see Deficiency.

R. Non-Conformance – see Deficiency

S. Over-written Value - Writing over a sensor value in the control system to see the response of a system (e.g., changing the outside air temperature value from 50-degrees F to 75-degrees F to verify economizer operation). See also "Simulated Signal."

T. Owner's Architectural/Engineering Design Team (A/E) – the team of the Owner's consultants and subconsultants develop the design, generally the HVAC mechanical designer/engineer, the electrical designer/engineer and the security designer.

U. Owner-Contracted Tests- tests paid for by the Owner outside the GC's contract and which the CxA does not oversee. These tests will not be repeated during functional tests if properly documented.

V. Owner's Project Requirements (OPR) – documents that define the design criteria and features that are most important to the Owner.

W. Prefunctional Checklist (PC also referred to as Construction Checklists) - A list of items to inspect and elementary component tests to conduct to verify proper installation of equipment. Pre-functional tests are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension, oil levels, labels affixed, gauges in place, sensors calibrated, etc.). However, some pre-functional test items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three phase pump motor of a chiller system). The term "pre-functional" implies that these items must be completed prior to the functional testing. Pre-functional tests augment but do not replace the manufacturer's start-up procedures. Even without a commissioning process, contractors typically perform some, if not many, of the pre-functional checklist items a commissioning Agent will recommend. However, few contractors document in writing the execution of these checklist items. Therefore, for most equipment, the contractors execute the checklists on their own. The Commissioning Agent requires that the procedures be documented in writing, and typically does not witness much of the pre-functional testing, except for larger or more critical pieces of equipment.

X. Sampling - Functionally testing only a fraction of the total number of identical or near identical pieces of equipment.

Y. Seasonal Performance Tests - FT that is deferred until the system(s) will experience conditions closer to their design conditions.

Z. Simulated Condition - Condition that is created for the purpose of testing the response of a system (e.g., applying a hair blower to a space sensor to see the response in a VAV box).

AA. Simulated Signal - Disconnecting a sensor and using a signal generator to send an amperage, resistance or pressure to the transducer and DDC system to simulate a sensor value.

BB. Start-up - The initial starting or activating of dynamic equipment, including executing prefunctional checklists.

CC. Test Procedures - The step-by-step process which must be executed to fulfill the test requirements. The test procedures are developed by the CxA.

DD. Test Requirements - Requirements specifying what modes and functions, etc. shall be tested. The test requirements are not the detailed test procedures. The test requirements are specified in the Contract Documents and the referenced industry association standards, such as NFPA, or have been developed through the collaboration of the Commissioning team.

EE. Trending - Monitoring using the building control system.

FF. Vendor – supplier of equipment

GG. Verification Phase – phase of construction after start-up and initial checkout when functional tests, O&M documentation review and training occurs.

HH. Inspectors (TI) – County Inspector.

1.4 COORDINATION

A. Commissioning Team: The Commissioning Team for the construction and post-occupancy periods shall include:

1. Contractor Members:

a) The Contractor's Commissioning Coordinator (CCxC), see paragraph 1.3, G.

b) The Contractor's Quality Assurance Manager (see Specifications, Section 01 40 00 "Quality Requirements")

c) Key subcontractors where appropriate

d) The Test and Balance Contractor

e) The Electrical Testing Agency

2. The Owner:

a) The County's representative

b) The Owner's Commissioning Agent (CxA)

c) The building operators and engineer

d) The Owner's inspectors

e) The Owner's Architectural/Engineering (A/E) Design Team Members

B. Scheduling: The CxA will work with Contractor according to established protocols to schedule the commissioning activities. The CxA and TI will review the Construction Schedule and indicate when prefunctional and functional testing should occur. The Contractor will integrate all commissioning activities into the master construction schedule.

1.5 OVERVIEW OF THE COMMISSIONING PROCESS

A. Fundamental Commissioning Process: The following narrative provides a brief overview of the Fundamental Commissioning tasks during the design and the construction phases.

1. Commissioning during the construction phase consists of verifying the installation and performance of the systems by reviewing the PC and FT forms and developing a summary of the commissioning report.

2. Fundamental Commissioning during construction begins with a scoping meeting conducted by the CxA where the commissioning process is reviewed with the commissioning team members.

3. Additional meetings will be required throughout construction, scheduled by the CxA with necessary parties attending, to plan, scope, coordinate, schedule future activities and resolve problems. Typically these will follow the weekly contractors' meetings.

4. Equipment documentation is submitted to the CxA through the normal submittal process.

5. The full start-up and initial checkout plan shall get approval from the CxA.

6. The Contractor executes and documents the prefunctional checklists. The CxA documents that the checklists were completed according to the approved plans. The CxA and TI will witness a percentage of the prefunctional tests and verify prefunctional checklists are being completed correctly.

7. The CxA develops specific equipment and system functional performance test procedures.

8. The FT procedures are executed by the Contractor and documented by the CxA.

B. Enhanced Commissioning Process: The following narrative provides a brief overview of the Enhanced Commissioning tasks during the design and the construction phases.

1. Commissioning review of the OPR, BOD, Specifications, and the Commissioning plan developed in the Fundamental Commissioning Process.

2. The CxA provides a review of the contractor submittals applicable to systems being commissioned in compliance with the OPR and BOD.

3. The CxA and TI will review the O&M documentation for completeness.

4. The CxA and TI will review the training provided by the Contractor and verify that it is completed.

5. The CxA and TI will verify continual systems performance during the warranty period.

1.6 RESPONSIBILITIES

A. Commissioning Agent (CxA) Responsibilities:

1. Review and approval of the contractor's commissioning team members.

2. Review of the design documents.

3. Preparation of the draft Commissioning plan including brief overview of commissioning process, list of all systems and assemblies included in the commissioning work, identification of the Commissioning Team and its responsibilities, description of the management, communication and reporting of the commissioning process, Overview of the commissioning activities for design, construction, warranty and post warranty phases, list of the expected work products and list of Key commissioning process milestones.

4. Coordinate the commissioning work with the Contractor to ensure that commissioning activities are being scheduled into the master schedule.

5. Schedule and chair commissioning meetings and site visits. Record and distribute trip reports. During scheduled site visits, observe component and system installations.

6. Review Contractor submittals, applicable to systems being commissioned for compliance with the specifications.

7. Review the pre-functional checkout procedures with the Contractor.

8. Document prefunctional checklist completion by reviewing completed prefunctional checklists and by selected site observation.

9. Development of functional test scripts as noted in specifications (some of the Specification Sections require the contractor to develop the functional test scripts). Review with the Contractor, the functional performance test procedures for equipment and systems. This will include manual functional testing, energy management control system trending and may include stand-alone datalogger monitoring.

10. Analyze functional performance trend logs and monitoring data to verify performance.

11. Witness all pre-functional and functional testing and ensure that all tests are successfully completed. Sign each test form indicating that the test was witnessed and successfully run.

12. Witness and verify testing of all control systems including: point-by-point verification, sensor calibration (as specified), mapping of data through gateways.

13. Development of Cx issues log and report all issues and correction progress in the master issues log to the County. Provide directly to the County written progress reports and test results with recommended actions.

14. During Warranty Phase conduct periodic review by the CxA of the system performance throughout the warranty period.

15. Compile a Commissioning Report, which shall include:

    a. A brief summary report that includes a list of participants and roles, brief building description, overview of commissioning and testing scope, and a general description of testing and verification methods.

    b. All outstanding non-compliance items shall be specifically listed. Recommendations for improvement to equipment or operations, future actions, commissioning process changes, etc. shall also be listed. Each non-compliance issue shall be referenced to the specific functional test, inspection, trend log, etc. where the deficiency is documented.

    c. The issues log, commissioning plan, progress reports, a summary of the design review process, submittal and O&M manual reviews, training record, test schedules, prefunctional checklists, start-up reports, functional tests, and trend log analysis.

16. Verify that the requirements for training operating personnel and building occupants are completed.

17. Review equipment warranties.

18. Return to the site 8 to 10 months after substantial completion and review with the facility staff the current building operation and the condition of outstanding issues related to the original and seasonal commissioning. Also interview facility staff and identify problems or concerns they have with operating the building as originally intended. Make suggestions for improvements and for recording these changes in the O&M manuals. Identify areas that may come under warranty or under the original construction contract. Assist facility staff in developing reports and documents and requests for services to remedy outstanding problems.

19. Review BMS post-construction and post –occupancy trends from the Section 23 09 23 Direct Digital Controls Contractor prior to submission to the CxA. Ensure

that the trend data includes all of the required data. Ensure that the trends are formatted as required. Ensure that there are no gaps in the trends. Verify resolution of trend review punch lists from CxA. Verify retesting where required until tests are successfully completed.

20. Sign the LEED letter for the commissioning and enhanced commissioning credits.

B. Contractor Responsibility:

1. Qualifications of the Contractor's Commissioning Coordinator (CCxC): Cumulative of four or more years of experience in commissioning projects of similar size and complexity including building mechanical, electrical or security system commissioning. The CCxC may be either an employee of or direct subcontractor to the Contractor and may perform other roles on the project.

2. Construction Phase

a. Management of the commissioning activities

b. Prepare a schedule of commissioning activities including: Submission of equipment submittals and shop drawings, equipment start-up and pre-functional tests, factory start-up and inspection of equipment, Test and Balance, BMS calibration and start up, electrical system functional testing, BMS function testing, BMS demonstration test to CxA., BMS trending initiation, BMS trend review data distribution to the CxA representative, submission of operations and maintenance manuals, development and submission of record drawings and training of the Owner's personnel.

c. Prepare a system and equipment commissioning matrix with a line item for each piece of equipment and each subsystem specified to be commissioned under Divisions 22, 23, 26, 27 and 28. The System/Equipment matrix shall include for each line item: Equipment tag or name, service, location, responsible subcontractor. It shall also include the due date and actual completion date for the following (where applicable):

1) Submittals

2) Shop drawings

3) Factory Test

4) Equipment Test

5) Preliminary operations and maintenance manuals indicating start-up procedures

6) Pre-start verification

7) Equipment start-up

8) Pre-functional test

9) Test and balance

10) Functional and maintenance manuals

11) Operations and maintenance manuals

12) Record drawings

13) Training

d. Complete the commissioning matrix as activities are completed, and distribute to Commissioning team at least one day prior to each Team meeting or when requested by the Owner/CxA

e. Notify the CxA when pipe and duct system testing, flushing, cleaning, start-up of each piece of equipment and Testing Adjusting & Balancing (TAB) will occur. Be responsible to notify the CxA ahead of time, when commissioning activities not yet performed or not yet scheduled will delay construction. Be proactive in seeing that commissioning processes are executed and that the CxA has the scheduling information needed to efficiently execute the commissioning process

f. Attend a commissioning scoping meeting and other meetings necessary to facilitate the Commissioning process.

g. Provide assistance to the CxA in preparing the specific functional performance test procedures when requested. Contractor shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.

h. System documentation including as-built drawing and O&M documentation. Provide additional requested documentation, prior to normal O&M manual submittals, to the CxA for development of functional testing procedures. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.

i. During construction, maintain as-built red-line drawings for all drawings and final CAD as-builts for Contractor-generated coordination drawings. Update after completion of commissioning (excluding deferred testing).

j. Equipment start-up: develop a full start-up and initial checkout plan. Submit to CxA for review four weeks prior to start-up.

k. Perform full start-up and initial checkout and compile the check record. All site installed sensors and actuators shall be calibrated during prefunctional check by the Contractor. Clearly document all completed start-up, prefunctional check, and system initial checkout procedures, providing a copy to the CxA.

l. Control system calibration and testing. Provide all test equipment necessary to fulfill specified testing requirements.

m. Perform Functional Tests (FT) and compile the FT record. This includes manual functional testing, energy management control system trending and may include stand-alone datalogger monitoring. Analyze functional performance trend logs and monitoring data to verify performance.

n. The functional testing shall include operating the system and components through each of the written sequences of operation, and other significant modes and sequences, including start-up, shutdown, unoccupied mode, manual mode, staging, miscellaneous alarms, power failure, security alarm when impacted and interlocks with other systems or equipment.

o. Tests on respective HVAC equipment shall be executed, if possible, during both the heating and cooling season. However, some overwriting of control values to simulate conditions may be required. Functional testing shall be done using conventional manual methods, control system trend logs, and read-outs or stand-alone dataloggers, to provide a high level of confidence in proper system function, as deemed appropriate by the Commissioning Agent.

p. Address current A/E punch list items before functional testing. Air and water testing and balancing shall be completed with discrepancies and problems remedied before functional testing of the respective air- or water-related systems.

q. Coordinate BMS post-construction and post-occupancy trend reviews with Section 23 09 23 Direct Digital Controls Contractor: The post-construction review will occur directly after functional testing is complete. Ensure data is transmitted in required format to the CxA. Coordinate and ensure resolution of trend review punch lists from CxA. Coordinate retesting where required until tests are successfully

completed. Assist the CxA in interpreting the trending and monitoring data, as necessary.

r. Correct deficiencies (differences between specified and observed performance) as interpreted by the CxA and A/E and retest the equipment.

s. Report the corrected issues to CxA and reschedule testing the non-conformance items with CxA.

t. Testing and balancing: submit the outline of the TAB plan and approach for each system and component to the CxA and TI six weeks prior to starting the TAB.

u. Training of Owner's operational personnel: provide training and submit the training verification report to CxA. Submit the recorded training session to the County.

v. Training shall consist of a review of the O&M manuals and hands-on training. Hands-on training shall include start-up, operation in all modes possible, including manual shut-down and any emergency procedures and preventative maintenance for all pieces of equipment. The Contractor shall fully explain and demonstrate the operation, function and overrides of any local packages controls, not controlled by the central control system. Training shall occur after functional testing is complete, unless approved otherwise by the PM.

w. Documentation of commissioning activities.

3. Warranty Phase

a. Contractor remedial work to fix deficiencies identified in Warranty Phase reviews by the Owner.

b. Refer to Division 1 for additional requirements.

c. Ensure the warranty package is delivered to the County and CxA. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

1.7 SYSTEMS TO BE COMMISSIONED with Commissioning Agent ( O ) and without Commissioning Agent ( X )

| | HVAC Equipment and System | | Electrical Equipment and System |
|---|---|---|---|
| (0) | Variable Refrigerant Flow Heating and Cooling System | (0) | Lighting Control Systems |
| (0) | Exhaust Systems | (0) | Occupancy Sensors |
| (0) | Variable Refrigerant Flow air terminals | (0) | Programming Lighting Control Panels |
| (0) | Air inlets and outlets | (0) | Variable Frequency Drives |
| (0) | Fire/smoke dampers | (0) | Small Uninterruptable power supply systems |
| (0) | Controls System (TPC and BMS) | (0) | Photovoltaic Array system |
| (0) | Testing, Adjusting, and Balancing | (0) | Medium Voltage Switchgear |
| | | (0) | Low Voltage Switchgear |
| | | (0) | Electrical Monitoring and control systems |
| | **Communications System** | | **Plumbing System** |
| (0) | Intercom System | (0) | Domestic Hot Water |
| | **Electronic Safety and Security** | (0) | Natural Gas fired water heater |
| (0) | Access Control System | (0) | Cold Water |
| (0) | IP Video Surveillance | | |
| (0) | Touchscreen Control Station | | |
| (0) | Programmable Logic Controller (PLC) | | |
| | | | |

**PART 2 PRODUCTS**

2.1 TEST EQUIPMENT

A. All standard testing equipment required to perform the full start-up and initial checkout and the required full functional performance testing shall be provided by the Contractor for the equipment being tested.

B. Special equipment, tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents shall be included in the base bid price to the Contractor and shall be left on site for use by County.

C. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications.

## PART 3 EXECUTION

3.1 MEETINGS

A. During regular Contractor meetings, the CxA will be available to answer questions about the commissioning process and assist the Contractor in the completion of prefunctional and functional test sheets.

B. Contractor Members of Commissioning Team shall attend all scheduled meetings:

1. At start of construction until 30 days prior to start-up of any equipment.

2. One scoping meeting shall occur prior to any Division 22, 23, 26 27 and 28 submissions of equipment submittals or shop drawings. Meeting shall include a discussion of preliminary commissioning schedule and roles of each Team member.

3. Bi-monthly progress meeting; more or less frequent if required in the judgment of the commissioning agent.

4. 30 days prior to start-up of any or less equipment through start of functional testing: bi-weekly progress meeting; more/less frequent if required in the judgment of the commissioning agent.

5. During functional testing until their completion: Weekly progress meeting; more or less frequent if required in the judgment of the commissioning agent.

6. After functional testing until all commissioning documentation is complete: Meetings as required by the commissioning agent.

3.2 REPORTING

A. The CxA will provide trip reports and document the progress of the commissioning activity. Initially this will occur monthly, and in the later stages of construction will occur at least bi-weekly.

3.3 SUBMITTALS

A. Submittal Requirements for Commissioning:

1. Copies required: In addition to the submittal quantity requirements of Section 01 33 00, submit to the CxA one paper copy and one electronic copy of submittals for items to be commissioned. The paper copy will remain on site in the filing system set up by the CxA. The Contractor will maintain this filing system. The electronic copy is to be forwarded to the CxA.

2. The CxA will review Contractor submittals applicable to systems being commissioned.

3. Typically the commissioning submittal will include detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, full details of any County-contracted tests, fan and pump curves, full factory testing reports, if any, and full warranty information, including all responsibilities of County to keep the warranty in force clearly identified. In addition, copies of the installation checkout sheets and the field checkout sheet forms to be used by the factory or field technicians.

4. Contractor shall develop a full start-up and initial checkout plan and submit to CxA for review within three months from receiving the CxA's Prefunctional Checklists.

B. Submittals

1. Equipment submittals and shop drawings: See Division 22, 23, 26, 27 and 28.

2. Commissioning Reports:

a. Start-up and Factory Tests: See Division 22, 23, 26, 27 and 28 for requirements.

1) Compile after all equipment has been started and submit five copies to the CxA for review and approval.

b. Pre-functional Tests: See the Cx plan for checklists.

1) Compile after all equipment pre-functional forms have been completed and submit five copies to the CxA for review and approval.

c. Test and Balance Reports: See Specifications; Section 23 05 93 “Testing, Adjusting and balancing” for content and quantity of reports.

    1) Include only those reports developed after spot checks and associated rebalancing have been completed

d. Functional Tests: See the Cx plan for test scripts.

    1) Contractor to submit functional test scripts where indicated in the Performance Specifications.

e. Demonstration Tests: Test will be a subset of Functional Test.

f. Training: Compile all of the training requirements into a single schedule and submit five copies to the Owner for review and approval.

g. Trend Review: Data to be provided to the CxA in electronic format specified in Section 23 09 23.

h. Final Report:

    1) Include the following completed documentation:

        a. System/Equipment Matrix, see Paragraph 1.6, B, 1, c.

        b. Start-up and Factory Tests

        c. Test and Balance Reports

        d. Pre-functional test documentation

        e. Functional test documentation

        f. Training documentation

    2) Format and Procedure:

        a. Submit two draft copies for review and comment by the CxA, who will return one copy

        b. Make changes noted on returned copy and submit final

        c. Submit Final Report in the following format

    3) Submit two bound copies

    4) One electronic copy on CD.

j. Operations and Maintenance Manuals: See Divisions 1, 22, 23, 26, 27 and 28.

k. Training manuals: See Specifications, Section 01 77 00 Contract Closeout Procedures 1, 22, 23, 26, 27 and 28

l. Summary Commissioning Report

B. Submittal Requirement for TAB Plan:

1. Submit the TAB plan to the CxA and TI six weeks prior to starting the TAB. See Specifications; Section 23 05 93 "Testing, Adjusting and balancing for HAC" for content and quantity of reports.

2. Include only those reports developed after spot checks and associated rebalancing have been completed.

3.4 COMMISIONING PLAN

A. Where conflicts arise, the specifications shall take precedence over the Commissioning Plan.

B. The commissioning plans shall confirm with the requirements of LEED (NC 3.3), ASHRAE Guideline 0 and ASHRAE Guideline 1, Associated Commissioning Group (ACG)

C. The commissioning plans shall contain the following information:

a. Introduction (Organization and Logistics)

i. Executive Summary

ii. Scope of Commissioning Work and the Systems to be commissioned.

iii. Commissioning Team Information

iv. Organizational charts for:

1. All commissioning team members

2. Contractor's commissioning team member

3. Owner's commissioning team members

v. Contact information

vi. Resumes for contractor commissioning team members

vii. Communication Protocols

viii. Roles and Responsibilities Matrix

1. Contractors' roles and responsibilities

2. Owner's responsibilities

ix. Process Description during construction phase, and post occupancy

x. Quality Control Plan

xi. Schedule

xii. List of expected work products

b. Performance criteria

i. The Owner's Project Requirements (OPR) and the Basis of Design (BOD) for each of piece of equipment and system that are to be commissioned.

ii. This information shall be organized by trade providing the work.

c. Testing

i. Description of all testing to be performed including but not limited to

1. Factory witness tests

2. Start-up

3. Pre-functional tests.

4. Functional tests

5. Demonstration tests

6. BMS trends

ii. Forms to be used for each test

iii. For each test the plan should identify:

1. What is to be tested

2. Who is to test it

3. When it will be tested

4. What is to be submitted

d. Training

i. The requirements for training include

1. Who is to be trained

2. Who is doing the training
3. Schedule for the training
4. Training agendas
5. Documentation requirements for the training
6. Submittals requirements for the training

3.5 COMMISSIONING REPORT

A. The CxA is responsible to compile, organize and index commissioning data by equipment into labeled, indexed and tabbed, three-ring binders and deliver it to the County. The final commissioning report shall conform with the requirements of LEED (NC 3.3) and contain the following:

B. Executive summary of the commissioning process and results of the commissioning program. This shall include: observations, conclusions, and list of any outstanding or unresolved items

C. A complete history of all system deficiencies identified during the commissioning and how they were resolved. This shall include:

1. List of any outstanding or unresolved items
2. Seasonal testing that is deferred for a later date

D. System performance test results and evaluation

E. A summary of submittal review process including submittals review comments and resolution

F. A summary of the O & M documentation.

G. A summary of the training activities

H. Commissioning meeting minutes, correspondence and warranties review items

3.6 TRAINING OF COUNTY PERSONNEL

A. The Contractor shall be responsible for coordinating the operator training. Training requirements are shown in each Division and in Division 22, 23, 26, 27 and 28.

B. The CxA shall be responsible for overseeing the content and adequacy of the training material for the commissioned equipment.

1. The Contractor will submit a written training plan to the CxA for review prior to training. The plan will cover the following elements:

a. Equipment included in training

b. Intended audience

c. Location of training

d. Objectives

e. Subjects covered (description, duration of discussion, special methods, etc.)

f. Duration of training on each subject

g. Instructor for each subject

h. Methods (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.)

i. Instructor and qualifications

2. For the primary HVAC equipment, the Contractor shall provide a short discussion of the control of the equipment during the mechanical or electrical training.

3. Video recording of the training sessions will be provided by the Contractor in DVD format and added to the O&M manuals. The CxA will witness the recorded sessions and review the recorded DVD.

3.7 DEFERRED TESTING

A. Unforeseen Deferred Tests. If any check or test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of checklists and functional testing may be delayed upon approval of the PM. These tests will be conducted in the same manner as the seasonal tests as soon as possible.

B. Seasonal Testing. During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system's design) shall be completed as part of this contract. The Contractor shall coordinate this activity. Tests will be executed, documented and deficiencies corrected by the Contractor, with facilities staff and the CxA witnessing. Any final adjustments to the O&M manuals and as-builts due to the testing will be made.

3.8 PREREQUISITES TO SUBSTANTIAL COMPLETION

A. The commissioning must be complete, except for functional testing and controls training, prior to Substantial Completion, unless approved in writing by the County's Representative.

3.9 PREREQUISITES TO FINAL COMPLETION

A. All TAB work and commissioning must be complete prior to Final Completion, unless approved in writing by the County's Representative. Exceptions to this are the planned control system training performed after occupancy and any required seasonal or approved deferred testing. This includes for all systems, but is not limited to:

1. Completed and signed start-up and prefunctional checklist documentation
2. Requested trend log data and post-construction trend review
3. Submission of final approved TAB report
4. Completion of all functional testing
5. Required training of County personnel completed and approved
6. Submission of the approved O&M manuals
7. All identified deficiencies have been corrected or are approved by the County

B. The County's Representative will determine the date of Final Completion after reviewing the CxA's recommendation for Final Completion.

C. Commissioning activities are non-compensable and cannot be a cause for delay claims.

3.10 WORK PRODUCTS AND RESPONSIBILITY MATRIX

A. The commissioning process generates a number of written work products described in various parts of the Specifications. The Commissioning Plan lists all the formal written work products, describes briefly their contents, who is responsible to create them, their due dates, who receives and approves them, and the location of the specification to create them. In summary, the written products are:

B.

| Activity | GC | County | TI | A/E | CxA |
|---|---|---|---|---|---|
| Develop Cx Plan | R | R | | R | X |
| Submittal Review | X | | | X | R |
| O&M Manual | X | R | V | R | R |
| Coordinate Cx schedule | X | | V | | R |
| Review test procedure and prepare Full Start-up Plan | X | | | | X |

| Activity | GC | County | TI | A/E | CxA |
|---|---|---|---|---|---|
| Prefunctional Check (PC) – Full Start-up | X | | V | | R |
| Compile PC Record | X | | V | R | R |
| Issues Log (PC & FT) | R | R | V | R | X |
| Forms Log (PC & FT) | R | | V | | X |
| Review test procedure and prepare Full Functional Test Procedure | X | | V | R | X |
| Functional Test (FT) – Full Functional Test | X | | V | | W |
| Compile FT Record | X | | V | R | R |
| Sign Off (PC and FT) | X | X | X1 | X | X |
| Cx Report | | R | | | X |
| Training Enhanced Commissioning | X | R | V | X | R |
| Warranty (deferred & seasonal test/ correction) | X | R | W | | R |

Notes:

This table shows only responsibilities for major activities. See the Cx Plan and Specifications for additional responsibilities. In case of conflict, the Cx Specifications govern.

X = Primary Responsibility
R = Review of documents and comments.
W = Witness of the tests/training.
V = Verification

**END OF SECTION 01 91 13**

# SECTION 02 41 13 - SELECTIVE SITE DEMOLITION

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
1. Demolition and removal site improvements.
2. Disconnecting, capping or sealing, and removing site utilities and utility structures.

B. Related Sections:
1. Section 011100 "Summary of Work" for use of the premises and phasing requirements.
2. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade site improvements not part of building demolition.
3. Section 330500 "Common Work Results for Utilities" for shutting off, disconnecting, removing, and sealing or capping utilities.

### 1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed.

### 1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

### 1.5 INFORMATIONAL SUBMITTALS

A. Proposed Protection Measures: Submit informational report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection. Indicate proposed locations and construction of barriers, fencing, barricades, other devices, and warning signs around the construction perimeter.

B. Submit safety plan.

C. Submit methods and procedures for excavation, backfilling, compaction, and moisture addition or drying of all materials.

D. Submit “Shoring and Bracing Drawings” prior to beginning any trench or structure excavation 5 feet deep or over, in accordance with Section 6705, California Labor Code. If such plan varies from the shoring system standards established in the construction Safety Orders of the State of California, such alternative system plans shall be prepared, stamped and signed by a civil or structural engineer licensed in the State of California at the Contractor’s expense.

E. Submit a construction drainage plan showing the collection and disposal of surface and subsurface water that may be encountered in the course of construction. Water disposal shall meet Federal, State, and local/regional requirements.

1.6 FIELD CONDITIONS

A. Hazardous Materials: Contractor is to remove any Hazardous materials that may be encountered on the site.
   1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner.
   2. Hazardous material remediation to be performed by the Contractor.

B. On-site storage or sale of removed items or materials is not permitted.

1.7 COORDINATION

A. Arrange demolition schedule so as not to interfere with Owner's on-site operations.

B. The Contractor shall carefully coordinate the extent of the demolition in areas where existing utilities shall be reconnected to new facilities where existing facilities shall remain operational, and the vegetation/plants/trees and curb/gutter shall be restored.

**PART 2 - PRODUCTS**

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulation of authorities having jurisdiction.

B. Standards: Comply with ASSE A10.6 and NFPA 241.

2.2 SOIL MATERIALS

A. Satisfactory Soils: Comply with requirements in Section 312000 "Earth Moving."

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Verify locations of utilities to be disconnected and capped before starting demolition operations.

B. Review Project Record Documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. In addition to surveying elements to be removed, carefully consider all bearing loads and capacities for placement of equipment and materials on site. In the event of any questions as to whether an area to be loaded has adequate bearing capacity, determine the case prior to the placement of such equipment or material.

3.2 PROTECTION

A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.
   1. Strengthen or add new supports when required during progress of demolition.

B. Temporary Shoring, Underground Utilities: Maintain utility services to remain and protect from damage during demolition operations.

C. Existing Utilities: Maintain utility services to remain and protect from damage during demolition operations.
   1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
   2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction.
      a. Provide at least 48hours' notice to occupants of affected buildings if shutdown of service is required during changeover.

D. Comply with CAL-OSHA requirements regarding trench bracing and shoring.

E. If Contractor elects to slope top of trench in lieu of trench bracing, the trench width shall be maintained at least 2 feet above top of pipe before sloping begins. Sloping, unless otherwise approved by the Owner Representative, shall not be steeper than 1(H):1(V).

F. The Contractor shall furnish and install all shoring, sheeting and bracing required to support adjacent earth banks and structures for the protection and safety of all personnel working in the trench. All shoring, sheeting and bracing shall conform to the requirements of the State or local agencies having jurisdiction over such matters. Remove shoring, sheeting and bracing in a manner that will protect the workman and prevent caving of banks and damage to the pipe, excavation, backfill or adjacent property.

G. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements Division 01 "Temporary Facilities and Controls."
   1. Protect adjacent buildings and facilities from damage due to demolition activities.
   2. Protect existing site improvements, appurtenances, and landscaping to remain.
   3. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
   4. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
   5. Protect trees to remain per Division 01, “Temporary Tree Protection.”

H. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.3 DEMOLITION, GENERAL

A. General: Demolish indicated site improvements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.

B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
2. Use water mist and other suitable methods to limit spread of dust and dirt. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

C. Pavement removal:
1. Asphalt concrete or concrete on roads shall be saw cut before excavation. Cutting with a spade or jackhammer or grader-mounted wheel will not be allowed. Armor coats on roads shall be cut with a suitable tool before excavation. Breaking of asphalt, concrete or armor coats with excavation equipment will not be permitted.
2. All edges of asphalt concrete or armor coats shall be cut vertically, with a neat, square edge.
3. In all cases, existing asphalt paving, concrete, or armor coating shall be saw cut after construction and just prior to final paving to a point 6 inches or wider than each side of the trench line. Saw cuts shall parallel or be perpendicular to center line of the trench.
4. Excess paving shall be disposed of per the Owner Representative’s direction and shall not be used as backfill material

D. Explosives: Use of explosives is not permitted.

3.4 DEMOLITION BY MECHANICAL MEANS

A. Existing Utilities: Demolish existing utilities and below-grade utility structures that are within 5 feet outside footprint indicated for new construction. Abandon utilities outside this area.
1. Fill abandoned utility structures with satisfactory soil materials according to backfill requirements in Section 312000 "Earth Moving."
2. Piping: Disconnect piping at unions, flanges, valves, or fittings.
3. Wiring Ducts: Disassemble into unit lengths and remove plug-in and disconnecting devices.

B. Existing Utilities: Demolish and remove existing utilities and below-grade utility structures.
1. Piping: Disconnect piping at unions, flanges, valves, or fittings.

2. Wiring Ducts: Disassemble into unit lengths and remove plug-in and disconnecting devices.

3.5 SITE RESTORATION

A. Below-Grade Areas: Rough grade below-grade areas ready for further excavation or new construction.

B. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.6 REPAIRS

A. Promptly repair damage to adjacent buildings caused by demolition operations.

B. The Contractor shall repair all damage caused by settlement deemed to have occurred if the following conditions exist:
1. In paved areas, the depression of 3/8-inch below the average of the sides of the uncut portion shall be deemed a settlement.
2. Across all unpaved areas, or areas untravelled by automotive equipment, a depression of 1-1/2-inches below the average of the sides of the uncut portion shall be deemed a settlement. In this regard, any settlement that causes drainage problems or concentration causing water to run along the depression shall be subject to correction immediately during the entire guaranty period.
3. Any damage to remaining road improvements, utility poles, adjacent structures to remain, and other existing facilities to remain as caused by the Contractor's operations shall be repaired at the Contractor's expense.
4. Damaged items shall be repaired or replaced with new materials as required to restore damaged items or surfaces, equal or better pre-construction condition, as approved by the Owner Representative.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and legally dispose of them in an EPA-approved landfill acceptable to authorities having jurisdiction. See Section 017419 "Construction Waste Management and Disposal" for recycling and disposal of demolition waste.
1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Do not burn demolished materials.

3.8 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.
1. Clean roadways of debris caused by debris transport. Refer to Division 01 "Temporary Stormwater Pollution Prevention."

**END OF SECTION 02 41 13**

# SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

## PART 1 - GENERAL

RFI 0134 — Slab on Grade Finish: Smooth trowel finish is acceptable for the SOG finish.

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Section 133419 Metal Building Systems

### 1.2 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

B. Increased footing sizes and/or reinforcing steel sizes, as a result of the final foundation design and as required for permit by the agency having jurisdiction (beyond those shown on the drawings), shall be at no additional cost to the County.

C. The Contractor shall schedule and give prompt attention to the Deferred Approval Pre-Engineered Metal Building submittal affecting the foundation design. Extension of Contract Time will not be granted if the project is delayed due to not making the submittal in a timely manner.

### 1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

### 1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:
1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.
3. Laboratory Test Reports for Credit IEQ 4.3: For curing and sealing compounds, documentation indicating that products comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the

Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

4. Design Mixtures for Credit ID 1.1: For each concrete mixture containing fly ash as a replacement for portland cement or other portland cement replacements, and for equivalent concrete mixtures that do not contain portland cement replacements.

C. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
   1. Indicate amounts of mixing water to be withheld for later addition at Project site.

D. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

E. Pour Joint Layout: Indicate proposed pour joints required to construct the structure.
   1. Location of pour joints is subject to approval of the Architect.

F. Samples: Vapor retarder.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer manufacturer.

B. Material Certificates: For each of the following, signed by manufacturers:
   1. Cementitious materials.
   2. Admixtures.
   3. Form materials and form-release agents.
   4. Steel reinforcement and accessories.
   5. Floor and slab treatments.
   6. Bonding agents.
   7. Adhesives.
   8. Vapor retarders.
   9. Semirigid joint filler.
   10. Joint-filler strips.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
   1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
   2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

1.8 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
   2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
   3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 and as follows:
   1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
   2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

## PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
   1. ACI 301.
   2. ACI 117.

2.2 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
   1. Plywood, metal, or other approved panel materials.
   2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
      a. High-density overlay, Class 1 or better.
      b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
      c. Structural 1, B-B or better; mill oiled and edge sealed.
      d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
   3. Overlaid Finish birch plywood.

B. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

C. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.

D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

E. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
   1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

F. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
   1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
   2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.
   3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

B. Welded-Wire Fabric Reinforcement: ASTM A 185/A 185M.

2.4 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
   1. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.5 CONCRETE MATERIALS

A. Regional Materials: Concrete shall be manufactured within 500 miles of Project site from aggregates and cementitious materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

C. Cementitious Materials:
   1. Portland Cement: ASTM C 150/C 150M, Type II , uniform color for all exposed concrete.
   2. Fly Ash: ASTM C 618, Class F.

D. Normal-Weight Aggregates: ASTM C 33/C 33M coarse aggregate.
   1. Maximum Coarse-Aggregate Size: 1 inch nominal.
   2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

E. Air-Entraining Admixture: ASTM C 260/C 260M.

F. Water: ASTM C 94/C 94M and potable.

G. Air-Entraining Admixtures: ASTM C 260/C 260M.

H. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
   1. Water-Reducing Admixture: ASTM C 494/C 494M, Type D - for use in hot weather, and Type A - for use in cool weather.
   2. Retarding Admixture: ASTM C 494/C 494M, Type B.

## 2.6 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Meadows, W.R., Inc.; Perminator 15 mil.
      b. Stego Industries, LLC; Stego Wrap 15 mil Class A.
      c. As approved by Equal.

## 2.7 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. BASF Construction Chemicals - Building Systems; Confilm.
      b. Euclid Chemical Company (The), an RPM company; EUCOBAR.
      c. Meadows, W. R., Inc.; EVAPRE.
      d. Sika Corporation.; SikaFilm.
      e. SpecChem, LLC; SpecFilm.
      f. As approved by Architect.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Submit product for approval by Architect prior to use.

2.8 RELATED MATERIALS

A. Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.
1. Sonneborn "Sonobond"; the Euclid Chemical Company "Euco-Weld"; Larsen Products Corp., "Weld-Crete" or approved equal.

B. Joint former: Burke zip strip joint formers or approved equivalent.

2.9 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 318 Section 5.3 or 5.4 for approval prior to beginning concrete work.
1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
2. All concrete mix designs shall be signed by a Civil or Structural Engineer registered in California.

B. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.

C. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
1. Fly Ash: 15 percent.

RFI 0071 — Foundation Concrete PSI — Building A & B Footings to be 4000 PSI

2.10 CONCRETE MIXTURES

A. All structural concrete: Normal-weight concrete.
1. Minimum Compressive Strength: 4000 psi at 28 days for slab on grade, ~~3000~~ 4,000 psi for foundations.
2. Maximum W/C Ratio: 0.45 for slab on grade, 0.58 for foundations.
3. Slump Limit: 3 inches (8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticising admixture), plus or minus 1 inch.
4. Air Content: percent, plus or minus 1.5 percent.

2.11 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.12 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
   1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
   2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
   3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

2.13 CONCRETE HARDENERS AND SEALERS
   1. Provide at all rooms noted to have receive sealed concrete.
      a. Apply hardener at the rate consistent with the manufacturer's definition of light traffic areas in accordance with the manufacturer's printed instructions.
      b. Apply Sealer and Polish surface to smooth gloss level.
   2. Clear, nonmetallic dust-on type.
      a. Dayton Superior; Emery Tuff.
      b. Lambert Corp.; Crystal Clear Seal 1315
      c. Or Approved Equal.

2.14 CONCRETE SELF LEVELING TOPPING
   1. Provide at all rooms noted to have receive floor coverings; such as VCT, Resilient Tile, Resilient Sheet Flooring and Carpet.
   2. Apply in accordance with the manufacturer's printed instructions.
      a. Ardex K 500
      b. Or Approved Equal.

## PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
   1. Class A, 1/8 inch for smooth-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
   1. Install keyways, reglets, recesses, and the like, for easy removal.
   2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

## 3.2 EMBEDDED ITEM INSTALLATION

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.

## 3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.
   1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
   2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORING AND RESHORING INSTALLATION

A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.
   1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR-RETARDER INSTALLATION

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
   1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.6 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
   1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
   1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

3.7 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
   1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
   2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
   3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
   4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.

5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
6. Use a bonding agent at locations where fresh concrete is placed against hardened concrete surfaces.

## 3.8 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

## 3.9 FINISHING FORMED SURFACES

A. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces exposed to public view, .

B. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

## 3.10 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

RFI 0134 — Slab on Grad Finish — Smooth Trowel Finish Approved via Brad Schultz, Kitchell

## 3.11 MISCELLANEOUS CONCRETE ITEM INSTALLATION

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

## 3.12 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
      a. Water.
      b. Continuous water-fog spray.
      c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
   2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
      a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
      b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
      c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.

RFI 0143 — Slab on Grade Cure Clarification — One coat is acceptable

   3. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

## 3.13 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
   1. Defer joint filling until concrete has aged at least one month(s). Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

## 3.14 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
   1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
   2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
   3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
   1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
   2. After concrete has cured at least 14 days, correct high areas by grinding.
   3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

## 3.15 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:
1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Verification of use of required design mixture.
5. Concrete placement, including conveying and depositing.
6. Curing procedures and maintenance of curing temperature.
7. Verification of concrete strength before removal of shores and forms from beams and slabs.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:
1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
   a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Unit Weight: ASTM C 567/C 567M, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
5. Compression Test Specimens: ASTM C 31/C 31M.
    a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
    b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M;
    a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
    b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
9. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

D. Measure floor and slab flatness and levelness according to ASTM E 1155 within 48 hours of finishing.

**END OF SECTION 03 30 00**

# SECTION 04 22 00 - CONCRETE UNIT MASONRY

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
1. Concrete masonry units.
2. Mortar and grout.
3. Steel reinforcing bars.

B. Related Section;
1. Section 07 19 00 – Water Repellents.

### 1.3 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

### 1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:
1. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.

C. Shop Drawings: For the following:
1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315.
3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

D. Samples for Initial Selection:
1. Colored mortar.
2. Weep holes/vents.

E. Samples for Verification: For each type and color of the following:
1. CMUs.

2. Pigmented mortar. Make Samples using same sand and mortar ingredients to be used on Project.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Material Certificates: For each type and size of the following:
   1. Masonry units.
      a. Include material test reports substantiating compliance with requirements.
      b. For masonry units, include data and calculations establishing average net-area compressive strength of units.
   2. Cementitious materials. Include name of manufacturer, brand name, and type.
   3. Mortar admixtures.
   4. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
   5. Grout mixes. Include description of type and proportions of ingredients.
   6. Reinforcing bars.

C. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
   1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
   2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

D. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to TMS 602/ACI 530.1/ASCE 6.

E. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
   1. Build mockup of a typical wall area is required and shall be determined prior to the start of work under this section.
   2. Build mockups for each type of exposed unit masonry construction in sizes approximately 48 inches long by 36 inches high by full thickness, including face and backup wythes and accessories.
      a. Include a sealant-filled joint at least 16 inches long in each mockup.
      b. Include lower corner of window opening at upper corner of exterior wall mockup. Make opening approximately 12 inches wide by 16 inches high.

c. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view.

3. Protect accepted mockups from the elements with weather-resistant membrane.
4. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
   a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
   b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 FIELD CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
   1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
   1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
   2. Protect sills, ledges, and projections from mortar droppings.

3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
1. Basis of Design: Basalite Structural Block or approved equal

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

### 2.2 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops indicated net-area compressive strengths at 28 days.
1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ACI 530.1/ASCE 6.
2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C 1314.

### 2.3 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6 except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.

C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.

1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

## 2.4 CONCRETE MASONRY UNITS

A. Regional Materials: CMUs shall be manufactured within 500 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
   1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
   2. Provide square-edged units for outside corners unless otherwise indicated.

C. CMUs: ASTM C 90.
   1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3350 psi.
   2. Density Classification: Medium weight.
   3. Size (Width): Manufactured to dimensions 3/8 inch less-than-nominal dimensions.
   4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.
   5. Faces To Receive Plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.

## 2.5 MORTAR AND GROUT MATERIALS

A. Regional Materials: Aggregate for mortar and grout, cement, and lime shall be extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
   1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C 114.

C. Hydrated Lime: ASTM C 207, Type S.

D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

E. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979/C 979M. Use only pigments with a record of satisfactory performance in masonry mortar.

F. Aggregate for Mortar: ASTM C 144.
   1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
   2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.

G. Aggregate for Grout: ASTM C 404.

H. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

I. Water: Potable.

2.6 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M, Grade 60.

2.7 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
   1. Do not use calcium chloride in mortar or grout.
   2. Use portland cement-lime mortar unless otherwise indicated.
   3. For exterior masonry, use portland cement-lime mortar.
   4. For reinforced masonry, use portland cement-lime mortar.
   5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270 Specification, Type M or Type S.

D. Pigmented Mortar: Use colored cement product.
   1. Pigments shall not exceed 10 percent of portland cement by weight.
   2. Pigments shall not exceed 5 percent of masonry cement or mortar cement by weight.
   3. Mix to match Architect's sample.

E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
   1. Mix to match Architect's sample.

F. Grout for Unit Masonry: Comply with ASTM C 476.
   1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
   2. Proportion grout in accordance with ASTM C 476, paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2500 psi.
   3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
   1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
   2. Verify that foundations are within tolerances specified.
   3. Verify that reinforcing dowels are properly placed.
   4. Verify that substrates are free of substances that would impair mortar bond.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION, GENERAL

A. Build chases and recesses to accommodate items specified in this and other Sections.

B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.

C. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

### 3.3 TOLERANCES

A. Dimensions and Locations of Elements:
   1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
   2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
   3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:
   1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
   2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
   3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
   4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
   5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.

6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch.

RFI 97.1 CMU Wainscot EXP Joints & Rebar
PVC Expansion joints added and rebar adjusted accordingly

C. Joints:
1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

## 3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

G. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

H. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
1. Wedge nonload-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
2. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078443 "Joint Firestopping."

RFI 0136 BLDG A&B - Epoxy Mortar for CMU Wall
Disregard epoxy mortar

3.5 MORTAR BEDDING AND JOINTING

A. Rake out mortar joints at pre-faced CMUs to a uniform depth of 1/4 inch and point with epoxy mortar to comply with epoxy-mortar manufacturer's written instructions.

B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

C. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

D. Cut joints flush where indicated to receive waterproofing unless otherwise indicated.

3.6 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
   1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
   2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
   1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
   2. Limit height of vertical grout pours to not more than 60 inches.

3.7 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections: Special inspections according to Level B in TMS 402/ACI 530/ASCE 5.
   1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
   2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
   3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Prior to Construction: One set of tests.

D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.

F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

G. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.

H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

I. Prism Test: For each type of construction provided, according to ASTM C 1314 at 7 days and at 28 days.

3.8 PARGING

A. Parge exterior faces of below-grade masonry walls, where indicated, in two uniform coats to a total thickness of 3/4 inch. Dampen wall before applying first coat, and scarify first coat to ensure full bond to subsequent coat.

B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot. Form a wash at top of parging and a cove at bottom.

C. Damp-cure parging for at least 24 hours and protect parging until cured.

3.9 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.10 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
   1. Crush masonry waste to less than 4 inches in each dimension.
   2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Section 312000 "Earth Moving."
   3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

C. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.

D. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

**END OF SECTION 04 22 00**

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# SECTION 05 12 00 - STRUCTURAL STEEL FRAMING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
1. Structural steel.
2. Prefabricated building columns.
3. Field-installed shear connectors.
4. Grout.

### 1.3 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

B. Seismic-Load-Resisting System: Elements of structural-steel frame designated as "SLRS" or along grid lines designated as "SLRS" on Drawings, including columns, beams, and braces and their connections.

C. Heavy Sections: Rolled and built-up sections as follows:
1. Shapes included in ASTM A 6/A 6M with flanges thicker than 1-1/2 inches.
2. Welded built-up members with plates thicker than 2 inches.
3. Column base plates thicker than 2 inches.

D. Protected Zone: Structural members or portions of structural members indicated as "Protected Zone" on Drawings. Connections of structural and nonstructural elements to protected zones are limited.

E. Demand Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the Seismic-Load-Resisting System and which are indicated as "Demand Critical" or "Seismic Critical" on Drawings.

### 1.4 COORDINATION

A. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

### 1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Laboratory Test Reports for Credit IEQ 4.2: For primers, documentation indicating that products comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Shop Drawings: Show fabrication of structural-steel components.
1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment Drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
5. Identify members and connections of the Seismic-Load-Resisting System.
6. Indicate locations and dimensions of protected zones.
7. Identify demand critical welds.

D. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, including the following:
1. Power source (constant current or constant voltage).
2. Electrode manufacturer and trade name, for demand critical welds.

E. Certificates
1. Manufacturer’s Mill Certificate: Submit certificate that products meet or exceed specified requirements.
2. Mill Test Reports: Submit manufacturer’s certificates, indicating structural strength, destructive and nondestructive test analysis.
3. Welder’s Certificates: Submit certificates for welders employed on the Work, verifying AWS qualifications within the previous 12 months.

1.6 QUALITY ASSURANCE

A. Fabrication and erection of structural steel and miscellaneous steel shall be in accordance with the requirements of the latest edition of the Specifications for Structural Steel Buildings (AISC 360) of the American Institute of Steel Construction (AISC) (2013 CBC Section 2205.1). Also comply with the requirements of the AISC Code of Standard Practice for Steel Buildings and Bridges (AISC 303).

B. Fabricator Qualifications: A qualified fabricator who employs adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section. The Fabricator shall have completed a project of similar size and scope, and shall have adequate facilities, personnel, and equipment to meet production and quality requirements to maintain proper job progress.

C. The fabricator shall maintain a quality control program to ensure that the work is performed in accordance with the requirements of AISC 303, AISC 360 and the contract documents. The fabricator shall have the option to use the AISC Quality Certification Program to establish and administer the quality control program.

D. Erector Qualifications: A qualified erector who employs adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

E. The erector shall maintain a quality control program to ensure that the work is performed in accordance with the requirements of AISC 303, AISC 360 and the contract documents. The erector shall be capable of performing erection of the structural steel, and shall provide the equipment, personnel and management for the scope, magnitude and required quality of this project. The erector shall have the option to use the AISC Erector Certification Program to establish and administer the quality control program.

F. Identification of Structural Steel: The fabricator shall maintain the identity of the material and shall maintain suitable procedures and records attesting that the specified grade has been furnished, in compliance with AISC 360 and 2013 CBC Section 2203.1.

G. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint or to SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."

H. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
   1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.

I. Comply with applicable provisions of the following specifications and documents:
   1. AISC 303.
   2. AISC 341 and AISC 341s1.
   3. AISC 360.
   4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
   1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
   1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
   2. Clean and relubricate bolts and nuts that become dry or rusty before use.

3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

## PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering analysis by a qualified professional engineer, to withstand loads indicated and comply with other information and restrictions indicated.
1. Select and complete connections using AISC 360.

B. Moment Connections: Designed in accordance with the 2013 California Building Code & AISC.

C. Construction: Combined system of moment frame and braced frame.

2.2 STRUCTURAL-STEEL MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than the following:
1. W-Shapes: 60 percent.
2. Channels, Angles, M , S-Shapes: 60 percent.
3. Plate and Bar: 25 percent.
4. Steel Pipe: 25 percent.
5. All Other Steel Materials: 25 percent.

C. W-Shapes: ASTM A 992/A 992M, Grade 50.

D. Channels, Angles, S-Shapes: ASTM A 36/A 36M.

E. Plate and Bar: ASTM A 36/A 36M.

F. Steel Pipe: ASTM A 53/A 53M, Type E or Type S, Grade B.

G. Hollow Structural Sections (HSS): ASTM A500, Grade B.

H. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS, CONNECTORS, AND ANCHORS

A. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

B. Threaded Rods: ASTM A 36/A 36M.
1. Nuts: ASTM A 563 heavy-hex carbon steel.

2. Washers: ASTM F 436, Type 1, hardened carbon steel.
3. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

2.4 PRIMER

A. Primer: Comply with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

B. Primer: SSPC-Paint 25, , zinc oxide, alkyd, linseed oil primer.

C. Primer: SSPC-Paint 25 BCS, , zinc oxide, alkyd, linseed oil primer.

D. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.

2.5 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.6 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

F. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
2. Baseplate Holes: Cut, drill, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.7 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
   1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.8 PREFABRICATED BUILDING COLUMNS

A. Prefabricated building columns consisting of load-bearing structural-steel members.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Star Building Systems.
      b. Varco Pruden Buildings.

2.9 SHOP PRIMING

A. Shop prime steel surfaces except the following:
   1. Surfaces to be field welded or sprayed applied fireproofing.
   2. Galvanized surfaces.
   3. Surfaces to be embedded in concrete.
   4. Contact areas of high strength bolted connections.

2.10 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.
   1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
   2. Galvanize attached to structural-steel frame and located in exterior walls.

2.11 SOURCE QUALITY CONTROL

A. Testing Agency: Owner to employ a qualified testing agency to perform shop tests and inspections.
   1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
   1. Liquid Penetrant Inspection: ASTM E 165.
   2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
   3. Ultrasonic Inspection: ASTM E 164.
   4. Radiographic Inspection: ASTM E 94.

C. In addition to visual inspection, test and inspect shop-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
   1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
   2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

D. Prepare and submit test and inspection reports.

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
   1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
   1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Baseplates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
   1. Set plates for structural members on wedges, shims, or setting nuts as required.
   2. Weld plate washers to top of baseplate.
   3. Tighten anchor rods, as indicated in the drawings, after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
   4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
   1. Level and plumb individual members of structure.
   2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

G. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
   1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
   2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
   3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.

3.5 PREFABRICATED BUILDING COLUMNS

A. Install prefabricated building columns to comply with AISC 360, manufacturer's written recommendations, and requirements of testing and inspecting agency that apply to the fire-resistance rating indicated.

3.6 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
   1. Verify structural-steel materials and inspect steel frame joint details.
   2. Verify weld materials and inspect welds.
   3. Verify connection materials and inspect high-strength bolted connections.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

C. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.

1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
   a. Liquid Penetrant Inspection: ASTM E 165.
   b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
   c. Ultrasonic Inspection: ASTM E 164.
   d. Radiographic Inspection: ASTM E 94.

D. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
   1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
   2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

3.7 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780/A 780M.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

**END OF SECTION 05 12 00**

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# SECTION 05 40 00 - COLD-FORMED METAL FRAMING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
1. Load-bearing wall framing.
2. Floor joist framing.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of cold-formed steel framing product and accessory.

B. LEED Submittals:
1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings:
1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

### 1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Mill certification.

### 1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

C. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

**PART 2 - PRODUCTS**

2.1 COLD-FORMED STEEL FRAMING, GENERAL

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Steel Sheet for Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
1. Grade: 33.
2. Coating: G60.

2.2 FLOOR JOIST FRAMING

A. Steel Joists: Manufacturer's standard C-shaped steel joists, of web depths indicated, with stiffened flanges, and as follows:
1. Section Properties: As indicated in the drawings.

2.3 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
1. Backer plates.

2.4 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.

C. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

D. Welding Electrodes: Comply with AWS standards.

2.5 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
   1. Fabricate framing assemblies using jigs or templates.
   2. Cut framing members by sawing or shearing; do not torch cut.
   3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
      a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
      b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.
   4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
   1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
   2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
   1. Cut framing members by sawing or shearing; do not torch cut.
   2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
      a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
      b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.

H. Install insulation, specified in Section 072100 "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
   1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

## 3.3 LOAD-BEARING WALL INSTALLATION

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:
   1. Anchor Spacing: As indicated in the drawings.

B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:
   1. Stud Spacing: As indicated in the drawings.

C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar configurations.

D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Align floor and roof framing over studs according to AISI S200, Section C1. Where framing cannot be aligned, continuously reinforce track to transfer loads.

F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.

G. Install horizontal bridging in stud system, spaced vertically 48 inches as indicated in the drawings. Fasten at each stud intersection.

H. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

I. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.4 JOIST INSTALLATION

A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated in the drawings.

B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.

C. Space joists not more than 2 inches from abutting walls, and as follows:
1. Joist Spacing: As indicated in the drawings.

D. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated in the drawings.

E. Install bridging at intervals indicated in the drawings. Fasten bridging at each joist intersection as follows:
1. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.

F. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

G. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.5 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer. Installer ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

**END OF SECTION 05 40 00**

# SECTION 05 50 00 - METAL FABRICATIONS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
1. Equipment support for assemblies.
2. Miscellaneous Metal requirements for steel shapes, plates and pipe.

### 1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

### 1.4 ACTION SUBMITTALS

A. LEED Submittals:
1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Laboratory Test Reports for Credit IEQ 4.2: For primers, documentation indicating that products comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Small-Scale Environmental Chambers."

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
1. Equipment support for assemblies.
2. Miscellaneous Metal requirements for steel shapes, plates and pipe.

### 1.5 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

## PART 2 - PRODUCTS

2.1 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.

2.2 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 325, Type 3; with hex nuts, ASTM A 563, Grade C3; and, where indicated, flat washers.

D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1.

2.3 MISCELLANEOUS MATERIALS

A. Shop Primers: Provide primers that comply with

B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

C. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.4 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

## 2.5 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

C. Fabricate steel pipe columns for supporting wood frame construction from steel pipe with steel baseplates and top plates as indicated. Drill or punch baseplates and top plates for anchor and connection bolts and weld to pipe with fillet welds all around. Make welds the same size as pipe wall thickness unless otherwise indicated.
   1. Unless otherwise indicated, fabricate from Schedule 40 steel pipe.
   2. Unless otherwise indicated, provide 1/2-inch baseplates with four 5/8-inch anchor bolts and 1/4-inch top plates.

D. Prime miscellaneous framing and supports with where indicated.

## 2.6 FINISHES, GENERAL

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

## PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

**END OF SECTION 05 50 00**

# SECTION 06 10 00 - ROUGH CARPENTRY

## PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Framing with dimension lumber.
2. Rooftop equipment bases and support curbs.
3. Wood blocking, cants, and nailers.
4. Wood furring.
5. Wood sleepers.
6. Wall, roof and floor sheathing.

1.3 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.

B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.

C. Exposed Framing: Framing not concealed by other construction.

D. OSB: Oriented strand board.

E. Timber: Lumber of 5 inches nominal size or greater in least dimension.

1.4 ACTION SUBMITTALS

A. LEED Submittals:
1. Certificates for Credit MR 6: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
2. Product Data for Credit IEQ 4.1: For adhesives, documentation including printed statement of VOC content.
3. Product Data for Credit IEQ 4.4: For composite wood products, documentation indicating that product contains no urea formaldehyde.
4. Laboratory Test Reports for Credit IEQ 4: For adhesives and composite-wood products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

**PART 2 - PRODUCTS**

2.1 WOOD PRODUCTS, GENERAL

A. New materials forming the work. Do not utilize previously used materials.

B. Products specified by Reference Standards or by description only: any product meeting those standards or description.

C. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
   1. Factory mark each piece of lumber with grade stamp of grading agency.
   2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
   3. Dress lumber, S4S, unless otherwise indicated.

D. Maximum Moisture Content of Lumber: 19 percent maximum moisture content at time of installation.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
   1. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
   1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

D. Application: Treat exposed framing and framing where indicated on the drawings.

2.3 LUMBER & TIMBER MATERIALS

A. Beams 6x and thicker and posts 6x6 and larger: Douglas Fir-Larch species, Select Structural grade.

B. All other framing not otherwise indicated: Douglas Fir-Larch species, No. 1 grade.

C. Wall studs: Douglas Fir-Larch species, No. 1 grade.

D. Sill Plates: Pressure Preservative treated Douglas Fir-Larch, No. 1 grade.

E. 1x Roof or Wall Sheathing Boards: Douglas Fir-Larch species, No. 2 grade.

2.4 SHEATHING MATERIALS

A. Plywood Roof Sheathing: APA Plywood per PS-1 Structural I, Span Rating as noted: Exposure Durability 1; unsanded, CD.

B. Plywood Wall Sheathing: APA Plywood per PS-1 Structural I, Exposure Durability 1; unsanded CD.

C. Plywood Floor Sheathing: APA Plywood per PS-1 Structural I, Span Rating as noted; Exposure Durability 1; unsanded CD.

D. Telephone and Electrical Panel Boards: APA PS-1 Plywood. APA rated CD, exposure 1.

2.5 UNDERLAYMENT MATERIALS

A. Plywood Underlayment: APA Rated PS-1 plywood Structural I, Exposure Durability 1; unsanded.

2.6 MISCELLANEOUS LUMBER & MATERIALS

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
   1. Blocking.
   2. Nailers.
   3. Rooftop equipment bases and support curbs.
   4. Cants.
   5. Furring.

B. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

C. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

D. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

E. Subfloor Glue: APA AFG-01, waterproof.

F. Building Paper: No. 15 asphalt felt, or spun bonded polyethylene as directed by the Architect.

2.7 FASTENERS

A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.
   1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M or of Type 304 stainless steel.

B. Nails: Common steel wire nails per ASTM F1667, all requirements of the 2013 California Building Code, Chapter 23 and the National Design Specifications (NDS).

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1, the requirements of the 2013 CBC, Chapter 23 and the NDS.

E. Lag Screws: ASME B18.2.1, the requirements of the 2013 CBC, Chapter 23 and the NDS.

F. Bolts: Steel bolts complying with ASTM A307, Grade A; with ASTM A563 hex nuts and, where indicated, flat washers.

2.8 STRUCTURAL FRAMING CONNECTORS

A. Galvanized Steel, sized to suit framing conditions or as shown on the drawings. Simpson Strong-Tie, or approved equivalent, installed per manufacturer's instructions for maximum rated capacities.

**PART 3 - EXECUTION**

3.1 INSTALLATION, GENERAL

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.

C. Install structural framing connectors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

D. Do not splice structural members between supports unless otherwise indicated.

E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
   1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

F. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
   1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
   2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.
   3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
   4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.

G. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

H. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
   1. Use inorganic boron for items that are continuously protected from liquid water.
   2. Use copper naphthenate for items not continuously protected from liquid water.

I. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

J. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
   1. Table 2304.9.1, "Fastening Schedule," in 2013 California Building Code (CBC).

K. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

L. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
   1. Comply with indicated fastener patterns where applicable.
   2. Use finishing nails unless otherwise indicated. Countersink nail heads and fill holes with wood filler.
   3. Use common nails unless otherwise indicated. Drive nails snug but do not countersink nail heads.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal- size furring horizontally and vertically at 24 inches o.c.

C. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal- size furring vertically at 16 inches o.c.

3.4 WALL AND PARTITION FRAMING INSTALLATION

A. General: Provide single bottom plate and double top plates using members of 2-inch nominal thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions. Fasten plates to supporting construction unless otherwise indicated.
   1. For exterior walls, provide 2-by-6-inch nominal- size wood studs spaced 16 inches o.c. unless otherwise indicated.
   2. For interior partitions and walls, provide 2-by-4-inch nominal- size wood studs spaced 16 inches o.c. unless otherwise indicated.
   3. Provide continuous horizontal blocking at midheight of partitions more than 96 inches high, using members of 2-inch nominal thickness and of same width as wall or partitions.

B. Construct corners and intersections with three or more studs, except that two studs may be used for interior non-load-bearing partitions.

C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.
   1. For non-load-bearing partitions, provide double-jamb studs and headers not less than 4-inch nominal depth for openings 48 inches and less in width, 6-inch nominal depth for openings 48 to 72 inches in width, 8-inch nominal depth for openings 72 to 120 inches in width, and not less than 10-inch nominal depth for openings 10 to 12 feet in width.
   2. For load-bearing walls, provide double-jamb studs for openings 60 inches and less in width, and triple-jamb studs for wider openings. Provide headers of depth indicated.

3.5 FLOOR JOIST FRAMING INSTALLATION

A. General: Install floor joists with crown edge up and support ends of each member with not less than 1-1/2 inches of bearing on wood or metal, or 3 inches on masonry. Attach floor joists as follows:
   1. Where supported on wood members, by toe nailing or by using metal framing anchors.
   2. Where framed into wood supporting members, by using wood ledgers as indicated or, if not indicated, by using metal joist hangers.

B. Fire Cuts: At joists built into masonry, bevel cut ends 3 inches and do not embed more than 4 inches .

C. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches .

D. Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than one-third depth of joist; do not locate closer than 2 inches from top or bottom.

E. Provide solid blocking of 2-inch nominal thickness by depth of joist at ends of joists unless nailed to header or band.

F. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches or securely tie opposing members together. Provide solid blocking of 2-inch nominal thickness by depth of joist over supports.

G. Anchor members paralleling masonry with 1/4-by-1-1/4-inch metal strap anchors spaced not more than 96 inches o.c., extending over and fastening to three joists. Embed anchors at least 4 inches into grouted masonry with ends bent at right angles and extending 4 inches beyond bend.

H. Provide solid blocking between joists under jamb studs for openings.

I. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.
   1. Provide triple joists separated as above, under partitions receiving ceramic tile and similar heavy finishes or fixtures.

J. Provide bridging of type indicated below, at intervals of 96 inches o.c., between joists.
   1. Diagonal wood bridging formed from bevel-cut, 1-by-3-inch nominal- size lumber, double-crossed and nailed at both ends to joists.
   2. Steel bridging installed to comply with bridging manufacturer's written instructions.

3.6 CEILING JOIST AND RAFTER FRAMING INSTALLATION

A. Rafters: Notch to fit exterior wall plates and toe nail or use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.
   1. At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against valley rafters.
   2. At hips, provide hip rafter of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against hip rafter.

B. Provide collar beams (ties) as indicated or, if not indicated, provide 1-by-6-inch nominal- size boards between every third pair of rafters, but not more than 48 inches o.c. Locate below ridge member, at third point of rafter span. Cut ends to fit roof slope and nail to rafters.

C. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions if any.

3.7 SHEATHING

A. Install floor and roof sheathing with face grain direction perpendicular to supports with end joints staggered. Secure sheet edges over center of bearing. Attach floor sheathig with subfloor glue and provide nailing indicated on the drawings

3.8 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet enough that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

**END OF SECTION 06 10 00**

# SECTION 06 41 16 - PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
   1. Plastic-laminate-faced architectural cabinets.
   2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.

B. Related Requirements:
   1. Section 061000 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets and concealed within other construction before cabinet installation.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of producthigh-pressure decorative laminate and cabinet hardware and accessories.
   1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. LEED Submittals:
   1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
   2. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regionally manufactured materials. Include statement indicating cost for each regionally manufactured material.
      a. Include statement indicating location of manufacturer and distance to Project for each regionally manufactured material.
   3. Certificates for Credit MR 6 and Credit MR 7: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification and chain-of-custody requirements. Include statement indicating cost for each certified wood product.
   4. Laboratory Test Reports for Credit IEQ 4.1: For adhesives, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
   5. Product Data for Credit IEQ 4.4: For adhesives and composite wood products, documentation indicating that products contain no urea formaldehyde.

6. Laboratory Test Reports for Credit IEQ 4.4: For composite wood products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Samples for Verification:
   1. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finishand specified edge material applied to one edge.
   2. Wood-grain plastic laminates, 12 by 24 inches, for each type, pattern and surface finishand specified edge material applied to one edge.
   3. Thermoset decorative panels, 8 by 10 inches, for each color, pattern, and surface finish, with edge banding on one edge.
   4. Corner pieces as follows:
      a. Cabinet-front frame joints between stiles and rails, as well as exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
   5. Exposed cabinet hardware and accessories, one unit for each type and finish.

## 1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For the following:
   1. Composite wood and agrifiber products.
   2. Thermoset decorative panels.
   3. High-pressure decorative laminate.
   4. Glass.
   5. Adhesives.

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

## 1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.

B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.

C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.7 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets can be supported and installed as indicated.

B. Hardware Coordination: Distribute copies of approved hardware schedule specified in Section 080671 "Door Hardware Sets" to fabricator of architectural woodwork; coordinate Shop Drawings and fabrication with hardware requirements.

RFI 0045 — BLDG A&B - Phenolic Casework Confirmation
Provide phenolic casework in lieu of the plastic laminate casework.

## PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.
1. Provide labels from WI certification program indicating that woodwork, including installation, complies with requirements of grades specified.
2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

B. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Formica Corporation.
   b. Panolam Industries International, Inc.
   c. Wilsonart International; Div. of Premark International, Inc.

C. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
1. As indicated by laminate manufacturer's designations.
2. Match Architect's sample.
3. As selected by Architect from laminate manufacturer's full range in the following categories:
   a. Solid colors, matte finish.
   b. Solid colors with core same color as surface, matte finish.
   c. Wood grains, matte finish.
   d. Patterns, matte finish.

2.2 MISCELLANEOUS MATERIALS

A. Adhesive for Bonding Plastic Laminate: Non-Urea formaldehyde.
   1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.3 FABRICATION

A. Fabricate cabinets to dimensions, profiles, and details indicated.

B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
   1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
   2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

**PART 3 - EXECUTION**

3.1 PREPARATION

A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.

3.2 INSTALLATION

A. Grade: Install cabinets to comply with same grade as item to be installed.

B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.

C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
   1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
   2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean cabinets on exposed and semiexposed surfaces.

**END OF SECTION 06 41 16**

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# SECTION 07 13 26 - SELF-ADHERING SHEET WATERPROOFING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
   2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.

B. Sustainable Design Submittals:

   1. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.

C. Shop Drawings: Show locations and extent of waterproofing and details of substrate joints and cracks, expansion joints, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.
   1. Include setting drawings showing layout, sizes, sections, profiles, and joint details of pedestal-supported concrete pavers.

### 1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Sample Warranties: For special warranties.

### 1.5 FIELD CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended in writing by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.
   1. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.6 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to furnish replacement waterproofing material for waterproofing that does not comply with requirements or that fails to remain watertight within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.

B. Installer's Special Warranty: Provide warranty signed by Installer, covering Work of this Section, for warranty period of two years.
   1. Warranty includes removing and reinstalling protection board, drainage panels, insulation, pedestals, and pavers on plaza decks.

RFI 0235 — BLDG A - Self Adhered Membrane Flashing Detail — Waterproofing detail per Grace Waterproofing Systems

## PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Waterproofing System: Obtain waterproofing materials, protection course, molded-sheet drainage panels from single source from single manufacturer.

2.2 MODIFIED BITUMINOUS SHEET WATERPROOFING

A. Modified Bituminous Sheet: Minimum 60-mil nominal thickness, self-adhering sheet consisting of 56 mils of rubberized asphalt laminated on one side to a 4-mil- thick, polyethylene-film reinforcement, and with release liner on adhesive side.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. American Hydrotech, Inc.; VM60.
      b. Carlisle Coatings & Waterproofing Inc; CCW MiraDRI 860/861.
      c. Grace Construction Products; W.R. Grace & Co. -- Conn.; Bituthene 3000.
   2. Physical Properties:
      a. Tensile Strength, Membrane: 250 psi minimum; ASTM D 412, Die C, modified.
      b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
      c. Low-Temperature Flexibility: Pass at minus 20 deg F; ASTM D 1970/D 1970M.
      d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch movement; ASTM C 836/C 836M.
      e. Puncture Resistance: 40 lbf minimum; ASTM E 154/E 154M.
      f. Water Absorption: 0.2 percent weight-gain maximum after 48-hour immersion at 70 deg F; ASTM D 570.
      g. Water Vapor Permeance: 0.05 perm maximum; ASTM E 96/E 96M, Water Method.
      h. Hydrostatic-Head Resistance: 200 feet minimum; ASTM D 5385.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of waterproofing.
   1. Verify that concrete has cured and aged for minimum time period recommended in writing by waterproofing manufacturer.
   2. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
   3. Verify that compacted subgrade is dry, smooth, sound, and ready to receive waterproofing sheet.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.
   1. Install sheet strips of width according to manufacturer's written instructions and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch .

F. Bridge and cover isolation joints, expansion joints, and discontinuous deck-to-wall and deck-to-deck joints with overlapping sheet strips of widths according to manufacturer's written instructions.
   1. Invert and loosely lay first sheet strip over center of joint. Firmly adhere second sheet strip to first and overlap to substrate.

G. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.
   1. Install membrane strips centered over vertical inside corners. Install 3/4-inch fillets of liquid membrane on horizontal inside corners and as follows:
      a. At footing-to-wall intersections, extend liquid membrane in each direction from corner or install membrane strip centered over corner.
      b. At plaza-deck-to-wall intersections, extend liquid membrane or sheet strips onto deck waterproofing and to finished height of sheet flashing.

H. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests.
   1. Testing agency shall provide survey report indicating locations of discontinuities, if any.

B. Waterproofing will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.4 PROTECTION, REPAIR, AND CLEANING

A. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect waterproofing from damage and wear during remainder of construction period.

C. Protect installed insulation drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

D. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

E. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

**END OF SECTION 07 13 26**

# SECTION 07 18 00 - TRAFFIC COATINGS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section includes traffic coatings and pavement markings for the following applications:
   1. Pedestrian traffic.
   2. Vehicular traffic.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product, including installation instructions.

B. LEED Submittals:

   1. Product Test Reports for Credit SS 7.2: For traffic coatings that are roof coverings, documentation indicating compliance with Solar Reflectance Index requirement.
   2. Product Data for Credit IEQ 4.2: For interior field-applied traffic coatings and pavement-marking paints, documentation including printed statement of VOC content.
   3. Laboratory Test Reports for Credit IEQ 4: For interior traffic coatings and pavement-marking paints, documentation indicating that products comply with the testing and product requirements of CALGreen Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Shop Drawings: For traffic coatings.
   1. Include details for treating substrate joints and cracks, flashings, deck penetrations, and other termination conditions.
   2. Include plans showing layout of pavement markings, lane separations, and defined parking spaces. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

### 1.4 QUALITY ASSURANCE

A. Mockups: Build mockups to set quality standards for materials and execution.
   1. Build mockup for each traffic coating and substrate to receive traffic coatings.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Apply traffic coatings within the range of ambient and substrate temperatures recommended in writing by manufacturer. Do not apply traffic coatings to damp or wet substrates, when temperatures are below 40 deg F, when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F above dew point.
   1. Do not apply traffic coatings in snow, rain, fog, or mist, or when such weather conditions are imminent during the application and curing period. Apply only when frost-free conditions occur throughout the depth of substrate.

B. Do not install traffic coating until items that penetrate membrane have been installed.

1.6 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace traffic coating that fails in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Adhesive or cohesive failures.
      b. Abrasion or tearing failures.
      c. Surface crazing or spalling.
      d. Intrusion of water, oils, gasoline, grease, salt, deicer chemicals, or acids into deck substrate.
   2. Warranty Period: Five years from date of Substantial Completion.

**PART 2 - PRODUCTS**

2.1 MATERIALS, GENERAL

A. Material Compatibility: Provide primers; base-, intermediate-, and topcoat; and accessory materials that are compatible with one another and with substrate under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Source Limitations:
   1. Obtain traffic coatings from single source from single manufacturer.
   2. Obtain primary traffic-coating materials, including primers, from traffic-coating manufacturer. Obtain accessory materials including aggregates, sheet flashings, joint sealants, and substrate repair materials of types and from sources recommended in writing by primary material manufacturer.
   3. Obtain pavement-marking paint from single source from single manufacturer.

2.2 TRAFFIC COATING

A. Traffic Coating: Manufacturer's standard, traffic-bearing, seamless, high-solids-content, cold liquid-applied, elastomeric, waterproofing membrane system with integral wearing surface for pedestrian traffic vehicular traffic ; according to ASTM C 957.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. Advanced Polymer Technology Corporation.
      b. BASF Construction Chemicals, LLC - Building Systems.
      c. Carlisle Coatings & Waterproofing Inc.

d. Euclid Chemical Company (The); an RPM company.

B. Primer: Liquid waterborne primer recommended for substrate and conditions by traffic-coating manufacturer.

C. Preparatory and Base Coats: or epoxy.
1. Thicknesses: Minimum dry film thickness as recommended in writing by manufacturer for substrate and service conditions indicated.

D. Intermediate Coat: Polyurethane.
1. Thicknesses: Minimum dry film thickness as recommended in writing by manufacturer for substrate and service conditions indicated, measured excluding aggregate.
2. Aggregate Content: As recommended in writing by traffic-coating manufacturer for substrate and service conditions indicated.

E. Topcoat: Polyurethane.
1. Thicknesses: Minimum dry film thickness as recommended in writing by manufacturer for substrate and service conditions indicated, measured excluding aggregate.
2. Aggregate Content: As recommended in writing by traffic-coating manufacturer for substrate and service conditions indicated.
3. Color: As selected by Architect from manufacturer's full range.

F. Energy Performance: Provide traffic coating with an initial Solar Reflectance Index of not less than 78 when calculated according to ASTM E 1980 based on the testing of identical products by a qualified testing agency.

G. VOC Content: Traffic coating shall have a VOC content of 150 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 ACCESSORY MATERIALS

A. Joint Sealants: As specified in Section 079200 "Joint Sealants."

2.4 PAVEMENT MARKINGS

A. Pavement-Marking Paint: Comply with Section 321216 "Asphalt Paving."

B. VOC Content: Pavement-marking paints shall have a VOC content of 150 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

## PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for surface smoothness, surface moisture, and other conditions affecting performance of traffic-coating work.

B. Verify that substrates are visibly dry and free of moisture.
1. Test for moisture according to ASTM D 4263.

2. Test for moisture content by method recommended in writing by traffic-coating manufacturer.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of traffic-coating work.

D. Proceed with installation only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.
1. Begin coating application only after minimum concrete-curing and -drying period recommended in writing by traffic-coating manufacturer has passed and after substrates are dry.
2. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. General: Before applying traffic coatings, clean and prepare substrates according to ASTM C 1127 and manufacturer's written instructions to produce clean, dust-free, dry substrate for traffic-coating application. Remove projections, fill voids, and seal joints if any, as recommended in writing by traffic-coating manufacturer.

B. Schedule preparation work so dust and other contaminants from process do not fall on wet, newly coated surfaces.

C. Mask adjoining surfaces not receiving traffic coatings to prevent overspray, spillage, leaking, and migration of coatings. Prevent traffic-coating materials from entering deck substrate penetrations and clogging weep holes and drains.

3.3 TERMINATIONS AND PENETRATIONS

A. Prepare vertical and horizontal surfaces at terminations and penetrations through traffic coatings and at expansion joints, drains, and sleeves according to ASTM C 1127 and manufacturer's written instructions.

B. Provide sealant cants at penetrations and at reinforced and nonreinforced, deck-to-wall butt joints.

C. Terminate edges of deck-to-deck expansion joints with preparatory base-coat strip.

3.4 JOINT AND CRACK TREATMENT

A. Prepare, treat, rout, and fill joints and cracks in substrates according to ASTM C 1127 and manufacturer's written recommendations. Before coating surfaces, remove dust and dirt from joints and cracks according to ASTM D 4258.
1. Comply with recommendations in ASTM C 1193 for joint-sealant installation.

3.5 TRAFFIC-COATING APPLICATION

A. Apply traffic coating according to ASTM C 1127 and manufacturer's written instructions.

B. Apply number of coats of specified compositions for each type of traffic coating at locations as indicated on Drawings.

C. Start traffic-coating application in presence of manufacturer's technical representative.

D. Verify that wet film thickness of each coat complies with requirements every 100 sq. ft..

E. Uniformly broadcast aggregate on coats specified to receive aggregate. Embed aggregate according to manufacturer's written instructions. After coat dries, sweep away excess aggregate.

F. Apply traffic coatings to prepared wall terminations and vertical surfaces to height indicated; omit aggregate on vertical surfaces.

G. Cure traffic coatings. Prevent contamination and damage during application and curing stages.

3.6 PAVEMENT MARKINGS

A. Do not apply pavement-marking paint for striping and other markings until layout, colors, and placement have been verified with Architect and traffic coating has cured.

B. Sweep and clean surface to eliminate loose material and dust.

C. Apply pavement-marking paint with mechanical equipment to produce markings of dimensions indicated with uniform straight edges. Apply at manufacturer's recommended rates for a 15-mil- minimum, wet film thickness.

3.7 PROTECTING AND CLEANING

A. Protect traffic coatings from damage and wear during remainder of construction period.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

**END OF SECTION 07 18 00**

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# SECTION 07 19 00 - WATER REPELLENTS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include manufacturer's printed statement of VOC content.
   2. Include manufacturer's recommended number of coats for each type of substrate and spreading rate for each separate coat.

### 1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of water repellent.

### 1.4 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

### 1.5 FIELD CONDITIONS

A. Limitations: Proceed with application only when the following existing and forecasted weather and substrate conditions permit water repellents to be applied according to manufacturers' written instructions and warranty requirements:
   1. Concrete surfaces and mortar have cured for not less than 28 days.
   2. Building has been closed in for not less than 30 days before treating wall assemblies.
   3. Ambient temperature is above 40 deg F and below 100 deg F and will remain so for 24 hours.
   4. Substrate is not frozen and substrate-surface temperature is above 40 deg F and below 100 deg F.
   5. Rain or snow is not predicted within 24 hours.
   6. Not less than 24 hours have passed since surfaces were last wet.
   7. Windy conditions do not exist that might cause water repellent to be blown onto vegetation or surfaces not intended to be treated.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

A. Performance: Water repellents shall meet the following performance requirements as determined by preconstruction testing on manufacturer's standard substrates representing those indicated for this Project.

B. Water-Vapor Transmission: Comply with one or both of the following:
   1. Maximum 10 percent reduction water-vapor transmission of treated compared to untreated specimens, according to ASTM E 96/E 96M.
   2. Minimum 80 percent water-vapor transmission of treated compared to untreated specimens, according to ASTM D 1653.

C. Water Penetration and Leakage through Masonry: Minimum 90 percent reduction in leakage rate of treated compared to untreated specimens, according to ASTM E 514/E 514M.

D. Durability: Maximum 5 percent loss of water-repellent performance after 2500 hours of weathering according to ASTM G 154 compared to water-repellent-treated specimens before weathering.

2.2 PENETRATING WATER REPELLENTS

A. Silane, Penetrating Water Repellent: Clear, containing 20 percent or more solids of alkyltrialkoxysilanes; with alcohol, mineral spirits, water, or other proprietary solvent carrier; and with 400 g/L or less of VOCs.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. BASF Construction Chemicals - Building Systems; .
      b. Dayton Superior; Weather Worker 40% J29WB.
      c. Euclid Chemical Company (The), an RPM company; .
      d. Kelly-Moore Paint Company Inc.; Kel-Seal 77.

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements and conditions affecting performance of the Work.
   1. Verify that surfaces are clean and dry according to water-repellent manufacturer's requirements. Check moisture content in three representative locations by method recommended by manufacturer.
   2. Verify that there is no efflorescence or other removable residues that would be trapped beneath the application of water repellent.
   3. Verify that required repairs are complete, cured, and dry before applying water repellent.

B. Test pH level according to water-repellent manufacturer's written instructions to ensure chemical bond to silica-containing or siliceous minerals.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. New Construction and Repairs: Allow concrete and other cementitious materials to fully cure before application of water repellent, according to repellent manufacturer's written instructions.

B. Cleaning: Before application of water repellent, clean substrate of substances that could impair penetration or performance of product according to water-repellent manufacturer's written instructions.

C. Protect adjoining work, including mortar and sealant bond surfaces, from spillage or blow-over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of water repellent being deposited on surfaces. Cover live vegetation.

D. Coordination with Mortar Joints: Do not apply water repellent until pointing mortar for joints adjacent to surfaces receiving water-repellent treatment has been installed and cured.

E. Coordination with Sealant Joints: Do not apply water repellent until sealants for joints adjacent to surfaces receiving water-repellent treatment have been installed and cured.
1. Water-repellent work may precede sealant application only if sealant adhesion and compatibility have been tested and verified using substrate, water repellent, and sealant materials identical to those required.

RFI 0521 BLDG A&B - Water Repellent Factory Inspection Clarification A factory-authorized witness is not required for CMU.

3.3 APPLICATION

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect the substrate before application of water repellent and to instruct Applicator on the product and application method to be used.

B. Apply coating of water repellent on surfaces to be treated using brush to the point of saturation. Apply coating in dual passes of uniform, overlapping strokes. Remove excess material; do not allow material to puddle beyond saturation. Comply with manufacturer's written instructions for application procedure unless otherwise indicated.
1. At Contractor's option, first application of water repellent may be completed before installing units. Mask mortar and sealant bond surfaces to prevent water repellent from migrating onto joint surfaces. Remove masking after repellent has cured.

C. Apply a second saturation coating, repeating first application. Comply with manufacturer's written instructions for limitations on drying time between coats and after rainstorm wetting of surfaces between coats. Consult manufacturer's technical representative if written instructions are not applicable to Project conditions.

3.4 CLEANING

A. Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Correct damage to work of other trades caused by water-repellent application, as approved by Architect.

B. Comply with manufacturer's written cleaning instructions.

**END OF SECTION 07 19 00**

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# SECTION 07 21 00 - THERMAL INSULATION

## PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Mineral-wool blanket.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam-plastic board insulation as follows:
1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

## PART 2 - PRODUCTS

2.1 MINERAL-WOOL BLANKETS

A. Recycled Content of Insulation: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50 percent.

B. Mineral-Wool Blanket, Unfaced (Interior Walls): ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. EcoBatt by Knauf Insulation.
      b. Thermafiber Inc.; an Owens Corning company.
      c. Certainteed Corp Insulation Group.

C. Mineral-Wool Blanket, Reinforced-Foil Faced (Exterior Building Envelop Walls and Below Roof Deck): ASTM C 665, Type III (reflective faced), Class A (faced surface with a flame-spread index of 25 or less per ASTM E 84); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. EcoBatt by Knauf Insulation.
      b. Thermafiber Inc.; an Owens Corning company.
      c. Certainteed Corp Insulation Group.

## 2.2 INSULATION FASTENERS

A. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. AGM Industries, Inc.
      b. Gemco.

## 2.3 ACCESSORIES

A. Insulation for Miscellaneous Voids:
   1. Spray Polyurethane Foam Insulation: ASTM C 1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

## PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

**END OF SECTION 07 21 00**

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# SECTION 07 41 13.13 - FORMED METAL ROOF PANELS

## PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Exposed-fastener, lap-seam, metal roof panels.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. LEED Submittals:
1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Product Test Reports for Credit SS 7.2: For roofing materials, documentation indicating that roofing materials comply with Solar Reflectance Index requirement.

C. Shop Drawings:
1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
1. Metal Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal panel accessories.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Installation firm must have a minimum of three years' experience and certified by the roofing system manufacturer. Furnish qualification documentation including a list of a minimum of ten projects within 100 mile radius from the project site and include size, location and the project owner contact information. State Contractors License: Class C-39.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

E. Copper Panels: Wear gloves when handling to prevent fingerprints and soiling of surface.

1.7 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.8 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leak proof, secure, and noncorrosive installation.

1.9 WARRANTY

A. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
   2. Finish Warranty Period: 20 years from date of Substantial Completion.

**PART 2 - PRODUCTS**

2.1 PERFORMANCE REQUIREMENTS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Solar Reflectance Index: Not less than 78 according to ASTM E 1980.

Energy Performance: Provide roof panels that are listed on the EPA/DOE's ENERGY STAR "Roof Product List" for low -slope roof products. Roofing system shall have an initial solar reflectance of not less than 0.70 and an emissivity of not less than 0.75 when tested according to CRRC-1.

C. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
1. Uplift Rating: UL 30.

D. FM Global Listing: Provide metal roof panels and component materials that comply with requirements in FM Global 4471 as part of a panel roofing system and that are listed in FM Global's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.
1. Fire/Windstorm Classification: Class 1A-60.
2. Hail Resistance: SH.

2.2 METAL ROOF PANELS

A. Basis of Design Product: Star Building Systems Metal Roof Panels Double-Lok or equal: Formed with vertical ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels.
1. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.024-inch nominal 24 GA uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
   a. For low slope (2:12 or less) roofing provide a Solar Reflectivity (SR) value of 0.65 or higher when tested according to Cool Roof Rating Council (CRRC-1).
2. Clips: One-piece fixed to accommodate thermal movement.
3. Joint Type: mechanically field seamed together.
4. Panel Coverage: ~~12 inches.~~ 24 inches
5. Panel Height: 3 inches.
6. Color: As shown on drawings.

RFI 0061 — Metal Roof Panel Confirmation — 18" or 24" Roof panels are acceptable.

B. Finishes: Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions

C. Accessories:
   1. Box Gutters 26 gauge with integral apron extension, leaf gutter guards and gutter hangers strap at 2'-0" on center. Finish color to match building roof panels. Provide color sample for Architects review.
   2. Rainwater downspout, elbow, kickout, commercial grade, 26 gauge with straps at 6'-0" on center. Finish to match building wall panels. Provide color sample for Architects review.

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645; cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 coating designation or ASTM A 792/A 792M, Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
   1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, door header and jambs, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Roof Curbs: Fabricated from same material as roof panels, 0.048-inch- nominal thickness; with bottom of skirt profiled to match roof panel profiles and with welded top box and integral full-length cricket. Fabricate curb subframing of 0.060-inch- nominal thickness, angle-, C-, or Z-shaped steel sheet. Fabricate curb and subframing to withstand indicated loads of size and height indicated. Finish roof curbs to match metal roof panels.
   1. Insulate roof curb with 1-inch- thick, rigid insulation.

E. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

F. Panel Sealants: Provide sealant types recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
   1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
   2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
   3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.4 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
   1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
   2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
   3. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
   4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
   5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
      a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal panel manufacturer for application, but not less than thickness of metal being secured.

2.5 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Steel Panels and Accessories:

1. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
   1. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.
   2. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.
      a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

### 3.3 METAL PANEL INSTALLATION

A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
   1. Shim or otherwise plumb substrates receiving metal panels.
   2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air or water-resistive barriers and flashings that are concealed by metal panels are installed.
   3. Install screw fasteners in predrilled holes.
   4. Locate and space fastenings in uniform vertical and horizontal alignment.
   5. Install flashing and trim as metal panel work proceeds.
   6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.

7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:
1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
1. Lap ribbed or fluted sheets one full rib. Apply panels and associated items true to line for neat and weathertight enclosure.
2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
5. Flash and seal panels with weather closures at perimeter of all openings.
6. Watertight Installation:
   a. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels and elsewhere as needed to make panels watertight.
   b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
   c. At panel splices, nest panels with minimum 6-inch end lap, sealed with sealant and fastened together by interlocking clamping plates.

E. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended in writing by metal panel manufacturer.

F. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level. Install work with laps, joints, and seams that are permanently watertight.
1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof performance.

2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

G. Roof Curbs: Install flashing around bases where they meet metal roof panels.

H. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.4 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal panel units within installed tolerance of 1/4 inch in 20 feet on slope and location lines and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.5 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

**END OF SECTION 07 41 13.13**

# SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
1. Manufactured through-wall flashing with counterflashing.
2. Formed wall sheet metal fabrications.
3. Formed equipment support flashing.
4. Formed overhead-piping safety pans.
5. Window and door opening flashing.
6. Sheet metal flashing at head of openings and exterior wall base flashing.

### 1.3 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

### 1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
3. Review requirements for insurance and certificates if applicable.
4. Review sheet metal flashing observation and repair procedures after flashing installation.

### 1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

C. Samples for Verification: For each type of exposed finish.
   1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
   2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
   3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.
   4. Anodized Aluminum Samples: Samples to show full range to be expected for each color required.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
   1. For copings and roof edge flashings that are FM Approvals approved, shop shall be listed as able to fabricate required details as tested and approved.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.8 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
   2. Finish Warranty Period: 20 years from date of Substantial Completion.

**PART 2 - PRODUCTS**

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Sheet Metal Standard for Copper: Comply with CDA's "Copper in Architecture Handbook." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

D. FM Approvals Listing: Manufacture and install roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with name of fabricator and design approved by FM Approvals.

E. SPRI Wind Design Standard: Manufacture and install roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressure:
1. Design Pressure: As indicated on Drawings.

F. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

## 2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 coating designation; prepainted by coil-coating process to comply with ASTM A 755/A 755M.
1. Surface: Smooth, flat.
2. Exposed Coil-Coated Finish:
   a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
3. Color: As selected by Architect from manufacturer's full range.

## 2.3 MANUFACTURED SHEET METAL FLASHING AND TRIM

A. Through-Wall, Ribbed, Sheet Metal Flashing: Manufacture through-wall sheet metal flashing for embedment in masonry, with ribs at 3-inch intervals along length of flashing to provide integral mortar bond. Manufacture through-wall flashing with interlocking counterflashing on exterior face, of same metal as flashing.
1. Stainless Steel: 0.016 inch thick.
   a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      1) Cheney Flashing Company; Cheney Flashing (Dovetail).

2.4 MANUFACTURED FLEXIBLE FLASHING

A. Self-Adhering – Straight Flashing: Basis of Design: Self-adhering straight flashing membrane tape is based on DuPont StraightFlash over sheet metal flashing.
   Description:
   a. Face Material Composition: Textured polyethylene laminate barrier.
   b. Face color: white
   c. Adhesive composition: Butyl adhesive
   d. Thickness: 30 mil
   e. Release Liner: 1 piece siliconized paper
   f. Dimension: 4 inches wide by 150 feet

B. Self-Adhering – Straight Flashing: Basis of Design: Self-adhering flexible flashing membrane is based on DuPont FlexWrap around all window and door openings.
   2. Description:
   a. Face Material Composition: Conformable textured polyethylene laminate barrier.
   b. Face color: White.
   c. Adhesive composition: Butyl adhesive
   d. Thickness: 70 mil
   e. Release liner: 2-part siliconized paper.
   f. Dimension: 9 inches wide by 75 feet

2.5 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
   1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
   2. Obtain field measurements for accurate fit before shop fabrication.
   3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
   4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

D. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
   1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
   2. Use lapped expansion joints only where indicated on Drawings.

E. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

G. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

H. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

I. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

J. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.

K. Do not use graphite pencils to mark metal surfaces.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
   1. Verify compliance with requirements for installation tolerances of substrates.
   2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
   3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners[**, solder**], protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
   1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
   2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
   3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.

4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
5. Torch cutting of sheet metal flashing and trim is not permitted.
6. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
1. Coat concealed side of stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

G. Rivets: Rivet joints in uncoated aluminum where necessary for strength.

3.3 FLEXIBLE FLASHING

A. Cut 9-inch wide DuPont™ FlexWrap a minimum of 12 inches longer than width of sill rough opening. Apply primer as required by manufacturer.

B. Cover horizontal sill by aligning DuPont™ FlexWrap edge with inside edge of sill. Adhere to rough opening across sill and up jambs a minimum of 6 inches. Secure flashing tightly into corners by working in along the sill before adhering up the jambs.

C. Fan DuPont™ FlexWrap™ at bottom corners onto face of wall. Firmly press in place. Mechanically fasten fanned edges.

D. Apply 9-inch wide strips of DuPont™ StraightFlash™ at jambs. Align flashing with interior edge of jamb framing. Start StraightFlash™ at head of opening and lap sill flashing down to sill.

E. Spray-apply primer to top 6 inches of jambs and exposed sheathing.

F. Install DuPont™ FlexWrap™ at opening head using same installation procedures used at sill. Overlap jamb flashing a minimum of 2 inches.

G. Coordinate flexible flashing with window installation.

H. On exterior, install backer-rod in joint between window frame and flashed rough framing. Apply sealant at jambs and head, leaving sill unsealed. Apply sealants in accordance with sealant manufacturer's instructions and ASTM C1193.

I. On interior, install backer rod in joint between frame of window and flashed rough framing. Apply sealant around entire window to create air seal. Apply sealant in accordance with sealant manufacturer's instructions and ASTM C1193.

J. Adhere using 4-inch wide DuPont StraightFlash over all sheet metal flashing at head of openings and exterior wall base flashing.

3.4 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

3.5 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Through-Wall Flashing: Installation of through-wall flashing.

C. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

3.6 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

B. Overhead-Piping Safety Pans: Suspend pans from structure above, independent of other overhead items such as equipment, piping, and conduit, unless otherwise indicated on Drawings. Pipe and install drain line to plumbing waste or drainage system.

3.7 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.8 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

**END OF SECTION 07 62 00**

# SECTION 07 72 33 - ROOF HATCHES

## PART 1 GENERAL

### 1.1 SUMMARY

A. Section Includes:
   1. Roof hatches, safety post, hatch rail system, hardware, ladder and related accessories.

B. Related Sections:
   1. Section 07 60 00 - Flashing and Sheet Metal.
   2. Section 13 34 19 – Metal Building Systems.

### 1.2 REFERENCES

A. FM - Factory Mutual Engineering Corporation: Roof Assembly Classifications.

B. UL - Underwriters' Laboratories, Inc.: Fire Hazard Classifications.

C. ASTM A568 - Steel Sheet, Carbon and High Strength, Low-Alloy, Hot-Rolled and Cold-Rolled.

D. ASTM A653/A653M - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

### 1.3 SUBMITTALS

A. Submit in accordance with Section 01 33 00 and 01 33 23.

B. Shop Drawings: Indicate manufacturer, model, materials, size, operation, components, hardware, finish and installation details.

C. Manufacturer's Installation Instructions: Indicate installation criteria, interface with adjacent components.

D. Warranty: Sample of special warranty.

### 1.4 COORDINATION

A. Coordinate installation of roof hatches with installation of roofing, flashing, and other associated work.

### 1.5 WARRANTY

A. Manufacturer Qualifications: Minimum 5 year experience manufacturing similar equipment.

B. Installer Qualifications: Minimum 2 year experience installing similar equipment.

## PART 2 PRODUCTS

2.1 MANUFACTURED UNITS

A. Roof Hatch
1. Manufacturers
a. BILCO; Steel Curb & Aluminum Cover Model # E-40 with LadderUP safety post Model # LU-1. Provide fixed Bil-Guard hatch rail system attached to roof hatch capflashing Model #3E.
b. Precision Ladders, LLC.
c. Nystrom Bulding Products, Inc.
d. Or Approved Equal
2. Description
a. Opening and Closing Criteria: The roof hatch must be spring loaded and require no more than 15-lbs of force to open the latch mechanism and 30-lbs of force to open the roof hatch.
b. Roof hatch access ladder Basis of Design; Alaco Ladder Company Model #560-C fixed ladder with upper fall protection cage.

2.2 FABRICATION - ROOF HATCHES

A. Fabricate components free of visual distortion or defects; fit components for weathertight assembly.

B. Curb
1. 12 inches high, of 14 gauge galvanized steel, and formed with a 3-1/2-inch flange with holes provided for securing to the roof deck.
2. Curb must be equipped with integral metal cap flashing of the same material and gauge as the curb, fully welded at the corners for weather tightness and insulated with 1 inch thick rigid fiberboard.

C. Hardware: Stainless steel.

D. Assembly
1. Hatch must be completely assembled with heavy pintle hinges, compression spring operators enclosed in telescopic tubes, positive snap latch with turn handles and Folger Adam deadbolts with keying to both sides, and neoprene draft seal.
2. Cover must be equipped with an automatic hold/open arm complete with vinyl grip handle to permit easy release with one hand.
3. Hold/open assembly must be capable of maintaining cover in position at any point through entire range of movement.

E. Finish: Pre-finish Kynar paint finish with color to match adjacent roof panels.

**PART 3 EXECUTION**

3.1 EXAMINATION

A. Verify that conditions are satisfactory for the installation of roof hatches.

B. If unsatisfactory conditions exist, do not commence installation until such conditions have been corrected. Beginning installation means acceptance of existing conditions.

3.2 INSTALLATION

A. Install hatches in accordance with the manufacturer's printed instructions and approved shop drawings.

B. When complete, hatch covers must operate smoothly, quietly, and free from binding; exposed surfaces must be clean and free from dents or other defects and damage; and each assembly must be watertight.

**END OF SECTION 07 72 33**

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# SECTION 07 84 13 - PENETRATION FIRESTOPPING

## PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Penetrations in fire-resistance-rated walls.

A. Related Requirements:

1. Section 07 84 43 "Joint Firestopping" for joints in or between fire-resistance-rated construction, at exterior curtain-wall/floor intersections, and in smoke barriers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.6 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

## PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:

a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.

1) UL in its "Fire Resistance Directory."
2) Intertek Group in its "Directory of Listed Building Products."
3) FM Global in its "Building Materials Approval Guide."

2.2 PENETRATION FIRESTOPPING SYSTEMS

A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. 3M Fire Protection Products.
b. Hilti, Inc.
c. Tremco, Inc.

B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

D. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.

1. Collars.

2.3 MIXING

A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

3.3 INSTALLATION

A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.

C. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

D. Install fill materials by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.

3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

3.5 PENETRATION FIRESTOPPING SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.

B. Penetration Firestopping Systems for Metallic Pipes, Conduit, or Tubing FS-1:

1. Type of Fill Materials: As required to achieve rating.

C. Penetration Firestopping Systems for Nonmetallic Pipe, Conduit, or Tubing FS-2:

1. Type of Fill Materials: As required to achieve rating.

D. Penetration Firestopping Systems for Miscellaneous Electrical Penetrants FS-3:
1. UL-Classified Systems: 6001-6999.
2. Type of Fill Materials: As required to achieve rating.

E. Penetration Firestopping Systems for Miscellaneous Mechanical Penetrants FS-4:

1. UL-Classified Systems: 7001-7999.
2. F-Rating: 2 hours.
3. Type of Fill Materials: As required to achieve rating.

F. Penetration Firestopping Systems for Groupings of Penetrants FS-5:

1. UL-Classified Systems: 8001-8999.
2. F-Rating: 2 hours.
3. Type of Fill Materials: As required to achieve rating.

**END OF SECTION 07 84 13**

# SECTION 07 84 43 - JOINT FIRESTOPPING

## PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Joints in or between fire-resistance-rated constructions.
2. Joints in smoke barriers.

B. Related Requirements:

1. Section 07 84 13 "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers.
2. Section 09 22 16 "Non-Structural Metal Framing" for firestop tracks for metal-framed partition heads.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Do not install joint firestopping systems when ambient or substrate temperatures are outside limits permitted by joint firestopping system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Install and cure joint firestopping systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.5 COORDINATION

A. Coordinate construction of joints to ensure that joint firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of joints to accommodate joint firestopping systems.

## PART 2 - PRODUCTS

2.1 JOINT FIRESTOPPING SYSTEMS

A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

B. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E 1966 or UL 2079.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. 3M Fire Protection Products.
b. Hilti, Inc.
c. Tremco, Inc.

2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.

C. Joints in Smoke Barriers: Provide fire-resistive joint systems with ratings determined per UL 2079 based on testing at a positive pressure differential of 0.30-inch wg.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. 3M Fire Protection Products.
b. Hilti, Inc.
c. Tremco, Inc.

2. L-Rating: Not exceeding 5.0 cfm/ft. of joint at both ambient and elevated temperatures.

D. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

## PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Before installing fire-resistive joint systems, clean joints immediately to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of elastomeric fill materials or compromise fire-resistive rating.
2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with elastomeric fill materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by joint firestopping system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

C. Install elastomeric fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Elastomeric fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.
3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels are visible to anyone seeking to remove or joint firestopping system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Joint Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing agency.

4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 CLEANING AND PROTECTION

A. Clean off excess elastomeric fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by joint firestopping system manufacturers and that do not damage materials in which joints occur.

B. Provide final protection and maintain conditions during and after installation that ensure joint firestopping systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

**END OF SECTION 07 84 43**

# SECTION 07 92 00 - JOINT SEALANTS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
1. Silicone joint sealants.
2. Nonstaining silicone joint sealants.
3. Urethane joint sealants.
4. Mildew-resistant joint sealants.
5. Latex joint sealants.

### 1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

### 1.4 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

C. LEED Submittals:

1. Product Data for Credit IEQ 4.1: For sealants and sealant primers used inside the weatherproofing system, documentation including printed statement of VOC content.

D. Joint-Sealant Schedule: Include the following information:
1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

### 1.5 PRECONSTRUCTION TESTING

A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
1. Adhesion Testing: Use ASTM C 794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

2. Compatibility Testing: Use ASTM C 1087 to determine sealant compatibility when in contact with glazing and gasket materials.
3. Stain Testing: Use ASTM C 1248 to determine stain potential of sealant when in contact with masonry substrates.
4. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint-sealant backings, and miscellaneous materials.
5. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
6. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
7. Testing will not be required if joint-sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:
1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
2. Conduct field tests for each kind of sealant and joint substrate.
3. Notify Architect seven days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
    a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
        1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.6 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
   1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
   2. Disintegration of joint substrates from causes exceeding design specifications.
   3. Mechanical damage caused by individuals, tools, or other outside agents.
   4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

**PART 2 - PRODUCTS**

2.1 JOINT SEALANTS, GENERAL

A. Low-Emitting Interior Sealants: Sealants and sealant primers shall comply with the testing and product requirements of the CALGreen.

2.2 SILICONE JOINT SEALANTS

A. Silicone, S, NS, 100/50, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. GE Construction Sealants; SCS2700 SilPruf LM .
      b. Sika Corporation U.S.; Sikasil WS-290.

2.3 NONSTAINING SILICONE JOINT SEALANTS

A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.

2.4 URETHANE JOINT SEALANTS

A. Urethane, S, NS, 25, NT: Single-component, nonsag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Construction Chemicals - Building Systems; Sonalastic TX1.
b. Pecora Corporation; Dynatrol I-XL.
c. Tremco Incorporated; Dymonic.

2.5 MILDEW-RESISTANT JOINT SEALANTS

A. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. Dow Corning Corporation; 786-M White.
b. GE Construction Sealants; Momentive Performance Materials Inc.; SCS1700 Sanitary.
c. Tremco Incorporated; Tremsil 200.

2.6 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. BASF Construction Chemicals - Building Systems; Sonolac.
b. Pecora Corporation; AC-20.
c. Tremco Incorporated; Tremflex 834.

2.7 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
a. BASF Construction Chemicals - Building Systems.
b. Construction Foam Products, a division of Nomaco, Inc.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.8 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

## PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
   1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
   2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
      a. Concrete.
      b. Masonry.
      c. Unglazed surfaces of ceramic tile.
      d. Exterior insulation and finish systems.
   3. Remove laitance and form-release agents from concrete.
   4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
      a. Metal.
      b. Glass.
      c. Porcelain enamel.
      d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of sealant backings.
   2. Do not stretch, twist, puncture, or tear sealant backings.
   3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
   1. Place sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses in each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
   1. Remove excess sealant from surfaces adjacent to joints.
   2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
   3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.
   4. Provide flush joint profile at locations indicated on Drawings according to Figure 8B in ASTM C 1193.
   5. Provide recessed joint configuration of recess depth and at locations indicated on Drawings according to Figure 8C in ASTM C 1193.
      a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
   1. Extent of Testing: Test completed and cured sealant joints as follows:
      a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
      b. Perform one test for each 1000 feet of joint length thereafter or one test per each floor per elevation.
   2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
      a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
   3. Inspect tested joints and report on the following:
      a. Whether sealants filled joint cavities and are free of voids.
      b. Whether sealant dimensions and configurations comply with specified requirements.
      c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.
   4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.
   5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.
   1. Joint Locations:
      a. Control and expansion joints in brick pavers.
      b. Isolation and contraction joints in cast-in-place concrete slabs.
      c. Joints between different materials listed above.
      d. Other joints as indicated on Drawings.
   2. Joint Sealant: Urethane, M, P, 50, T, NT.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces subject to water immersion.
   1. Joint Locations:
      a. Joints in pedestrian walks.
      b. Other joints as indicated on Drawings.
   2. Joint Sealant: Urethane, immersible, S, P, 25, T, NT, I.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces .
   1. Joint Locations:
      a. Construction joints in cast-in-place concrete.
      b. Control and expansion joints in unit masonry.
      c. Joints in glass unit masonry assemblies.
      d. Joints between metal panels.
      e. Joints between different materials listed above.
      f. Perimeter joints between materials listed above and frames of doors and windows.
      g. Control and expansion joints in overhead surfaces.
      h. Other joints as indicated on Drawings.
   2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

RFI 0065
BLDG A&B - Non-Exposed Metal Panel Joint Sealant
Butyl sealants are acceptable at non-exposed metal panel joints

D. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
   1. Joint Locations:
      a. Isolation joints in cast-in-place concrete slabs.
      b. Control and expansion joints in stone flooring.
      c. Control and expansion joints in brick flooring.
      d. Control and expansion joints in tile flooring.
      e. Other joints as indicated on Drawings.
   2. Joint Sealant: Urethane, S, P, 25, T, NT.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.
   1. Joint Locations:
      a. Control and expansion joints on exposed interior surfaces of exterior walls.
      b. Tile control and expansion joints.
      c. Vertical joints on exposed surfaces of unit masonry .
      d. Other joints as indicated on Drawings.

2. Joint Sealant: Urethane, S, NS, 25, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

F. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.
   1. Joint Locations:
      a. Control joints on exposed interior surfaces of exterior walls.
      b. Perimeter joints between interior wall surfaces and frames of windows.
      c. Other joints as indicated on Drawings.
   2. Joint Sealant: Acrylic latex.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

G. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
   1. Joint Locations:
      a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
      b. Tile control and expansion joints where indicated.
      c. Other joints as indicated on Drawings.
   2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

H. Joint-Sealant Application: Concealed mastics.
   1. Joint Locations:
      a. Aluminum thresholds.
      b. Sill plates.
      c. Other joints as indicated on Drawings.
   2. Joint Sealant: Butyl-rubber based.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

**END OF SECTION 07 92 00**

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# SECTION 08 06 71 – DOOR HARDWARE SETS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section references specification sections relating to commercial door hardware for the following:
   1. Swinging doors.
   2. Sliding Doors.
   3. Other doors to the extent indicated.

B. Commercial door hardware includes, but is not necessarily limited to, the following:
   1. Mechanical door hardware.
   2. Electromechanical and access control door hardware.
   3. Electromechanical and access control door hardware power supplies, back-ups and surge protection.
   4. Automatic operators.
   5. Cylinders specified for doors in other sections.

C. Related Sections:
   1. Division 08 Section “Hollow Metal Doors and Frames”.
   2. Division 08 Sections “Flush Wood Doors”.
   3. Division 08 Section “Door Hardware”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
   1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
   2. ICC/IBC - International Building Code.
   3. NFPA 70 - National Electrical Code.
   4. NFPA 80 - Fire Doors and Windows.
   5. NFPA 101 - Life Safety Code.
   6. NFPA 105 - Installation of Smoke Door Assemblies.
   7. State Building Codes, Local Amendments.

E. Standards: Reference Related Sections for requirements regarding compliance with applicable industry standards.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
3. Content: Include the following information:
   a. Type, style, function, size, label, hand, and finish of each door hardware item.
   b. Manufacturer of each item.
   c. Fastenings and other pertinent information.
   d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
   e. Explanation of abbreviations, symbols, and codes contained in schedule.
   f. Mounting locations for door hardware.
   g. Door and frame sizes and materials.
   h. Keying information.
   i. Wiring diagrams.

RFI 0515 — BLDG A & B - Ext Door Stop Clarification — Details on Mounting for Exterior Door Stop

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
5. Key Cylinders shall match existing Solano Stanton Facility keying, and shall be keyed in sets and master keyed, sub-master keyed etc. to a level as directed by the Owner.
   a. Provide (6) Grand master keys per set.
   b. Provide (6) Construction master keys.
   c. Provide (6) Construction Core Extractor keys.
   d. Provide (6) Change keys each lock, core or cylinder.
   e. Provide (6) each Permanent Extractor keys.
   f. Provide an extra (100) proprietary blank keys.
   g. Provide (6) keys for each lock cut and stamped at factory.
   h. Include 3 each change keys each lock, core or cylinder for gun lockers.
   i. Permanent keys shall be stamped "Do Not Duplicate".

RFI 007.1 — Door Cylinder Clarification — Clarified hardware components

6 j. Use ASSA High Security Cylinder Mogul, Keyway EC39 Series
6. When requested by the Owner, in writing, the contractor shall surrender any or all keys assigned to him.
7. All keys shall be stamped with identification characters, as directed by Owner. Each key shall be such that meets the 2006 NFPA-101 Life Safety Code (22.7.5) to identify key(s)

by touch and sight. This system shall be coordinated and installed by the facility maintenance staff after closeout to satisfy this code requirement.

C. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve submitted keying schedule prior to the ordering of permanent cylinders.

D. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the hardware and their nearest service representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.

F. Warranties and Maintenance: Special warranties and maintenance agreements specified in the Related Sections.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum [5] years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Installer Qualifications: Installers, trained by the primary product manufacturers, with a minimum [3] years documented experience installing both standard and electrified builders hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum [5] years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor in good standing by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

D. Source Limitations: Obtain each type and variety of Door Hardware specified in the Related Sections from a single source, qualified supplier unless otherwise indicated.

E. Regulatory Requirements: Comply with NFPA 70, NFPA 80, NFPA 101 and ANSI A117.1 requirements and guidelines as directed in the applicable model building code.

F. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

## 1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door and Frame Preparation: Division 08 Sections (Steel, Aluminum and Wood) doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

## 1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

## 1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

## PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. Refer to "PART 3 – EXECUTION" for required specification sections.

## PART 3 - EXECUTION

3.1 DOOR HARDWARE SETS

A. The door hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

B. The supplier is responsible for handing and sizing all products as listed in the door hardware sets. Quantities listed are for each pair of doors, or for each single door.

C. Products listed in the Door Hardware Sets must meet the requirements described in the specifications sections noted.
   1. Section 08 06 71 – Door Hardware Sets
   2. Section 08 71 63 – Detention Door Hardware
   3. Section 08 74 00 – Access Control Hardware

D. Manufacturer's Abbreviations:

1. MK - McKinney
2. RO - Rockwood
3. SA - Sargent
4. SU - Securitron
5. AA - ASSA High Security Locks
6. RF - Rixson
7. PE - Pemko
8. 00 - Other

**Hardware Schedule**

**HW 1.0**

Doors: B129.1, B135.1, B136.1, B136.2, B140.3, B140.4, B140.5, B141.1, B141.2, B141.5, B145.1, B145.2, B145.4, B145.5, B152.1, B155.2, G04, G05, G06, G07, G10, G13, G14, G15, G16, G17.

1 All hardware by door supplier 00

**HW 2.0**

Doors: A101.1

| | | | | | |
|---|---|---|---|---|---|
| 1 | Hinge (heavy weight) | T4A3386 NRP QC12 4-1/2" x 4-1/2" TXS-Stainless | US32D | MK | 087400 |
| 5 | Hinge (heavy weight) | T4A3386 NRP 4-1/2" x 4-1/2" TXS-Stainless | US32D | MK | 087100 |
| 1 | Flush Bolt | 2845 TORX | US26D | RO | 087100 |
| 1 | Exit Device | LC LD 36 59 8906 ETJ | US32D | SA | 087400 |
| 2 | ASSA high Security Cylinder | as required | | AA | |
| 2 | Door Closer | MC 36 281 CPSH | EN | SA | 087100 |
| 2 | Kick Plate | K1062 10X2LDW 4BE CSK | US32D | RO | 087100 |
| 1 | Threshold | 271A FHSL14 Torx | | PE | 087100 |
| 1 | Threshold Stop Seal | 1842APK FHSL14 Torx | | PE | 087100 |
| 1 | Gasketing | S44D | | PE | 087100 |
| 1 | Rain Guard | 346A | | PE | 087100 |
| 2 | Sweep | 315CN | | PE | 087100 |
| 1 | ElectroLynx Harness | QC-C--00P hinge to J box | | MK | 087400 |
| 1 | ElectroLynx Harness | QC-C-00P hinge to lock | | MK | 087400 |

Notes: Astragal by hollow metal door manufacture.

**HW 3.0**

Doors: A109.1

| | | | | | |
|---|---|---|---|---|---|
| 1 | Hinge (heavy weight) | T4A3386 NRP QC12 4-1/2" x 4-1/2" TXS-Stainless | US32D | MK | 087400 |
| 2 | Hinge (heavy weight) | T4A3386 NRP 4-1/2" x 4-1/2" TXS-Stainless | US32D | MK | 087100 |
| 1 | Magnetic Lock Delay Egress | IMXDA-CA | | SU | 087400 |
| 1 | Access Control Lock | 36 M1-82271-24V-IPS LNJ LC | US26D | SA | 087400 |
| 2 | ASSA high Security Cylinder | as required | | AA | |
| 1 | Door Closer | MC 36 281 P10 | EN | SA | 087100 |
| 1 | Kick Plate | K1062 10X2LDW 4BE CSK | US32D | RO | 087100 |
| 1 | Door Stop | 468 | Black | RO | 087100 |
| 1 | Threshold | 271A FHSL14 Torx | | PE | 087100 |
| 1 | Threshold Stop Seal | 1842APK FHSL14 Torx | | PE | 087100 |
| 1 | Gasketing | S44D | | PE | 087100 |
| 1 | Sweep | 315CN | | PE | 087100 |
| 1 | ElectroLynx Harness | QC-C--00P hinge to J box | | MK | 087400 |

| | | | | |
|---|---|---|---|---|
| 1 ElectroLynx Harness | QC-C-00P hinge to lock | | MK | 087400 |

**HW 4.0**

Doors: A101B.1, A101C.1, A102C.1, A102D.1, A102E.1, A102F.1, A102G.1, A102H.1, A103.B1, A103.C1, A103.D1, A103.E1, A103.F1, A103.G1, A104.C1, A104.D1, A104.E1, A104.F1, A104.G1, A104.H1

| | | | | |
|---|---|---|---|---|
| 3 Hinge (heavy weight) | T4A3786 NRP 4-1/2" x 4-1/2" TXS-Steel | US26D | MK | 087100 |
| 1 Mortise Lock | LC 36 9204 LNJ | US26D | SA | 087100 |
| 1 ASSA high Security Cylinder | as required | | AA | |
| 1 Surface Overhead Holder/Stop | 8-326 Torx | 630 | RF | 087100 |
| 1 Kick Plate | K1062 10X2LDW 4BE CSK | US32D | RO | 087100 |
| 3 Silencer | 608 | | RO | 087100 |

**HW 5.0**

Doors: A101.2, A102A.1, A102B.1, A103.1, A103A.1, A104A.1, A104B.1

RFI 198 — LVSE MEP Peer Review — Clarified door openings

| | | | | |
|---|---|---|---|---|
| 2 Hinge (heavy weight) | T4A3786 NRP 4-1/2" x 4-1/2" TXS-Steel | US26D | MK | 087100 |
| 1 Hinge (heavy weight) | T4A3786 NRP QC12 4-1/2" x 4-1/2" TXS-Steel | US26D | MK | 087400 |
| 1 Exit Device | LD 36 M1-8876-24V-IPS ETJ LC | US32D | SA | 087400 |
| 1 ASSA high Security Cylinder | as required | | AA | |
| 1 Door Closer | MC 36 281 P10 | EN | SA | 087100 |
| 1 Kick Plate | K1062 10X2LDW 4BE CSK | US32D | RO | 087100 |
| 1 Wall Stop | 409 | US32D | RO | 087100 |
| 1 Gasketing | S44D | | PE | 087100 |
| 1 ElectroLynx Harness | QC-C--00P hinge to J box | | MK | 087400 |
| 1 ElectroLynx Harness | QC-C-00P hinge to lock | | MK | 087400 |

**HW 6.0**

Doors: A105.1, A116.1, B133B.1, B138.B.1, B148.D.1, B154B.1, B156A.1

RFI 0554 — MDF Room Door Closer — Closer Not Required at RM B156

| | | | | |
|---|---|---|---|---|
| 3 Hinge (heavy weight) | T4A3786 NRP 4-1/2" x 4-1/2" TXS-Steel | US26D | MK | 087100 |
| 1 Mortise Lock | LC 36 9204 LNJ | US26D | SA | 087100 |
| 1 ASSA high Security Cylinder | as required | | AA | |
| 1 Wall Stop | 409 | US32D | RO | 087100 |
| 1 Gasketing | S44D | | PE | 087100 |

**HW 7.0**

Doors: A109.2, A122.1

| | | | | | |
|---|---|---|---|---|---|
| 2 | Hinge (heavy weight) | T4A3786 NRP 4-1/2" x 4-1/2" TXS-Steel | US26D | MK | 087100 |
| 1 | Hinge (heavy weight) | T4A3786 NRP QC12 4-1/2" x 4-1/2" TXS-Steel | US26D | MK | 087400 |
| 1 | Access Control Lock | 36 M1-82271-24V-IPS LNJ LC | US26D | SA | 087400 |
| 1 | ASSA high Security Cylinder | as required | | AA | |
| 1 | Door Closer | MC 36 281 P10 | EN | SA | 087100 |
| 1 | Kick Plate | K1062 10X2LDW 4BE CSK | US32D | RO | 087100 |
| 1 | Wall Stop | 409 | US32D | RO | 087100 |
| 1 | Gasketing | S44D | | PE | 087100 |
| 1 | ElectroLynx Harness | QC-C--00P hinge to J box | | MK | 087400 |
| 1 | ElectroLynx Harness | QC-C-00P hinge to lock | | MK | 087400 |

**HW 8.0**

Doors: A125.1

| | | | | | |
|---|---|---|---|---|---|
| 3 | Hinge (heavy weight) | T4A3786 NRP 4-1/2" x 4-1/2" TXS-Steel | US26D | MK | 087100 |
| 1 | Mortise Lock | LC 36 9205 LNJ | US26D | SA | 087100 |
| 1 | ASSA high Security Cylinder | as required | | AA | |
| 1 | Door Closer | MC 36 281 CPS | EN | SA | 087100 |
| 1 | Kick Plate | K1062 10X2LDW 4BE CSK | US32D | RO | 087100 |
| 1 | Gasketing | S44D | | PE | 087100 |

**HW 9.0**

Doors: A110B.1, A127.1, B134.1, B139.1, B149.1, B151.1

| | | | | | |
|---|---|---|---|---|---|
| 3 | Hinge (heavy weight) | T4A3386 NRP QC8 4-1/2" x 4-1/2" TXS-Stainless | US32D | MK | 087400 |
| 1 | Mortise Lock | LC 36 9204 LNJ | US26D | SA | 087100 |
| 1 | ASSA high Security Cylinder | as required | | AA | |
| 1 | Door Closer | MC 36 281 P10 | EN | SA | 087100 |
| 1 | Door Stop | 468 | Black | RO | 087100 |
| 1 | Threshold | 271A FHSL14 Torx | | PE | 087100 |
| 1 | Threshold Stop Seal | 1842APK FHSL14 Torx | | PE | 087100 |
| 1 | Gasketing | S44D | | PE | 087100 |
| 1 | Rain Guard | 346A | | PE | 087100 |

| | | | | | |
|---|---|---|---|---|---|
| 1 | Sweep | 315CN | | PE | 087100 |

**HW 10.0**

Doors: A107.1, A108.1

| | | | | | |
|---|---|---|---|---|---|
| 3 | Hinge (heavy weight) | T4A3786 NRP 4-1/2" x 4-1/2" TXS-Steel | US26D | MK | 087100 |
| 1 | Mortise Lock | LC 36 9204 LNJ | US26D | SA | 087100 |
| 1 | ASSA high Security Cylinder | as required | | AA | |
| 1 | Closer | MC 36 281 O10 | EN | SA | 087100 |
| 1 | Kick Plate | K1062 10X2LDW 4BE CSK | US32D | RO | 087100 |
| 1 | Wall Stop | 409 | US32D | RO | 087100 |
| 1 | Gasketing | S44D | | PE | 087100 |

**HW 11.0**

Doors: A114.1, A115.1

| | | | | | |
|---|---|---|---|---|---|
| 3 | Hinge (heavy weight) | T4A3786 NRP 4-1/2" x 4-1/2" TXS-Steel | US26D | MK | 087100 |
| 1 | Institutional Privacy Lock | LC 36 50 8267 LNJ | US26D | SA | 087100 |
| 1 | ASSA high Security Cylinder | as required | | AA | |
| 1 | Closer | MC 36 281 O10 | EN | SA | 087100 |
| 1 | Kick Plate | K1062 10X2LDW 4BE CSK | US32D | RO | 087100 |
| 1 | Wall Stop | 409 | US32D | RO | 087100 |
| 1 | Gasketing | S44D | | PE | 087100 |

**HW 12.0**

Doors: A117.1, A118.1

| | | | | | |
|---|---|---|---|---|---|
| 3 | Hinge (heavy weight) | T4A3786 NRP 4-1/2" x 4-1/2" TXS-Steel | US26D | MK | 087100 |
| 1 | Mortise Lock | LC 36 9237 LNJ | US26D | SA | 087100 |
| 1 | ASSA high Security Cylinder | as required | | AA | |
| 1 | Concealed Overhead Holder | 1-X16 | 652 | RF | 087100 |
| 1 | Kick Plate | K1062 10X2LDW 4BE CSK | US32D | RO | 087100 |
| 1 | Gasketing | S44D | | PE | 087100 |

**HW 13.0**

Doors: A110.1, A120.1

| | | | | | |
|---|---|---|---|---|---|
| 2 | Hinge (heavy weight) | T4A3786 NRP 4-1/2" x 4-1/2" TXS-Steel | US26D | MK | 087100 |
| 1 | Hinge (heavy weight) | T4A3786 NRP QC12 4-1/2" x 4-1/2" TXS-Steel | US26D | MK | 087400 |
| 1 | Access Control Lock | 36 M1-82271-24V-IPS LNJ LC | US26D | SA | 087400 |
| 1 | ASSA high Security Cylinder | as required | | AA | |
| 1 | Closer | MC 36 281 O10 | EN | SA | 087100 |
| 1 | Kick Plate | K1062 10X2LDW 4BE CSK | US32D | RO | 087100 |
| 1 | Wall Stop | 409 | US32D | RO | 087100 |
| 1 | Gasketing | S44D | | PE | 087100 |
| 1 | ElectroLynx Harness | QC-C--00P hinge to J box | | MK | 087400 |
| 1 | ElectroLynx Harness | QC-C-00P hinge to lock | | MK | 087400 |

**HW 14.0**

Doors: A111.1, A119.1, A126.1

| | | | | | |
|---|---|---|---|---|---|
| 3 | Hinge (heavy weight) | T4A3786 NRP 4-1/2" x 4-1/2" TXS-Steel | US26D | MK | 087100 |
| 1 | Push Pull | 107x73B/73BL | US32D | RO | 087100 |
| 1 | Door Closer | MC 36 281 P10 | EN | SA | 087100 |
| 1 | Kick Plate | K1062 10X2LDW 4BE CSK | US32D | RO | 087100 |
| 1 | Wall Stop | 409 | US32D | RO | 087100 |
| 1 | Gasketing | S44D | | PE | 087100 |

**HW 15.0**

Doors: A121.1

| | | | | | |
|---|---|---|---|---|---|
| 1 | Hinge (heavy weight) | T4A3386 NRP QC12 4-1/2" x 4-1/2" TXS-Stainless | US32D | MK | 087400 |
| 2 | Hinge (heavy weight) | T4A3386 NRP 4-1/2" x 4-1/2" TXS-Stainless | US32D | MK | 087100 |
| 1 | Magnetic Lock Delay Egress | IMXDA-CA | | SU | 087400 |
| 1 | Exit Device | LD 36 M1-8876-24V-IPS ETJ LC | US32D | SA | 087400 |
| 2 | ASSA high Security Cylinder | as required | | AA | |
| 1 | Door Closer | MC 36 281 CPS | EN | SA | 087100 |
| 1 | Kick Plate | K1062 10X2LDW 4BE CSK | US32D | RO | 087100 |
| 1 | Door Stop | 468 | Black | RO | 087100 |
| 1 | Threshold | 271A FHSL14 Torx | | PE | 087100 |
| 1 | Threshold Stop Seal | 1842APK FHSL14 Torx | | PE | 087100 |
| 1 | Gasketing | S44D | | PE | 087100 |
| 1 | Sweep | 315CN | | PE | 087100 |

| | | | | | |
|---|---|---|---|---|---|
| 1 | ElectroLynx Harness | QC-C--00P hinge to J box | | MK | 087400 |
| 1 | ElectroLynx Harness | QC-C-00P hinge to lock | | MK | 087400 |

**HW 16.0**

Doors: A128.2

| | | | | | |
|---|---|---|---|---|---|
| 6 | Hinge (heavy weight) | T4A3786 NRP 4-1/2" x 4-1/2" TXS-Steel | US26D | MK | 087100 |
| 2 | Push Plate | 71F | US32D | RO | 087100 |
| 2 | Door Closer | MC 36 281 P10 | EN | SA | 087100 |
| 2 | Kick Plate | K1062 10X2LDW 4BE CSK | US32D | RO | 087100 |
| 2 | Wall Stop | 409 | US32D | RO | 087100 |
| 1 | Gasketing | S44D | | PE | 087100 |
| 1 | Astragal | S772D | | PE | 087100 |

**HW 17.0**

Doors: B129.2, B129.3, B133.3, B135.2, B135.3, B136.3, B136.4, B138.3, B140.1, B140.2, B141.3, B141.4, B144.1, B145.3, B145.6, B148.3, B150.1, B152.2, B152.3, B154.4, B155.1, B155.3, B156B.1

| | | | | | |
|---|---|---|---|---|---|
| 1 | Hinge (heavy weight) | T4A3386 NRP QC12 4-1/2" x 4-1/2" TXS-Stainless | US32D | MK | 087400 |
| 2 | Hinge (heavy weight) | T4A3386 NRP 4-1/2" x 4-1/2" TXS-Stainless | US32D | MK | 087100 |
| 1 | Access Control Lock | 36 M1-82271-24V-IPS LNJ LC | US26D | SA | 087400 |
| 1 | ASSA high Security Cylinder | as required | | AA | |
| 1 | Door Closer | MC 36 281 P10 | EN | SA | 087100 |
| 1 | Kick Plate | K1062 10X2LDW 4BE CSK | US32D | RO | 087100 |
| 1 | Door Stop | 468 | Black | RO | 087100 |
| 1 | Threshold | 271A FHSL14 Torx | | PE | 087100 |
| 1 | Gasketing | S44D | | PE | 087100 |
| 1 | Rain Guard | 346A | | PE | 087100 |
| 1 | Sweep | 315CN | | PE | 087100 |
| 1 | ElectroLynx Harness | QC-C--00P hinge to J box | | MK | 087400 |
| 1 | ElectroLynx Harness | QC-C-00P hinge to lock | | MK | 087400 |

**HW 18.0**

Doors: A112.1

| | | | | | |
|---|---|---|---|---|---|
| 6 | Hinge (heavy weight) | T4A3786 NRP 4-1/2" x 4-1/2" TXS-Steel | US26D | MK | 087100 |
| 1 | Mortise Lock | LC 36 9204 LNJ | US26D | SA | 087100 |

| | | | | | |
|---|---|---|---|---|---|
| 1 | Flush Bolt | 2805 | US26D | RO | 087100 |
| 1 | ASSA high Security Cylinder | as required | | AA | |
| 2 | Wall Stop | 409 | US32D | RO | 087100 |
| 1 | Astragal | 355CV | | PE | 087100 |
| 2 | Silencer | 608 | | RO | 087100 |

**HW 19.0**

Doors: B129C.1, B129D.1, B129E.1, B135C.1, B135D.1, B135E.1, B136C.1, B136D.1, B136E.1, B140C.1, B140D.1, B140E.1, B141C.1, B141D.1, B141E.1, B145C.1, B145D.1, B145E.1, B152C.1, B152D.1, B152E.1, B155C.1, B155D.1, B155E.1

| | | | | | |
|---|---|---|---|---|---|
| 1 | Storeroom Lock | LC 36 11G04 OJ | US26D | SA | 087100 |
| 1 | ASSA high Security Cylinder | as required | | AA | |
| 1 | Balance of hardware by gate supplier | | | 00 | |

**HW 20.0**

Doors: B129B.1, B135B.1, B136B.1, B140B.1, B141B.1, B145B.1, B152B.1, B155B.1

| | | | | | |
|---|---|---|---|---|---|
| 2 | Hinge (heavy weight) | T4A3786 NRP 4-1/2" x 4-1/2" TXS-Steel | US26D | MK | 087100 |
| 1 | Hinge (heavy weight) | T4A3786 NRP QC12 4-1/2" x 4-1/2" TXS-Steel | US26D | MK | 087400 |
| 1 | Access Control Lock | 36 M1-82271-24V-IPS LNJ LC | US26D | SA | 087400 |
| 1 | ASSA high Security Cylinder | as required | | AA | |
| 1 | Door Closer | MC 36 281 P10 | EN | SA | 087100 |
| 1 | Kick Plate | K1062 10X2LDW 4BE CSK | US32D | RO | 087100 |
| 1 | Threshold | 271A FHSL14 Torx | | PE | 087100 |
| 1 | Gasketing | S44D | | PE | 087100 |
| 1 | Door Bottom | 222APK | | PE | 087100 |
| 1 | ElectroLynx Harness | QC-C--00P hinge to J box | | MK | 087400 |
| 1 | ElectroLynx Harness | QC-C-00P hinge to lock | | MK | 087400 |

**HW 21.0**

Doors: B133.1, B133.2, B138.1, B138.2, B148.1, B148.2, B154.1, B154.2

| | | | | | |
|---|---|---|---|---|---|
| 5 | Hinge (heavy weight) | T4A3786 NRP 4-1/2" x 4-1/2" TXS-Steel | US26D | MK | 087100 |
| 1 | Hinge (heavy weight) | T4A3786 NRP QC12 4-1/2" x 4-1/2" TXS-Steel | US26D | MK | 087400 |
| 1 | Flush Bolt | 2845 TORX | US26D | RO | 087100 |
| 1 | Access Control Lock | 36 M1-82271-24V-IPS LNJ LC | US26D | SA | 087400 |

| | | | | | |
|---|---|---|---|---|---|
| 1 | ASSA high Security Cylinder | as required | | AA | |
| 2 | Door Closer | MC 36 281 P10 | EN | SA | 087100 |
| 2 | Kick Plate | K1062 10X2LDW 4BE CSK | US32D | RO | 087100 |
| 1 | Threshold | 271A FHSL14 Torx | | PE | 087100 |
| 1 | Gasketing | S44D | | PE | 087100 |
| 2 | Door Bottom | 222APK | | PE | 087100 |
| 1 | ElectroLynx Harness | QC-C--00P hinge to J box | | MK | 087400 |
| 1 | ElectroLynx Harness | QC-C-00P hinge to lock | | MK | 087400 |

Notes: Astragal by hollow metal door manufacture.

**HW 22.0**

Doors: B147.1, B153.1

| | | | | | |
|---|---|---|---|---|---|
| 1 | Hinge (heavy weight) | T4A3386 NRP QC12 4-1/2" x 4-1/2" TXS-Stainless | US32D | MK | 087400 |
| 2 | Hinge (heavy weight) | T4A3386 NRP 4-1/2" x 4-1/2" TXS-Stainless | US32D | MK | 087100 |
| 1 | Access Control Lock | 36 M1-82281-24V-IPS LNJ LC | US26D | SA | 087400 |
| 1 | ASSA high Security Cylinder | as required | | AA | |
| 1 | Door Closer | MC 36 281 P10 | EN | SA | 087100 |
| 1 | Door Stop | 468 | Black | RO | 087100 |
| 1 | Threshold | 271A FHSL14 Torx | | PE | 087100 |
| 1 | Threshold Stop Seal | 1842APK FHSL14 Torx | | PE | 087100 |
| 1 | Gasketing | S44D | | PE | 087100 |
| 1 | Rain Guard | 346A | | PE | 087100 |
| 1 | Sweep | 315CN | | PE | 087100 |
| 1 | ElectroLynx Harness | QC-C--00P hinge to J box | | MK | 087400 |
| 1 | ElectroLynx Harness | QC-C-00P hinge to lock | | MK | 087400 |

Notes: Lockset has Privacy feature.

**HW 23.0**

Doors: A106.1

| | | | | | |
|---|---|---|---|---|---|
| 2 | Hinge (heavy weight) | T4A3786 NRP 4-1/2" x 4-1/2" TXS-Steel | US26D | MK | 087100 |
| 1 | Hinge (heavy weight) | T4A3786 NRP QC12 4-1/2" x 4-1/2" TXS-Steel | US26D | MK | 087400 |
| 1 | Access Control Lock | 36 M1-82271-24V-IPS LNJ LC | US26D | SA | 087400 |
| 1 | ASSA high Security Cylinder | as required | | AA | |

| | | | | | |
|---|---|---|---|---|---|
| 1 | Closer | MC 36 281 O10 | EN | SA | 087100 |
| 1 | Kick Plate | K1062 10X2LDW 4BE CSK | US32D | RO | 087100 |
| 1 | Wall Stop | 409 | US32D | RO | 087100 |
| 1 | Gasketing | S44D | | PE | 087100 |
| 1 | ElectroLynx Harness | QC-C--00P hinge to J box | | MK | 087400 |
| 1 | ElectroLynx Harness | QC-C-00P hinge to lock | | MK | 087400 |

**HW 24.0**

Doors: A123.1, A124.1

| | | | | | |
|---|---|---|---|---|---|
| 3 | Hinge (heavy weight) | T4A3786 NRP 4-1/2" x 4-1/2" TXS-Steel | US26D | MK | 087100 |
| 1 | Mortise Lock | LC 36 9237 LNJ | US26D | SA | 087100 |
| 1 | ASSA high Security Cylinder | as required | | AA | |
| 1 | Door Closer | MC 36 281 CPS | EN | SA | 087100 |
| 1 | Kick Plate | K1062 10X2LDW 4BE CSK | US32D | RO | 087100 |
| 1 | Gasketing | S44D | | PE | 087100 |

**HW 25.0**

Doors: A121.2

| | | | | | |
|---|---|---|---|---|---|
| 1 | Hinge (heavy weight) | T4A3386 NRP QC12 4-1/2" x 4-1/2" TXS-Stainless | US32D | MK | 087400 |
| 2 | Hinge (heavy weight) | T4A3386 NRP 4-1/2" x 4-1/2" TXS-Stainless | US32D | MK | 087100 |
| 1 | Exit Device | LC LD 36 8876-24v ETJ | US32D | SA | 087400 |
| 1 | ASSA high Security Cylinder | as required | | AA | |
| 1 | Door Closer | MC 36 281 CPS | EN | SA | 087100 |
| 1 | Kick Plate | K1062 10X2LDW 4BE CSK | US32D | RO | 087100 |
| 1 | Door Stop | 468 | Black | RO | 087100 |
| 1 | Threshold | 271A FHSL14 Torx | | PE | 087100 |
| 1 | Threshold Stop Seal | 1842APK FHSL14 Torx | | PE | 087100 |
| 1 | Gasketing | S44D | | PE | 087100 |
| 1 | Sweep | 315CN | | PE | 087100 |
| 1 | ElectroLynx Harness | QC-C--00P hinge to J box | | MK | 087400 |
| 1 | ElectroLynx Harness | QC-C-00P hinge to lock | | MK | 087400 |

**HW 26.0**

Doors: G09, G11 To Match Existing Gates At Stanton Facility

| | | | | | |
|---|---|---|---|---|---|
| 1 | Magnetic Lock | M62FGB | | SU | 087100 |
| 1 | Door Loop | TSB-C | | SU | 087100 |
| 1 | Balance of hardware by gate supplier | | | 00 | |

**HW 27.0**

Doors: G02, G03

| | | | | | |
|---|---|---|---|---|---|
| 1 | Magnetic Lock | M62FGB | | SU | 087100 |
| 1 | Door Loop | TSB-C | | SU | 087100 |
| 1 | Electromechanical Handle | EL-EMH-CL | | SU | 087400 |
| 1 | Timer | BA-XDT-24 | | SU | 087400 |
| 1 | Balance of hardware by gate supplier | | | 00 | |

**HW 28.0**

Doors: A121.3

RFI 0558 — Door A121.3 Hardware — Provide LC 36 9273-24V LNJ

| | | | | | |
|---|---|---|---|---|---|
| 1 | Hinge (heavy weight) | T4A3386 NRP QC12 4-1/2" x 4-1/2" TXS-Stainless | US32D | MK | 087400 |
| 2 | Hinge (heavy weight) | T4A3386 NRP 4-1/2" x 4-1/2" TXS-Stainless | US32D | MK | 087100 |
| 1 | Exit Device | ~~LD 36 M1-8876-24V-IPS ETJ LC~~ LC 36 9273-24V LNJ | US32D | SA | 087400 |
| 1 | ASSA high Security Cylinder | as required | | AA | |
| 1 | Door Closer | MC 36 281 P10 | EN | SA | 087100 |
| 1 | Kick Plate | K1062 10X2LDW 4BE CSK | US32D | RO | 087100 |
| 1 | Door Stop | 468 | Black | RO | 087100 |
| 1 | Threshold | 271A FHSL14 Torx | | PE | 087100 |
| 1 | Threshold Stop Seal | 1842APK FHSL14 Torx | | PE | 087100 |
| 1 | Gasketing | S44D | | PE | 087100 |
| 1 | Sweep | 315CN | | PE | 087100 |
| 1 | ElectroLynx Harness | QC-C--00P hinge to J box | | MK | 087400 |
| 1 | ElectroLynx Harness | QC-C-00P hinge to lock | | MK | 087400 |

**HW 29.0**

Doors: A128.1

| | | | | | |
|---|---|---|---|---|---|
| 1 | Hinge (heavy weight) | T4A3386 NRP QC12 4-1/2" x 4-1/2" TXS-Stainless | US32D | MK | 087400 |
| 2 | Hinge (heavy weight) | T4A3386 NRP 4-1/2" x 4-1/2" TXS-Stainless | US32D | MK | 087100 |
| 1 | Magnetic Lock Delay Egress | IMXDA-CA | | SU | 087400 |
| 1 | Exit Device | LD 36 M1-8876-24V-IPS ETJ LC | US32D | SA | 087400 |
| 2 | ASSA high Security Cylinder | as required | | AA | |
| 1 | Door Closer | MC 36 281 P10 | EN | SA | 087100 |
| 1 | Kick Plate | K1062 10X2LDW 4BE CSK | US32D | RO | 087100 |
| 1 | Door Stop | 468 | Black | RO | 087100 |
| 1 | Threshold | 271A FHSL14 Torx | | PE | 087100 |
| 1 | Threshold Stop Seal | 1842APK FHSL14 Torx | | PE | 087100 |
| 1 | Gasketing | S44D | | PE | 087100 |
| 1 | Sweep | 315CN | | PE | 087100 |
| 1 | ElectroLynx Harness | QC-C--00P hinge to J box | | MK | 087400 |
| 1 | ElectroLynx Harness | QC-C-00P hinge to lock | | MK | 087400 |

**END OF SECTION 08 06 71**

# SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section includes hollow-metal work.

### 1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

### 1.4 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

### 1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

### 1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.

B. LEED Submittals:
   1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings: Include the following:
   1. Elevations of each door type.
   2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
   3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
   4. Locations of reinforcement and preparations for hardware.
   5. Details of each different wall opening condition.
   6. Details of anchorages, joints, field splices, and connections.
   7. Details of accessories.
   8. Details of moldings, removable stops, and glazing.
   9. Details of conduit and preparations for power, signal, and control systems.

D. Samples for Verification:
   1. For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches.

E. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.7 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
   1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch- high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Amweld International, LLC.
   2. Apex Industries, Inc.
   3. Ceco Door; ASSA ABLOY.

B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 REGULATORY REQUIREMENTS

A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

2.3 INTERIOR DOORS AND FRAMES

A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Doors and Frames: SDI A250.8, Level 2. At locations indicated in the Door and Frame Schedule.
   1. Physical Performance: Level B according to SDI A250.4.
   2. Doors:
      a. Type: As indicated in the Door and Frame Schedule.
      b. Thickness: 1-3/4 inches.
      c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.042 inch.
      d. Edge Construction: Model 2, Seamless.
      e. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.
   3. Frames:
      a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch.
      b. Sidelite Frames: Fabricated from same thickness material as adjacent door frame.
      c. Construction: Full profile welded.
   4. Exposed Finish: Prime.

2.4 BORROWED LITES

A. Hollow-metal frames of uncoated steel sheet, minimum thickness of 0.042 inch.

B. Construction: Full profile welded.

2.5 HOLLOW-METAL PANELS

A. Provide hollow-metal panels of same materials, construction, and finish as adjacent door assemblies.

2.6 FRAME ANCHORS

A. Jamb Anchors:
   1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.

B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:
   1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.7 MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

C. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

2.8 FABRICATION

A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Hollow-Metal Doors:
1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch, steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches apart. Spot weld to face sheets no more than 5 inches o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.
2. Fire Door Cores: As required to provide fire-protection and temperature-rise ratings indicated.
3. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches.
4. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets.
5. Bottom Edge Closures: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets.
6. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.

C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Sidelite Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
4. Jamb Anchors: Provide number and spacing of anchors as follows:
   a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
      1) Three anchors per jamb up to 60 inches high.
      2) Four anchors per jamb from 60 to 90 inches high.
      3) Five anchors per jamb from 90 to 96 inches high.
      4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
5. Head Anchors: Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.

6. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
   a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
   b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
7. Terminated Stops: Terminate stops 6 inches above finish floor with a 45-degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.

D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.

E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

2.9 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

## PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.

B. Hollow-Metal Frames: Install hollow-metal frames for doors, transoms, sidelites, borrowed lites, and other openings, of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
   1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
      a. At fire-rated openings, install frames according to NFPA 80.
      b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
      c. Install frames with removable stops located on secure side of opening.
      d. Install door silencers in frames before grouting.
      e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
      f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
      g. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.

RFI 0360 — Exterior Door Anchoring
Floor anchoring not required.

   2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
   3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
   4. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.

RFI 360.1 — BLDG A&B - Exterior Door Anchoring
Door Frame Installation Repairs

   5. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
      a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
      b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
      c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
      d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
   1. Non-Fire-Rated Steel Doors:
      a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
      b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
      c. At Bottom of Door: 5/8 inch plus or minus 1/32 inch.
      d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.
   2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

## 3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow-metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

E. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

**END OF SECTION 08 11 13**

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# SECTION 08 14 16 - FLUSH WOOD DOORS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
1. Solid-core doors and transom panels with wood-veneer faces.
2. Shop priming flush wood doors.

### 1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

### 1.4 ACTION SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction, louvers, and trim for openings. Include factory-finishing specifications.

B. LEED Submittals:

1. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.
2. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regionally manufactured and regionally extracted and manufactured materials. Include statement indicating cost for each regionally manufactured material.
    a. Include statement indicating location of manufacturer and distance to Project for each regionally manufactured material.
    b. Include statement indicating location of manufacturer and point of extraction, harvest, or recovery for each raw material used in regionally extracted and manufactured materials. Indicate distance to Project and fraction by weight of each regionally manufactured material that is regionally extracted.
3. Product Data for Credit IEQ 4.4: For adhesives and composite wood products, documentation indicating that product contains no urea formaldehyde.
4. Laboratory Test Reports for Credit IEQ 4.1: For adhesives, documentation indicating that products comply with the testing and product requirements of the CALGreen Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers.

5. Laboratory Test Reports for Credit IEQ 4.2: For paints and coatings, documentation indicating that products comply with the testing and product requirements of the CALGreen Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers.
6. Laboratory Test Reports for Credit IEQ 4.4: For composite wood products, documentation indicating that products comply with the testing and product requirements of the CALGreen Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers.

C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:
1. Dimensions and locations of blocking.
2. Dimensions and locations of mortises and holes for hardware.
3. Dimensions and locations of cutouts.
4. Undercuts.
5. Requirements for veneer matching.
6. Fire-protection ratings for fire-rated doors.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags or cardboard cartons.

C. Mark each door ontop and bottom rail with opening number used on Shop Drawings.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.

B. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during remainder of construction period.

## PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Algoma Hardwoods, Inc.
2. Eggers Industries.
3. Haley Brothers, Inc.
4. Mohawk Doors; a Masonite company.

B. Source Limitations: Obtain flush wood doorsand wood paneling from single manufacturer.

2.2 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with ."
1. Provide WI Certified Compliance Labels indicating that doors comply with requirements of grades specified.
2. Contract Documents contain selections chosen from options in quality standard and additional requirements beyond those of quality standard. Comply with those selections and requirements in addition to quality standard.

B. Regional Materials: Flush wood doors shall be manufactured within 500 miles of Project site.

C. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that do not contain urea formaldehyde.

D. Low-Emitting Materials: Fabricate doors with adhesives that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:
1. Grade: Premium, with Grade AA faces.
2. Species: Select white maple .
3. Cut: Plain sliced (flat sliced) .
4. Match between Veneer Leaves: Book match.
5. Assembly of Veneer Leaves on Door Faces: Center-balance match.
6. Pair and Set Match: Provide for doors hung in same openingor separated only by mullions.
7. Room Match: Match door faces within each separate room or area of building. Corridor-door faces do not need to match where they are separated by 20 feet or more.
8. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.
9. Transom Match: Continuous match.
10. Blueprint Match: Where indicated, provide doors with faces produced from same flitches as adjacent wood paneling and arranged to provide blueprint match with wood paneling.
11. Exposed Verticaland Top Edges: Same species as faces or a compatible species - edge Type A.
12. Core: Particleboard.
13. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering. Faces are bonded to core using a hot press.
14. Construction: Seven plies, either bonded or nonbonded construction.

2.4 LIGHT FRAMES AND LOUVERS

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.

1. Wood Species: Same species as door faces.
2. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.

B. Metal Louvers:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Air Louvers, Inc.
   b. Anemostat; a Mestek company.
2. Blade Type: Vision-proof, inverted V.
3. Metal and Finish: Hot-dip galvanized steel, 0.040 inch thick, factory primed for paint finish.

2.5 FABRICATION

A. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.
1. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

B. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.
1. Fabricate door and transom panels with full-width, solid-lumber, rabbeted, meeting rails. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.

C. Openings: Factory cut and trim openings through doors.
1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished.
3. Louvers: Factory install louvers in prepared openings.

2.6 SHOP PRIMING

A. Doors for Transparent Finish: Shop prime faces and all four edges with stain (if required), other required pretreatments, and first coat of finish as specified in Section 099300 "Staining and Transparent Finishing." Seal edges of cutouts and mortises with first coat of finish.

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.
1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Section 087100 "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
   1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide1/4 inch from bottom of door to top of threshold unless otherwise indicated.
      a. Comply with NFPA 80 for fire-rated doors.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

**END OF SECTION 08 14 16**

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# SECTION 08 31 13.53 - SECURITY ACCESS DOORS AND FRAMES

## PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes security access doors and frames for walls and ceilings.

1.3 ALLOWANCES

A. Security access doors and frames are part of a security access door and frame allowance.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details materials, individual components and profiles, and finishes.

B. Product Schedule: For security access doors and frames.

## PART 2 - PRODUCTS

2.1 SECURITY ACCESS DOORS AND FRAMES

A. High-Security Flush Access Doors:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   2. Basis-of-Design Product, Acudor Products, Inc model SD-6000: Subject to compliance with requirements, provide product indicated on Drawings or a comparable product by one of the following:
      a. Acudor Products, Inc.
      b. JL Industries, Inc.; a division of the Activar Construction Products Group.
      c. Milcor; Commercial Products Group of Hart & Cooley, Inc.
   3. Locations: Wall and ceiling.
   4. Steel Door: Nominal 10 gage, min 24”x36” opening.
   5. Frame Material: 2” frame thickness, and finish as door.
   6. Hinges: Manufacturer's standard security hinge.
   7. Latch and Lock: Detention deadbolt with parametric key.

RFI 0480.1 — BLDG A&B - Access Panel Confirmation
Nystrom custom access panel with 10120AE lockset & EC39 keying.

2.2 MATERIALS

A. Frame Anchors: Same type as door face.

RFI 0480 — BLDG B Commercial Access Panel in B147
Commercial Access Door Acceptable In B147 in Lieu of Secured Access Door

2.3 FABRICATION

A. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

B. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.

C. Latch and Lock Hardware:
1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
2. Keys: Furnish two keys per lock and key all locks alike.
3. Mortise Cylinder Preparation: Where indicated, prepare door panel to accept cylinder specified in Section 087100 "Door Hardware."

2.4 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Prime Coated Steel Standard Finish.

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

3.3 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

**END OF SECTION 08 31 13.53**

# SECTION 08 33 23 - OVERHEAD COILING DOORS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
1. Service doors.

RFI 0303 — BLDG B - Overhead Door Coil Cord
Coil cord device altered

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory.
1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
3. Include description of automatic closing device and testing and resetting instructions.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
4. For exterior components, include details of provisions for assembly expansion and contraction and for excluding and draining moisture to the exterior.
5. Show locations of controls, locking devices, detectors or replaceable fusible links, and other accessories.
6. Include diagrams for power, signal, and control wiring.

### 1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

### 1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.
1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

B. Regulatory Requirements: Comply with applicable provisions in California Building Code.

1.6 WARRANTY

A. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace overhead coiling doors that show evidence of deterioration of factory-applied finishes within specified warranty period.
1. Finish Warranty Period: ~~10 years~~ 2 years from date of Substantial Completion.

RFI 0262 BLDG B - Overhead Coiling Door Warranty
Provide a 2-year warranty on the finishes.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS, GENERAL

A. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.
1. Obtain operators and controls from overhead coiling door manufacturer.

2.2 DOOR ASSEMBLY

A. Service Door: Overhead Roll-Up door formed with curtain of interlocking metal slats.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
Basis-of-Design Product: Subject to compliance with requirements, Cornell Iron Works: Thermiser Rolling Door insulated Model # ESD20.
2. Combined unit Overhead Rolling Grille V9 and Thermiser Rolling Door Model # MFW 6F 44GP or comparable product by one of the following:
a. Cookson Company.
b. Overhead Door Corporation.

B. Operation Cycles: Door components and operators capable of operating for not less than 10,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
1. Include tamperproof cycle counter.

C. Air Infiltration: Maximum rate of 0.4 cfm/sq. ft. at 15 and 25 mph when tested according to ASTM E 283.

D. Door Curtain Material: Galvanized steel.

E. Door Grille Material: Aluminum rods brick pattern.

F. Door Curtain Slats: Flat profile slats of 3-1/4-inch center-to-center height.
1. Solid Slats: Approximately 1/16-inch pinholes.
2. Gasket Seal. Manufacturer's standard continuous gaskets between slats.

G. Bottom Bar: Two angles, each not less than 2 by 2 by 1/8 inch thick; fabricated from hot-dip galvanized steel and finished to match door.

H. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats.

I. Hood: Match curtain material and finish.

1. Shape: Square.
2. Mounting: Face of wall.

J. Locking Devices: Equip door with slide bolt for padlock locking device assembly.
1. Locking Device Assembly: Single-jamb side locking bars, operable from inside with thumb turn.

K. Electric Door and Grille Operator (Provide manual chain hoist for emergency operation):
1. Usage Classification:
2. Operator Location: Wall.
3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 feet or lower.
4. Motor Exposure: Interior.
5. Other Equipment: Audible and visual signals.

RFI 0230
BLDG B - Overhead Coiling Door Audible and Visual Signals
Horn and strobe light to be provided

L. Curtain Accessories: Equip door with weather seals pull-down strap automatic closing device.

M. Door Finish:
1. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.

N. Control Station: Standard three button (open-close-stop) control for each operator; surface mounted max. 44” above finish floor.

RFI 0237
BLDG B - Overhead Door Push Buttons
Provide integral three button control with key switch

2.3 MATERIALS, GENERAL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.4 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural steel sheet; complying with ASTM A 653/A 653M, with G90 zinc coating; nominal sheet thickness (coated) of 0.028 inch; and as required.

B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain, and a continuous bar for holding windlocks.

2.5 HOODS

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
   1. Exterior-Mounted Doors: Fabricate hood to act as weather protection and with a perimeter sealant-joint-bead profile for applying joint sealant.

2.6 LOCKING DEVICES

A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.

B. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
   1. Lock Cylinders: Cylinders standard with manufacturer.
   2. Keys: Two for each cylinder.

C. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.7 CURTAIN ACCESSORIES

A. Weather seals for Exterior Doors: Equip each exterior door with weather-stripping gaskets fitted to entire exterior perimeter of door for a weather-resistant installation unless otherwise indicated.
   1. At door head, use 1/8-inch- thick, replaceable, continuous-sheet baffle secured to inside of hood or field- installed on the header.
   2. At door jambs, use replaceable, adjustable, continuous, flexible, 1/8-inch- thick seals of flexible vinyl, rubber, or neoprene.

B. Pull-Down Strap: Provide pull-down straps for doors more than 84 inches high. Concealed auxiliary chain to be provided with concealment bag.

2.8 COUNTERBALANCING MECHANISM

A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.

C. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

D. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.9 ELECTRIC DOOR OPERATORS

A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
      a. Chamberlain Group, Inc. (The).
      b. Approved equal
   2. Comply with NFPA 70.
   3. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.

B. Door Operator Location(s): Operator location indicated for each door.
   1. Wall Mounted: Operator is mounted to the inside front wall on the left or right side of door and connected to door drive shaft with drive chain and sprockets. Side room is required for this type of mounting. Wall mounted operator can also be mounted above or below shaft; if above shaft, headroom is required.

C. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated.
   1. Electrical Characteristics:
      a. Phase: Three phase.
      b. Volts: 408 V.
      c. Hertz: 60.
   2. Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.
   3. Operating Controls, Controllers, Disconnect Switches, Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
   4. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.

D. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

E. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf. Provide manual chain hoist for emergency operation.

F. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged. Provide manual chain hoist for emergency operation.

G. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

2.10 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products AMP 500-06" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.11 STEEL AND GALVANIZED-STEEL FINISHES

A. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

## PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

C. Fire-Rated Doors: Install according to NFPA 80.

D. Smoke-Control Doors: Install according to NFPA 80 and NFPA 105.

E. Power-Operated Doors: Install automatic garage doors openers according to UL 325.

3.3 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
   1. Adjust exterior doors and components to be weather-resistant.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

C. Adjust seals to provide tight fit around entire perimeter.

3.4 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of coiling-door Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for door operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
   1. Perform maintenance, including emergency callback service, during normal working hours.
   2. Include 24-hour-per-day, seven-day-per-week, emergency callback service.

**END OF SECTION 08 33 23**

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# SECTION 08 34 63 – DETENTION DOORS AND FRAMES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Section 013513.16, “Special Project Procedures for Detention Facilities”.

### 1.2 SUMMARY

A. This Section includes the following:
1. Swinging detention doors.
2. Detention door accessories.
3. Level 5 Bullet Resistant doors

B. Related Sections include the following:
1. Division 01 Section 013513.16, “Special Project Procedures for Detention Facilities” for general requirements for detention work, including responsibilities of a single-source detention specialist.
2. Division 04 Section 042000 “Unit Masonry” for anchoring and grouting detention door frames set in masonry construction.
3. Division 07 Section 079200 “Joint Sealants” for security sealants.
4. Division 08 Section 087163 "Detention Door Hardware" for door hardware for detention doors.
5. Division 08 Section 088853 “Security Glazing” for glazing in detention doors, sidelights, and borrowed lights.
6. Division 09 Section 099603 “Special Coatings” for painting requirements.
7. Division 26 for Electrical requirements.
8. Divisions 27 and 28 for Security Electronic device wiring and conduit requirements.
9. Division 284619 “PLC” for frame mounted Security Electronic devices.

### 1.3 SCOPE AND RESPONSIBILITIES

A. Under the requirements of this specification, the DEC shall be responsible for furnishing and installing all Detention hollow metal doors (DHM), frames and door accessories, as specified, in all locations.

### 1.4 DEFINITIONS

A. Uncoated Steel Sheet Thicknesses: Indicated as the minimum thicknesses.

B. Metallic-Coated Steel Sheet Thicknesses: Indicated as the minimum thicknesses of uncoated base metals.

C. Nominal Surface of Floor Covering: Top surface of floor; for resilient tile and carpet, nominal surface of floor covering is defined as top of concrete slab.

1.5 REFERENCES

A. ASTM A366/A 366M-97 Standard Specification for Commercial Steel (CS), Carbon (0.15 Maximum Percent), Cold Rolled

B. ASTM A569A 569M-97 Standard Specification for Steel, Carbon, (0.15 Maximum Percent), Hot Rolled Sheet and Strip, Commercial Quality

C. ASTM A1011, Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot Dip Process, Commercial Quality

D. ASTM A666-96b Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar

E. ASTM B117-95 Standard Practice for Operation salt Spray (Fog) Apparatus

F. ASTM 143-90a (1990) Standard Test Method for Slump of Hydraulic Cement Concrete

G. ASTM D610-95 Standard Test Method for Evaluating Degree of Rusting on Painted Steel Surfaces

H. ASTM D714-87 (1994), Standard Test Method for Evaluating Degree of Blistering of Paints

I. ASTM D 1735-92, Standard Practice for Testing Water Resistance of Coatings Using Water Fog Apparatus

J. ASTM F1450-12a, Standard Test Methods for Hollow Metal Swinging Door Assemblies for Detention Facilities

K. ASTM 1577-96, Standard Test Methods for Detention Locks for Swinging Doors

L. ASTM A167 and A240, Stainless Steel Type 304

M. NAAAM Hollow Metal Manual, all sections.

N. ANSI / UL 752 Bullet-Resistance Equipment

1.6 PERFORMANCE REQUIREMENTS

A. Detention Doors: Provide detention doors and frames that comply with Security Grade 1, or UL 752 Level 5, whichever applies, according to the latest edition of ASTM F 1450-12a, as determined by testing manufacturer's standard products representing those indicated for this Project.

B. Detention Sidelight and Borrowed-Light Frames: Provide detention vision frames that comply with ASTM F 1592-12 and removable glazing stop test according to HMMA 863-04, based on testing manufacturer's standard units.

## 1.7 SUBMITTALS

A. Product Data: Include construction details, material descriptions, core descriptions, label compliance, fire-resistance rating, and finishes for each type of detention door, frame and access panel, as specified.

B. Provide performance testing reports which support the testing requirements specified.

C. Shop Drawings: For detention doors and frames. Include conditions at openings, details of construction, dimensions of profiles, and details of joints and connections. Show anchorage and accessories. Include fastener types, sizes and spacing. Identify each detention door and frame using same reference numbers for openings as those on Drawings.

D. Shop Drawings: For access panels.
1. Door and panel units: Show types, elevations, lock type, thickness of metals, and full size profiles of door members.
2. General: Show connections of units and hardware to other Work. Include schedules showing location of each type and size of door and panel units.

E. Coordination Drawings: Drawings of each opening, including detention door and frame, drawn to scale and coordinating detention door hardware. Show the following:
1. Locations, dimensions, and profiles of detention door hardware reinforcements.
2. Locations and installation details of detention door hardware.
3. Elevations of each detention door design type showing dimensions, locations of detention door hardware, and preparations for power, signal, and electrified and pneumatic control systems.
4. Details of each detention frame type.
5. Details of mortar boxes in detention frames for hardware and communication devices.

F. Oversize Construction Certification: For detention door assemblies required to be fire rated and exceeding limitations of labeled assemblies, submit certification of a testing agency acceptable to authorities having jurisdiction that each detention door and frame assembly has been constructed to comply with design, materials, and construction equivalent to requirements for labeled construction.

## 1.8 QUALIFICATION OF MANUFACTURERS

A. Qualifications of Detention Hollow Metal Manufacturers: Detention hollow metal manufacturing firms shall have not less than five (5) years continuous successful experience with manufacturing hollow metal. These firms shall now be actively engaged in the manufacture of Detention hollow metal doors and frames of the type required for this project. Fabrication methods and product quality shall meet or exceed standards set by the Hollow Metal Manufacturers Association, (HMMA), a division of the National Association of Architectural Metal Manufacturers (NAAMM), and be tested in accordance with ASTM F 1450-12a for all

doors and frames in this section with the exception of door A120 which shall be UL 752 Level 5.

1. Submittal Requirements: In addition to a written request for substitutions, a full size corner sample of each type door and frame showing door construction, face stiffening, insulation, and top hinge reinforcements shall be provided. Provide details of each type of door and frame. Provide a list of 10 facilities of similar scope and size where the product has been installed for a minimum of 5 years. Provide the following information on the 10 facilities:
    a. List name and location of installation.
    b. Date of occupancy by Owner.
    c. Owner's representative to contact and telephone number.
    d. Name of DEC, Construction Manager or General Contractor, and Architect including names of contacts and phone numbers.
    e. The manufacturer shall also submit an audited and certified financial statement indicating a consolidated net worth of $1,000,000.
    f. Provide performance data and tests: All Detention hollow-metal door manufacturers shall submit to the Architect / Consultant evidence of compliance with ASTM F1450-12a and HMMA 863-04. Test reports and documentation shall be in accordance with ASTM F 1450-12a.
        1) Test Specimens: Test doors shall be 3'-0" W x 7-'0" H with 100 square inch vision panel, 4" x 25" clear opening, positioned generally as shown in ASTM F1450-12a, figure 3. Test doors and frames shall be prepared for hardware as specified in ASTM F1450-12a, Section 6 "Specimen Preparation".
        2) Testing Procedures: Test doors and frames shall be furnished with hardware in accordance ASTM F1450-12a, Section 6 – "Specimen Preparation". Latch throw of the lock shall not exceed 1". Assemblies shall be tested in accordance with procedures outlined in ASTM F1450-12a, 7.2 – "Door Assembly Impact Test".
        3) Door Static Load Test: Doors shall be tested in accordance with procedures outlined in ASTM F1450-12a, 7.3 – "Door Static Load Test".
        4) Door Rack Test: Doors shall be tested in accordance with procedures outlined in ASTM F1450-12a, 7.4 – "Door Rack Test".
        5) Performance Criteria for load testing shall be in accordance with applicable paragraphs of ASTM F1450-12a, Section 7 – "Procedures".
        6) Glass Stop Test: A rectangular view window test frame shall be constructed with a glass opening size of 28" x 33" ($\pm$1"). The frame shall be constructed of commercial quality steel meeting ASTM standard A366 or A1011, 12-gauge maximum. Refer to HMMA 863-04, Figure 5, for test frame configuration.
        7) A steel plate of 3/8" minimum thickness shall be glazed in place using the specified glass stop.
        8) The test frame assembly shall then be rigidly fixed in the vertical position with the removable glass stop on the opposite side of the 3/8" plate from the impact ram.
        9) A target on the side of the 3/8" plate shall be marked in one corner no more than 6" away from the stops.
        10) Using the door ram pendulum system specified in ASTM F1450-12a, Figure 2 deliver four hundred (400) impacts of 200 Ft-lbs. each, on the target area.

Removable glass stops and the 3/8" plate shall remain firmly in place so that removal cannot be accomplished without removing the retaining screws. There shall be no more than one (1) broken screw in the assembly after impact test.

g. Substitution after the bid date will not be allowed.

h. Approval of a Hollow Metal Manufacturer does not relieve that company from fully complying with the product as specified.

## 1.9 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative of detention door and frame manufacturer for installation of units required for this Project.

B. Source Limitations: Obtain detention doors and frames through one source from a single manufacturer.

C. Welding: Qualify procedures and personnel according to the following:
1. AWS D1.3, "Structural Welding Code--Sheet Steel."

## 1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver detention doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.

B. Deliver detention frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
1. Where frames are to be cast into precast concrete modules, take additional precautions, including bracing for detention frames, to ensure that detention frames are not deformed or damaged by concrete forces.

C. Inspect detention doors and frames, on delivery, for damage. Minor damage may be repaired provided refinished items match new work and are approved by Architect; otherwise, remove and replace damaged items as directed.

D. Store detention doors and frames under cover at building site. Place units in a vertical position with heads up, spaced by blocking, on minimum 4-inch- (100-mm-) high wood blocking. Avoid using non-vented plastic or canvas shelters that could create a humidity chamber.
1. If wrappers on detention doors become wet, remove cartons immediately. Provide minimum 1/4-inch (6-mm) space between each stacked detention door to permit air circulation.

## 1.11 COORDINATION

A. Coordinate installation of anchorages for detention frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.12 MAINTENANCE TOOLS

A. Tool Kit: Provide twelve (12) bits for use with security fasteners, each packaged in a compartmented kit configured for easy handling and storage.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

A. Detention Hollow Metal Manufacturers: Unless pre-approved prior to bidding, provide products by one of the following:
   1. Trussbilt, LLC: Vadis Heights, MN
   2. American Steel Products: Swainsboro, GA
   3. Slate Steel Door Industries: Hartselle, AL
   4. Curries (Level 5 BR): Mason City, IA

2.2 MATERIALS

A. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, CS (Commercial Steel), Type B: Free of scale, pitting or surface defects: Pickled and oiled.

B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, CS (Commercial Steel), Type B.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M CS (Commercial Steel), Type B; G60 (Z180) zinc galvanized or A60 (ZF180) zinc-iron-alloy glavannealed coating by hot dipped Process.

D. Stainless-Steel Sheet: ASTM A 240/A 240M, austenitic stainless steel, Type 304, No. 3 finish unless otherwise indicated.

E. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

F. Concealed Bolts: ASTM A 307, Grade A, unless otherwise indicated.

G. Post-installed Expansion Anchors in Concrete: With capability to sustain, without failure, a load equal to 4 times the load imposed, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
   1. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition (mild).
   2. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Alloy Group 1 or 4) for bolts and nuts; ASTM A 666 or ASTM A 276, Type 304 or 316, for anchors.
   3. Corrosion Protection: Components fabricated from nickel-copper-alloy rods complying with ASTM B 164 for UNS No. N04400 alloy.

H. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching detention frames of type indicated.

I. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, a load equal to 4 times the load imposed, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
   1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 (ASTM A 47M) malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.

J. Embedded Plate Anchors: Fabricated from mild steel shapes and plates, minimum 3/16 inch (4.8 mm) thick; with minimum 1/2-inch- (12.7-mm-) diameter headed studs welded to back of plate.

K. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

L. Detention Door, Sidelight and Borrowed-Light Glazing: Comply with Section 088853 "Security Glazing."

M. Grout-field installed by general contractor: Comply with ASTM C 476, with a slump of 4 inches (102 mm) for detention frames built into masonry, 8 to 11 inches (200 to 280 mm) for detention frames installed in concrete as measured according to ASTM C 143/C 143M.

N. Epoxy Filler: Bondo or other substitution acceptable to the Architect.

O. Electrical Conduit:
   1. Raceways: Circular raceways shall be 3/4” diameter U.L. approved rigid steel conduit, intermediate metal conduit (IMC) or electrical metallic tubing (EMT), galvanized inside and outside.
   2. Raceway Fittings: Fittings and couplings for conduit shall be galvanized or cadmium plated compatible with conduit materials. Fittings for rigid conduit and IMC shall be threaded.

## 2.3 DETENTION DOORS

A. General: Provide flush-design detention doors, 2 inches (50 mm) thick, of seamless hollow construction, unless otherwise indicated. Construct detention doors with smooth, flush surfaces without visible joints or seams on exposed faces or stile edges.
   1. Visible joints or seams around glazed, louvered panel inserts are permitted.
   2. For single-acting swinging detention doors, bevel both vertical edges 1/8 inch in 2 inches (3 mm in 50 mm).

B. Metallic Core Construction: Provide the following core construction welded to both detention door faces:
   1. Steel-Stiffened Core: 0.042-inch- (1.0-mm-) thick, steel vertical stiffeners extending full-door height, with vertical webs spaced not more than 4 inches (102 mm) apart, spot

welded to face sheets a maximum of 3 inches (76 mm) o.c. Fill spaces between stiffeners with insulation of minimum 0.6-lb/cu. ft. (9.6-kg/cu. m) density.

2. Truss-Stiffened Core: 0.013-inch- (0.3-mm-) thick steel, truncated triangular stiffeners extending between face sheets and for full height and width of door; with stiffeners welded to face sheets not more than 3 inches (76 mm) o.c. vertically and 2-3/4 inches (70 mm) horizontally. Fill spaces between stiffeners with insulation of minimum 0.8-lb/cu. ft. density.

C. Vertical Edge Channels: 0.123-inch- (3.1-mm-) thick, continuous steel channel extending full-door height at each vertical edge, with webs of channels flush with door edges; welded to top and bottom channels to create a fully welded perimeter channel.

D. Top and Bottom Channels: 0.123-inch- (3.1-mm-) thick metal channel spot welded, not more than 4 inches (102 mm) o.c., to face sheets.
1. Reinforce tops and bottoms of detention doors with inverted horizontal channels of same material as face sheet so flanges of channels are even with bottom and top edges of face sheets.
2. Close top edge with 0.074-inch- (1.8-mm-) thick closing channel of same material as face sheet; welded so webs of channels are flush with top door edges.
3. Close bottom edge with 0.074-inch- (1.8-mm-) thick closing channel of same material as face sheet; welded so webs of channels are flush with bottom door edges.

E. Hardware Reinforcement: Fabricate reinforcing plates from same material as detention door face sheets to comply with the following minimum thickness:
1. Full-Mortise Hinges and Pivots: 0.187 inch (4.7 mm) thick.
2. Maximum-Security Detention Surface Hinges: 12 Ga. 10”channel with 3/8” x 1” x 6” back-up at each hinge.
3. Strike Reinforcements: 10 ga. thick.
4. Slide-Device Hanger Attachments: As recommended by device manufacturer.
5. Lock Fronts, Concealed Holders, and Surface-Mounted Closers: 0.093 inch (2.3 mm) thick.
6. All Other Surface-Mounted Hardware: 0.093 inch (2.3 mm) thick.
7. Lock Pockets: 0.123 inch (3.1 mm) thick at secure side; welded to face sheet.

F. Frames shall be reinforced, drilled and tapped for all templated mortised hardware only, in accordance with the final approved hardware schedule and templates provided by the hardware supplier.

G. Loose Glazing Stops: Loose glazing stops shall be pressed steel angles, no less than 1 ¼” X 1 ¼” X 10 gauge.
1. Angle tops shall be butt and notch and tight fitting at the corner joints, and secured in place with 1/4-28 special hardened tamperproof button head Torx security screws spaced 8" o.c. maximum and not more than 2 inches from each corner.
2. The frame underneath the glazing stops and the inside of the glazing stop shall be chemically treated for maximum paint adhesion and painted with a rust-inhibitive primer prior to installation in the frame.

H. Hardware Enclosures: Provide enclosures and junction boxes for electrically operated detention door hardware, interconnected with UL-approved, 1/2-inch- (12.7-mm-) diameter conduit and connectors.

1. Enclosures for mechanical paracentric locks with lock mountings. Provide unitized pocket preparation, which after fabrication forms a one-piece box that provides for the lock mounting plate to be recessed into the door such that, when secured in place, the mounting plate outside surface is flush with the door face sheet.
   a. Lock preparation shall be constructed from 0.123 inch (3.1 mm) steel, punched for keying options as required, and drilled and tapped to receive lock mounting plate.
   b. Finished preparation shall be a unitized lock pocket, which completely surrounds the lock and is securely welded to both face sheets and the perimeter edge channel.
2. Provide 0.067 inch (1.7 mm) enclosed lock bolt keeper in edge of door for jamb-mounted locks.

I. Interior Steel Detention Door Face Sheets: Fabricated from hot-rolled steel sheets, metallic-coated steel sheets where indicated and stainless steel sheets where indicated and other metal components from hot- or cold-rolled steel sheets.
1. UL 752 level 5 at door A120: Hollow Metal (DHM) door. Provide galvannealed material in wet and exterior areas. Level 5 Bullet Resistant doors shall be equal to Curries proprietary constriction.

J. Exterior Steel Detention Door Face Sheets: Fabricated from metallic-coated steel sheets, and other metal components from hot- or cold-rolled steel sheets.
1. Security Grade 1: 12 gauge thick steel, – provided at Holding Cell doors. Provide galvannealed material in wet and exterior locations.

## 2.4 DETENTION FRAMES

A. General: Fabricate detention frames of full-welded unit construction, with corners mitered, reinforced, and continuously welded full depth and width of detention frame. Knockdown frames are not acceptable.

B. Interior Steel Detention Frames: Fabricated from hot-rolled steel sheets, metallic-coated steel sheets where indicated and stainless steel sheets for stainless-steel detention doors, and other metal components from hot- or cold-rolled steel sheets.
1. UL 752 level 5 at door A120: Hollow Metal (DHM) frame. Provide galvannealed material in wet and exterior areas.

C. Exterior Steel Detention Frames: Fabricated from metallic-coated steel sheets, and other metal components from hot- or cold-rolled steel sheets.
1. Security Grade 1: 12 gauge thick steel, galvanealed.

D. Hardware Reinforcement: Fabricate reinforcing plates from same material as detention frame to comply with the following minimum thickness:
1. Full-Mortise Hinges and Pivots: 3/16" x full width of jamb x 10" in length. The top hinge shall be additionally reinforced with 3/16” formed angle welded both to hinge reinforcing and frame face.
2. Strikes, Flush Bolts, and Closers: 0.187 inch (4.7 mm) thick.
3. Surface-Mounted Hardware: 12 ga. (2.66 mm) thick.

4. Provide a key cylinder protection pipe extension on both sides of the frame for all wide jamb electric locks. Where a recessed pocket is provided on the stop side of the frame, the cylinder protection pipe will only be required on the side of the frame with the lock cover plate. Provide a 3/16" steel pipe that extends 1/4" beyond the face of the key cylinder. Weld attach the 3" diameter pipe extension to the cover plate at four locations.

E. Hardware Enclosures: Provide enclosures and junction boxes for electrically operated detention door hardware, and frame mounted communication devices interconnected with UL-approved, ½ inch diameter conduit and connectors.
1. Provide enclosures with access for conduit, tapped holes for hardware and internal fastener protection so fasteners will seat after frame is grouted full.
2. Electrical access boxes will not be permitted except at hardware pockets or communication mortar boxes. Provide knockout at top and bottom of each box to accept conduit.
3. Lock pockets for jamb mounted locks: Provide 0.123 inch (3.1 mm) thick steel enclosure with:
   a. Surface mounted cover, minimum 10 ga. thick steel plate with uniform beveled edges on the side closest to the lock strike or frame rabbet, secured with a minimum of 8 flathead Torx security screws.
   b. Secure lock to frame or pocket in accordance with lock manufacturer's recommendations for each lock type.
   c. Provide concealed lock front preparation with frame rabbet cutout only to allow passage of latch bolt and deadbolt actuator. Lock front and case are not exposed.
   d. Provide key access ports at locks keyed two sides or side opposite the door swing. Size key access port to accommodate paracentric keys on a key ring.
4. Provide conduit between electric lock pocket and door position switch and between back-to-back communication boxes where scheduled for each frame. All other conduit will be field installed.

F. Mullions and Transom Bars: Provide closed or tubular mullions and transom bars where indicated. Fasten mullions and transom bars at crossings and to jambs by butt-welding. Reinforce joints between detention frame members with concealed clip angles or sleeves of same metal and thickness as detention frame.

G. Head Reinforcement: Leave vertical mullions in detention frames open at top for grouting.

H. Grout Holes: Provide grout holes in frames to be installed in existing wall or concrete wall openings. Weld 0.093-inch back reinforcing plate with 1-3/8" diameter hole to inside of frame. Flush cover plate, same gauge as frame, to be shipped loose for field installation after frame is grouted full. Weld cover plate to frame and grind smooth for a seamless finish.

I. Supports and Anchors: After fabricating, galvanize units to be built into exterior walls according to ASTM A 153/A 153M, Class B.

J. Jamb Anchors: Weld jamb anchors to detention frames near hinges and directly opposite on strike jamb as required to secure detention frames to adjacent construction. Locate jamb anchors at 16" on center and as follows:
1. Detention Door Frames: One additional anchor for each 16 inches (406 mm) or fraction thereof more than 40 inches (1016 mm) in height.

2. Detention Sidelight and Borrowed-Light Frames: One additional anchor for each 16 inches (406 mm) or fraction thereof more than 40 inches (1016 mm) in height.
3. Masonry Type: Adjustable, corrugated or perforated, strap-and-stirrup anchors to suit detention frame size; formed of same material and thickness as detention frame; with strap not less than 2 inches (50 mm) wide by 10 inches (250 mm) long with hole in strap for vertical wall reinforcing.
4. Embedment Type for Precast Concrete Walls: 0.187 inch (4.7 mm) thick x 6 inch long embed, plates with two 0.375 inch diameter x 4" headed studs per embed.
   a. Width of plate to be ½" greater than the depth of the frame.
   b. Provide shims and weld both sides of frame to embed.
5. Post-installed Expansion Anchors for In-Place Concrete or Masonry: Minimum 1/2-inch-(12.7-mm-) diameter concealed bolts with expansion shields or inserts. Provide conduit spacer from detention frame to wall, welded to detention frame. Reinforce detention frames at anchor locations.

K. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, formed of same material and thickness as detention frame, and as follows:
1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners, welded to bottom of jambs and mullions with at least four spot welds per anchor.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch (50-mm) height adjustment, welded to jambs and mullions with at least 4 spot welds per anchor. Terminate bottom of detention frames at finish floor surface.

L. Rubber Door Silencers: Except on weather-stripped detention doors, drill stops in strike jambs to receive three silencers on single-detention-door frames and drill head jamb stop to receive two silencers on double-detention-door frames. Install plastic plugs to keep holes clear during construction.

M. Grout Guards: Provide grout guards of same material as detention frame, welded to detention frame at back of hardware cutouts and glazing-stop screw and silencer preparations to close off interior of openings and prevent mortar or other materials from obstructing hardware operation or installation.

## 2.5 STOPS AND MOLDINGS

A. General: Provide stops and moldings around glazed panels where indicated.
1. Frame Stops for Detention Doors: Minimum 5/8 inch high, unless otherwise indicated.
2. Frame Stops for Detention Sidelights and Borrowed Lights: Minimum 5/8 inch high, unless otherwise indicated.
3. Glazing stops shall be 1 ¼" X 1 ¼" X 10 gauge.

B. Fixed Detention Door Moldings: Formed from 12 ga. thick sheet reinforcing 'Z', of same material as detention door face sheets, spot-welded to face sheets a maximum of 5 inches o.c.

C. Fixed Detention Frame Moldings: Formed integral with detention frames, unless otherwise indicated. Form corners with butted or mitered hairline joints.

D. Stops for Security Glazing: Formed from 0.123-inch thick, pressed-steel angle. Form corners with butt and notch ends to be tight fitting at the corner joints. Secure with minimum 1/4-28 pinned torx button head security machine screws spaced uniformly not more than 8 inches o.c. and not more than 2 inches from each corner.

E. Deliver frames to project site with stops temporarily secured with 2 Torx ¼-28 security screws. Ship security screws (plus 10% spare) in appropriate containers labeled and tagged to match detention frames.

F. Coordinate rabbet width between fixed and removable stops with type of glass or panel and type of installation indicated.

## 2.6 ACCESSORIES

A. Food Pass / Cuff Port Openings: Provide a flush mounted food pass door at the center of hollow metal doors. The food pass opening shall be fabricated from 10 gauge interior channels securely welded to the inside of both face sheets. Reinforcing for food pass locks shall be 10ga. channels or pockets. The clear opening shall be as depicted on the architectural drawings. The door shall be constructed of minimum 10ga. body and shall have a 10ga. backup plate securely welded and finished smooth so as to be flush to the inside and outside door skins. Door to contain formed metal recessed pull for outside access. Door flap to be affixed with two hinges on food pass equal to Southern Folger type 203FP (for 90 degree open). Provide a dead bolt lock equal to Southern Folger 1010A.

## 2.7 FABRICATION

A. Fabricate detention doors and frames rigid, neat in appearance, and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Weld exposed joints continuously; grind, fill, dress, and make smooth, flush, and invisible. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
   1. Exterior Detention Doors: Provide weep-hole openings in bottom of detention doors to permit entrapped moisture to escape. Seal joints in top edges of detention doors against water penetration.
   2. Fabricate detention doors and frames to comply with manufacturing tolerances indicated in HMMA 863-04.

B. Continuously weld detention frame corners, with contact edges closed tight and faces mitered.

C. Fabricate multiple-opening detention frames with mullions that have closed tubular shapes and with no visible seams or joints.

D. Exposed Fasteners: Provide countersunk security fasteners for exposed screws and bolts, unless otherwise indicated.

E. Hardware Preparation: Factory-prepare detention doors and frames to receive mortised hardware, including cutouts, reinforcement, mortising, drilling, and tapping, according to final

door hardware schedule and templates provided by detention door hardware supplier. Comply with applicable requirements in DHI A115 Series for detention door and frame preparation for door hardware.

1. Reinforce detention doors and frames to receive surface-mounted door hardware. Drilling and tapping may be done at Project site.
2. Locate door hardware as indicated or, if not indicated, according to HMMA 863-04, "Guide Specifications for Detention Security Hollow Metal Doors and Frames."

F. Factory-cut openings in detention doors for accessories.

G. Welding: Weld components to comply with referenced AWS standard. Weld before finishing components to greatest extent possible. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

H. Glazing Channels: Provide minimum clearances for thickness and type of glass indicated, according to GANA's "Glazing Manual."

I. Security Fasteners: Fabricate detention doors and frames using security fasteners with head style appropriate for fabrication requirements, strength, and finish of adjacent materials, except that a maximum of two different sets of tools shall be required to operate security fasteners for Project. Provide stainless-steel security fasteners in stainless-steel materials, exterior doors and frames and interior doors and frames located in wet areas.

## 2.8 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish detention doors and frames after assembly.

## 2.9 METALLIC-COATED STEEL FINISHES

A. Surface Preparation: Clean surfaces with non-petroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas and apply galvanizing repair paint specified below to comply with ASTM A 780.

1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
2. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than 0.7 mils (0.02 mm).
3. Shop Primer: Manufacturer's or fabricators standard, fast-curing, lead- and chromate-free primer complying with ANSI A224.1 acceptance criteria; recommended by primer manufacturer for zinc-coated steel; compatible with substrate and field-applied finish paint system indicated; and providing a sound foundation for field-applied topcoats despite prolonged exposure.

B. Steel Sheet Finishes

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning"; remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 3, "Power Tool Cleaning," or SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than 0.7 mils (0.02 mm).
3. Shop Primer: Manufacturer's or fabricators standard, fast-curing, corrosion-inhibiting, lead- and chromate-free, universal primer complying with ANSI A224.1 acceptance criteria; compatible with substrate and field-applied finish paint system indicated; and providing a sound foundation for field-applied topcoats despite prolonged exposure.

2.10 STAINLESS-STEEL FINISHES (WHERE SCHEDULED)

A. General: Remove tool and die marks and stretch lines or blend into finish. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
   1. Bright, Directional Polish: No. 3 finish, unless otherwise indicated.

B. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.11 SOURCE QUALITY CONTROL

A. Owner may select one detention door at random from detention doors delivered to Project and have it cut in half or otherwise taken apart for verification that construction complies with requirements.
   1. Should examination disclose door construction at variance from that specified, the door manufacturer shall, upon direction of the Architect-Engineer, replace all doors shipped to the project, as of the date of inspection, with doors constructed in conformance with project specifications. Under conditions of non-conformity, the door manufacturer shall pay for the destroyed door, replacement doors and related labor.
   2. Should examination prove the door was constructed in conformance with the specifications, the Owner will pay to replace the destroyed door and related labor.

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of detention doors and frames.
   1. Examine rough-ins for embedded and built-in anchors to verify actual locations of detention frame connections before detention frame installation.
   2. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of detention doors and frames.

B. Inspect built-in and cast-in anchor installations before installing detention frames to verify that anchor installations comply with requirements. Prepare inspection reports.
   1. Remove and replace anchors where inspections indicate that they do not comply with specified requirements. Reinspect after repairs or replacements are made.
   2. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.

C. Verify locations of detention doors and frames with those indicated on Coordination Drawings.

D. For material whose orientation is critical for its performance as a ballistic barrier, verify installation orientation.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

A. Prior to installation and with spreaders removed, adjust detention frames for squareness, alignment, twist, and plumb to the following tolerances:
   1. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb and perpendicular to frame head.
   2. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of face.
   3. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of door rabbet.
   4. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a perpendicular line from head to floor.

## 3.3 INSTALLATION

A. General: Install detention doors and frames plumb, rigid, properly aligned, and securely fastened in place, complying with Drawings, Coordination Drawings, DHI A115.IG, and manufacturer's written recommendations.

B. Detention Frames: Install detention frames for detention doors, transoms, sidelights, borrowed lights and other openings, of sizes and profiles indicated.
   1. Set masonry anchorage devices where required for securing detention frames to in-place concrete or masonry construction.
      a. Set anchorage devices opposite each anchor location according to details on Shop Drawings and anchorage device manufacturer's written instructions. Leave drilled holes rough, not reamed, and free of dust and debris.
   2. Embedment-Masonry-Type Jamb Anchors: Weld wall angle anchors to embedded steel plates to match locations of detention frame angle anchors. Remove jamb faces from detention frames and set detention frames into opening until detention frame anchors contact and match embedded anchors. Weld detention frame anchors to embedded anchors with 1-inch- (25-mm-) long welds at each end of angle. Reinstall jamb faces of detention frames.
   3. Post-installed Expansion Jamb Anchors: After bolt is tightened, weld bolt head to provide non-removable condition. Grind, dress, and finish smooth welded bolt head.

4. Floor anchors may be set with powder-actuated fasteners instead of post-installed expansion anchors if so indicated on Shop Drawings.
5. Placing Detention Frames: Set detention frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
   a. Field splice only at approved locations. Weld, grind, and finish as required to conceal evidence of splicing on exposed faces.
   b. Install detention frames with removable stops located on secure (non-inmate) side of opening.
6. Assemble detention frames fabricated in sections. Install angle splices at each corner, of same material and thickness as detention frame, and extend at least 4 inches (102 mm) on both sides of joint.
7. Continuously weld and finish smooth joints between faces of abutted, multiple-opening, detention frame members.
8. Field Welding: Comply with the following requirements:
   a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   b. Obtain fusion without undercut or overlap.
   c. Remove welding flux immediately.
   d. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
9. Grout-field installed by general contractor: Fill space between detention frames and concrete or masonry with grout. Install grout in lifts and take other precautions, including bracing detention frames, to ensure that detention frames are not deformed or damaged by grout forces. If a light consistency grout (greater than 5.0 inch slump in accordance with ASTM C 143) is to be used, special precautions shall be taken in the field by the Installer to protect tapped holes, electrical knock-outs, lock pockets, grout guards, junction boxes, etc., in the frames.

C. Swinging Detention Doors: Fit non-fire-rated detention doors accurately in their respective detention frames, with the following clearances:
   1. Between Doors and Frames at Jambs and Head: 1/8 inch (3.2 mm).
   2. Between Edges of Pairs of Doors: 1/8 inch (3.2 mm).
   3. At Door Sills with Threshold: 1/8 inch over threshold.
   4. At Door Sills without Threshold: 5/8 inch (15.9 mm).

D. Fire-Rated Detention Doors: Install with clearances as specified in NFPA 80.

E. Smoke-Control Detention Doors: Install according to NFPA 105.

F. Comply with installation tolerances indicated in HMMA 863-04.

G. Glazing: Comply with installation requirements in Division 8 Section "Security Glazing," unless otherwise indicated.

## 3.4 FIELD QUALITY CONTROL

A. Inspect installed products to verify compliance with requirements. Prepare inspection reports and indicate compliance with and deviations from the Contract Documents.

B. Remove and replace detention work where inspections indicate that work does not comply with specified requirements.

C. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.

D. Prepare field quality-control certification that states installed products and their installation comply with requirements in the Contract Documents.

## 3.5 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items just before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including detention doors, frames, steel grating, and door accessories, that are warped, bowed, or otherwise unacceptable.

B. Clean grout and other bonding material off detention doors and frames immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

1. After finishing smooth field welds, apply air-drying primer.

D. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

**END OF SECTION 08 34 63**

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# SECTION 08 41 13 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

## PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. LEED Submittals:

   1. Product Data for Credit IEQ 4.1: For glazing sealants used inside the weatherproofing system, documentation including printed statement of VOC content.
   2. Laboratory Test Reports for Credit IEQ 4.1: For glazing sealants used inside the weatherproofing system, documentation indicating that products comply with the testing and product requirements of CALGreen "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.
   1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
   2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
      a. Joinery, including concealed welds.
      b. Anchorage.
      c. Expansion provisions.
      d. Glazing.
      e. Flashing and drainage.
   3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

D. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following:

E. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

1.4 INFORMATIONAL SUBMITTALS

A. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
   1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.

B. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by manufacturer and witnessed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including, but not limited to, excessive deflection.
      b. Noise or vibration created by wind and thermal and structural movements.
      c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
      d. Water penetration through fixed glazing and framing areas.
      e. Failure of operating components.
   2. Warranty Period: Two years from date of Substantial Completion.

**PART 2 - PRODUCTS**

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
   1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.

2. Failure also includes the following:
   a. Thermal stresses transferring to building structure.
   b. Glass breakage.
   c. Noise or vibration created by wind and thermal and structural movements.
   d. Loosening or weakening of fasteners, attachments, and other components.
   e. Failure of operating units.

B. Structural Loads:
   1. Wind Loads: As indicated on Drawings.
   2. Other Design Loads: As indicated on Drawings.

C. Deflection of Framing Members: At design wind pressure, as follows:
   1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
   2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch.
      a. Operable Units: Provide a minimum 1/16-inch clearance between framing members and operable units.
   3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:
      a. Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4 inch for spans greater than 11 feet 8-1/4 inches or 1/175 times span, for spans less than 11 feet 8-1/4 inches.

D. Structural: Test according to ASTM E 330 as follows:
   1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
   2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
   3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

E. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
   1. Fixed Framing and Glass Area:
      a. Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft..
   2. Entrance Doors:
      a. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..

F. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
   1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft..

G. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft..
2. Maximum Water Leakage: According to AAMA 501.1. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.

H. Interstory Drift: Accommodate design displacement of adjacent stories indicated.
1. Design Displacement: As indicated on Drawings.
2. Test Performance: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.4 at design displacement and 1.5 times the design displacement.

I. Seismic Performance: Aluminum-framed entrances and storefronts shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.6 at design displacement and 1.5 times the design displacement.
2. Vertical Interstory Movement: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.7 at design displacement and 1.5 times the design displacement.

J. Energy Performance: Certify and label energy performance according to NFRC as follows:
1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.45 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.35 as determined according to NFRC 200.
3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 15 as determined according to NFRC 500.

K. Noise Reduction: Test according to ASTM E 90, with ratings determined by ASTM E 1332, as follows.
1. Outdoor-Indoor Transmission Class: Minimum 34.

L. Blast Resistance:
1. Hazard Rating: Low Hazard per ASTM F 1642.
2. Performance Condition: 4 per GSA-TS01.

M. Windborne-Debris Impact Resistance: Pass missile-impact and cyclic-pressure tests when tested according to ASTM E 1886 and testing information in ASTM E 1996 for Wind Zone 4.
1. Large-Missile Test: For glazed openings located within 30 feet of grade.

N. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
    a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.
    b. Low Exterior Ambient-Air Temperature: 0 deg F.

c. Interior Ambient-Air Temperature: 75 deg F.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product Kawneer 350 Swing Door comparable product by one of the following:
1. EFCO Corporation.
2. TRACO.

C. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing and accessories, from single manufacturer.

2.3 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:
1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from .
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.

F. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.4 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

## PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:
1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Seal perimeter and other joints watertight unless otherwise indicated.

B. Metal Protection:
1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Set continuous sill members and flashing in full sealant bed as specified in Section 079200 "Joint Sealants" to produce weathertight installation.

D. Install components plumb and true in alignment with established lines and grades.

E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

3.3 ERECTION TOLERANCES

A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:
1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
3. Alignment:
   a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
   b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
   c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.4 MAINTENANCE SERVICE

A. Entrance Door Hardware:
   1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.

**END OF SECTION 08 41 13**

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# SECTION 08 51 13 - ALUMINUM WINDOWS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section includes aluminum windows for exterior locations.

### 1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   2. Review and discuss the finishing of aluminum windows that is required to be coordinated with the finishing of other aluminum work for color and finish matching.
   3. Review, discuss, and coordinate the interrelationship of aluminum windows with other exterior wall components. Include provisions for anchoring, flashing, weeping, sealing perimeters, and protecting finishes.
   4. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
   5. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

### 1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for aluminum windows.

B. Shop Drawings: For aluminum windows.
   1. Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.

C. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.

### 1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of aluminum window, for tests performed by a qualified testing agency.

B. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by test reports and calculations.

B. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Failure to meet performance requirements.
      b. Structural failures including excessive deflection, water leakage, condensation, and air infiltration.
      c. Faulty operation of movable sash and hardware.
      d. Deterioration of materials and finishes beyond normal weathering.
      e. Failure of insulating glass.
   2. Warranty Period:
      a. Window: 10 years from date of Substantial Completion.
      b. Glazing Units: Five years from date of Substantial Completion.
      c. Aluminum Finish: 10 years from date of Substantial Completion.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

A. Source Limitations: Obtain aluminum windows from single source from single manufacturer.

2.2 ALUMINUM WINDOWS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide Kawneer 516 Iso Port low-e; or comparable product by one of the following:
   1. EFCO Corporation.
   2. Wausau Window and Wall Systems; Apogee Wausau Group.

C. Operating Types: Provide the following operating types in locations indicated on Drawings:
   1. Fixed.

D. Glazing System:
   1. Dual Glazing System:
      a. Interior Lite: Refer to section 08 88 53 for glazing types.
      b. Exterior Lite: Refer to section 08 88 53 for glazing types.

E. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.
   1. Exposed Hardware Color and Finish: As selected by Architect from manufacturer's full range.

F. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.

2.3 FABRICATION

A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.

B. Glaze aluminum windows in the factory.

C. Weather strip each operable sash to provide weathertight installation.

D. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.

E. Provide water-shed members above side-hinged sashes and similar lines of natural water penetration.

F. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

2.4 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Apply baked enamel complying with paint manufacturer's written instructions for cleaning, conversion coating, and painting.

1. Organic Coating: Thermosetting, modified-acrylic or polyester enamel primer/topcoat system complying with AAMA 2603, except with a minimum dry film thickness of 1.5 mils , medium gloss.
2. Color: As selected by Architect from full range of industry colors and color densities .

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.

C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.

B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.

C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
   1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.

B. Testing Services: Testing and inspecting of installed windows shall take place as follows:
   1. Testing Methodology: Testing of windows for air infiltration and water resistance shall be performed according to AAMA 502.
   2. Air-Infiltration Testing:
      a. Test Pressure: That required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance class indicated.

b. Allowable Air-Leakage Rate: 1.5 times the applicable AAMA/WDMA/CSA 101/I.S.2/A440 rate for product type and performance class rounded down to one decimal place.

3. Water-Resistance Testing:
   a. Test Pressure: Two-thirds times test pressure required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance grade indicated.
   b. Allowable Water Infiltration: No water penetration.
4. Testing Extent: Three windows of each type as selected by Architect and a qualified independent testing and inspecting agency. Windows shall be tested after perimeter sealants have cured.
5. Test Reports: Prepared according to AAMA 502.

C. Windows will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

## 3.4 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.

B. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
   1. Keep protective films and coverings in place until final cleaning.

C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

**END OF SECTION 08 51 13**

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# SECTION 08 71 63 – DETENTION DOOR HARDWARE

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and provisions of contract, including General and Supplementary Conditions and Division 01 specification Sections apply to Work in this Section.

### 1.2 SUMMARY

A. This Section includes the following:
   1. Electrical and Mechanical Security Hardware for Swinging Gates.

B. Related Sections include the following:
   1. Division 08 Section 083463 for Detention Doors and Frames.
   2. Division 08 Section 088853 for Security Glazing.
   3. Division 26 for Electrical requirements.
   4. Divisions 27 and 28 for Security Electronic requirements.
   5. Division 32 Section 323113.53 "High Security Chain Link Fences and Gates."

### 1.3 SCOPE AND RESPONSIBILITIES

A. Under the requirements of this specification, the DEC shall be responsible for furnishing and installing all hardware as specified, in all locations unless shown.

### 1.4 SUBMITTALS

A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections. All submittals shall be supplied on USB drive.

B. Product Data: Manufacturer's printed product data and catalog cuts indicating product characteristics, performance and limiting criteria.

C. Shop Drawings: For each type of hardware item: Include plans, wiring diagrams, method of construction, installation and attachment details and other information necessary to show compliance with requirements.

D. Hardware schedule coordinated with doors, frames, and related work to ensure proper size, thickness, hand and function of door hardware.
   1. Hardware Schedule Content: Based on hardware indicated, organize schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:
      a. Type, style, **exact** function, size, and finish of each hardware item.
      b. Name and manufacturer of each item.

c. Fastenings and other pertinent information.
d. Location of each hardware set cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.
   1) Door numbers and frame types in schedule to match door numbers and frame types shown on Drawings.
   2) Hardware sets shall match specified hardware sets found at the end of this specification section. Hardware set extensions (i.e.: "SH1.a") used to signify hardware sets with additional hardware requirements are acceptable.
e. Explanation of all abbreviations, symbols, and codes contained in schedule.
f. Mounting locations for hardware.
g. Door and frame sizes and materials.

2. Submittal Sequence: Submit schedule at earliest possible date, particularly where acceptance of Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include with schedule the product data, shop drawings of other work affected by door hardware, and other information essential to the coordinated review of schedule.
3. The DEC is responsible for counts, quantities, proper handing and correct nomenclature of all material provided under, and related to, this scope of work.

E. Keying Schedule: The owner shall provide an approved key schedule to the DEC at the time of detention hardware submittal review.

F. Submittal of written confirmation from the hardware manufacturer showing individual field technicians as approved installers shall be required.

G. Operating/Maintenance Manuals: Furnish O&M Manuals, as outlined in Division 1, for all security hardware and all security locking devices. Provide detailed parts lists and cutsheets for all items with mechanical moving parts or electrical components on the approved security hardware schedule. These manuals shall include instructions for the care of the materials, parts list to aid the Owner in ordering replacement parts, as well as instructions for contacting the appropriate personnel not only during the warranty period, but beyond. Manuals shall also include the final approved key schedule and "as built" shop drawings of all components. The Detention Equipment Contractor must have full time employees trained in the maintenance and repair of this equipment.

## 1.5 DELIVERY, STORAGE AND HANDLING

A. Packing and Marking: Each piece of security hardware furnished under this Section shall be packaged and marked according to the hardware set and door number listed in the approved hardware schedule.

B. Deliver all components cartoned or crated to provide protection during transit and job storage.

C. Inspect all components upon delivery for damage. Damages may be repaired, provided the repaired items are equal in all respects to new work and acceptable to the Architect-Engineer; otherwise, remove and replace damaged items as directed.

D. Store all components in a locked storage area for all components deemed necessary by the Detention Equipment Contractor. Do not store any materials directly on the ground or concrete. Provide adequate ventilation and protection to insure materials are kept dry, clean and secure.

Store all materials in the manner and order as prescribed by the Detention Equipment Contractor and/or manufacturer.

1.6 COORDINATION

A. Examine the drawings and specifications of other trades whose work may influence the installation and/or operation of the detention hardware. Prior to the start of work, review the project drawings and specifications and coordinate work with all other trades and Divisions of the Specifications affecting Work of this Section.
   1. Responsibilities for electrical and mechanical hardware installation shall include the following:
      a. Furnish and install door locks, door position switches, limit switches, lock feature switches and push buttons, as required for the system to perform the functions as defined in the "Door Control" section of the Division 28 specifications.
      b. Coordinate the integration and interfacing of the products and equipment specified in this section with Division 28 (SSI) specified, and in accordance with shop drawings and submittals approved by the Architect / Consultant.
      c. Review all control submittals submitted by Division 28 (SSI) and confirm that all scheduled controls and monitoring will function in accordance with the specified function. **A written confirmation of this review shall be submitted to the Architect / Consultant.**
      d. Coordinate the power requirements with all equipment furnished in this section.

1.7 MAINTENANCE

A. Contractor shall furnish spare parts required in each section, packaged to protect parts from damage and to allow for easy storage.

B. Supplier of equipment shall stock replacement parts for each system and be able to replace any part of the system within 24 hours.

A. Provide spare door hardware parts as follows:
   1. Hinges: 2 pair (4 total)
   2. Door position switches: 1 (single)
   3. Furnish the following material:
      a. Two (1) each of all locks specified (less cylinder).
      b. All parts shall be packaged and labeled to provide for long term storage.

**PART 2 - PRODUCTS**

2.1 GENERAL

A. Security design criteria are based upon the requirements and features of the products listed herein. The use of one manufacturer's numeric designation does not imply other manufacturer's products will not be accepted.

B. Fire Rated Openings: Provide hardware for fire-rated openings in compliance with NFPA Standard 80. This requirement takes precedence over other requirements for such hardware. Provide only hardware which has been tested and listed by UL, bears appropriate label or symbol for the types and sizes of doors required and compliance with the requirements of the required label and function of the opening wherever possible.

C. Acceptable Manufacturers

1. Except as otherwise specified herein, the equipment and materials of this section shall be products manufactured by one of the listed manufacturers and must be equal to the part specified in the product description.

D. Products/Manufacturers
1. Hinges: Southern Folger, Portland, Northwest Specialty Hardware
2. Pulls: Southern Folger, Portland, Northwest Specialty Hardware
3. Door Position Switches (DPS): Southern Folger, Sentrol
4. Door Stops: Ives
5. Silencers: Ives

E. Product Description
1. Hinges, SOUTHERN 204FMSS or approved equal:
   a. Full Mortise Detention Hinges shall be 4-1/2” x 4-1/2” x 0.188” thick investment cast 304 stainless steel with hospital tips and integral studs on both leaves. Pins shall be hardened stainless or alloy steel, concealed and non-removable. Each hinge shall be supplied with eight (8) ¼-20 flat head machine screws. All hinges and screws shall be US32D finished.
   b. Furnish three hinges for door through 84-inches in height and one additional hinge for each additional 30-inches of height or fraction thereof. Furnish three hinges for doors through 36-inches in width and one additional hinge for each additional 12-inches of width or fraction thereof.
   c. Except where otherwise indicated, hinges shall be mortised, 4-1/2" x 4-1/2", cast steel or stainless steel, ball bearing, with pins made non-removable by a concealed hardened roll pin. All hinges shall be furnished with 1/4-20 TORX FHMS.
   d. Hinges shall be certified, by an independent testing lab, to meet or exceed the cycle requirements of ASTM 1758, Grade 1A.
   e. Hinges furnished for use on labeled fire doors shall also comply with the requirements of NFPA 80.
2. Full surface hinges, equal to Southern Folger 203FS/203FP where indicated on architectural details for food pass applications in rated openings.
3. Strikes: All locks and latches shall be furnished with manufacturer's standard strikes complete with dust boxes to fully conceal the strike pocket. Where monitor strikes are specified, provide strikes as appropriate for the lock specified. All monitor strikes shall be designed to fit within a 2" face frame without protruding beyond the 2" frame depth.
4. Fasteners:
   a. Manufacturer hardware to conform to published template, generally prepared for machine screw installation. Do not provide hardware, which has been prepared for self-tapping of sheet metal screws.
   b. Furnish screws for installation with each hardware item. All exposed screw heads, whether door is open or closed, shall be Torx (with security stud) flat-head or oval head screws except as otherwise indicated. Screws shall be the same material and

finished to match the applied hardware item. Other types of security screws are unacceptable unless specifically approved by the Architect-Consultant.

5. Pull:
   a. Grip Type Door Pulls shall be cast of brass or bronze with satin finish of approximately US26D unless specified otherwise in hardware schedule. Approximate overall length, 8-11/16"; handhold, 5-1/4"; grip clearance, 1-1/2"; attachment holes, 7-3/4" o.c. Provide two (2) 3/8-16 x 5/8" flat head pinned Torx-plus screws of same finish and material as pull.
   b. Flush Type Door Pulls shall be cast of brass or bronze with satin finish of approximately US26D unless specified otherwise in hardware schedule. Size 4" x 5" x 1/8" x pocket rip 1" deep. Provide four (4) ¼-20 x 3/8" flat head Torx screws of same finish and material as pull.
6. Door Position Switch, SOUTHERN 200MRS, or as required by hardware schedule:
   a. Recessed Magnetic Door Position Switch-Triple Biased shall be a five-reed switch magnet mortised type assembly used for remotely monitoring the door status/position. The device shall be triple bias for tamper resistance.
   b. The device shall be moisture resistant and fit within a 2" hollow metal jamb or head. The device shall be field adjustable on 2 axis and supplied with a 5' vinyl jacketed lead wire and a 3-pin Molex connector. The device shall be all steel construction. The switch and magnet shall be encased in epoxy resin.
   c. Where this device is used in an exterior location, provide a complete water-tight installation.
7. High Security Closer (where required) LCN #4210/4510T series shall be surface mounted with security screws at all exposed locations and shall have fully adjustable spring tension. Closers shall have cast iron cylinders and two separately adjustable non-critical valves for closing speed and latching speed, plus a third valve for adjusting the hydraulic back-check. Closers shall be sized appropriately based on scheduled door width, per manufacturer's recommendations. A smooth molded case cover shall conceal the closer body. Closer to be located on the side of door/frame farthest from inmate contact, unless an exterior door. Mount closer for exterior doors on interior side of the door. Maximum opening clearance shall be 180-degrees. Parallel arm shall be used on the 4210 series closer, this closer shall be used at all locations not in direct contact with inmates. A track arm shall be used on the 4510T series closer, which shall be provided at dayrooms, and locations with direct inmate contact. Provide finish of standard powder coated aluminum. DEC shall be responsible for coordinating the installation of the closer with jobsite frame installation conditions prior to installation. Closer shall have sufficient force to fully close door to achieve a secured and locked indication. Closer body shall not be inhibited by, or touch the wall or any other object after installation. If the above conditions cannot be achieved, request direction from the Architect/Consultant, by providing suggested solution using LCN security grade products. DEC is responsible for proper closer placement and installation.
8. Wall Mounted Door Stops **(Wall mount only)** (Ives FS18L) shall be a tamper resistant device that is embedded into the wall with an epoxy resin adhesive. Bumper shall be 2" diameter x 3-1/2" long and made from a non-hazardous silicone elastomer, 80 durometer. The threaded and grooved steel mounting shank shall be 5/8" in diameter and embedded into the bumper at least half the length of the bumper. Mounting shank shall extend 2-1/2" beyond the bumper bottom for embedding into the wall.
   a. Provide wall-mounted door bumper **8"** off of the floor and 8" from edge of door when in the opened position. If the above conditions cannot be achieved, request direction from the Architect.

9. Thresholds: Provide thresholds as in "Detention Hardware Schedule", and where required on detention doors per architectural details. All doors into rated stairways shall be provided with Reese S204A thresholds (or approved equal).
10. Weatherstripping: Provide weatherstripping at all exterior doors equal to Reese DB469C door sweep plus 797B weatherstrip, or approved, at all heads and jambs (and astragals if pairs), After installation, razor cut gasketing into pieces not over 12" in length, installed per manufacturer's recommendations. Do not break weatherstrip at head of frame for closer installation. SILL SWEEP MUST BE FASTENED WITHIN ½" MAXIMUM FROM EDGE OF DOOR ON EACH SIDE.
11. Provide rain drips equal to Reese R199A and R201A at frame head and door bottom at all exterior doors install per manufacturers' recommendations. Apply head drip directly to door frame header ¼" above door opening.

## 2.2 MECHANICAL LOCKS FOR SECURITY DOORS

A. Acceptable Manufacturers
   1. Except as otherwise specified herein, the equipment and materials of this section shall be products of the following Manufacturer, no exceptions:
      a. Southern Folger Detention Equipment Company (SOUTHERN), San Antonio, TX

B. Mechanical Locks and Accessories for Swinging Doors
   1. Standard Features
      a. Lock case to be high tensile strength alloy steel with cold rolled steel cover
      b. All locks to operate by inserting a key into matching cylinder and rotating key to unlock the lock.
      c. All lock steel parts shall be zinc plated for corrosion protection and are suitable for both interior and exterior applications.
      d. Keyed One Side (K1) or Keyed Two Sides (K2).
      e. At rated locations, provide smoke gasketing, weather strip, sweeps, sill threshold, door skirts, plates, angles and/or additional material as required per the manufacturer's recommendations to obtain the appropriate label as per the architectural drawings. This requirement takes precedence over other requirements for scheduled hardware. Provide only hardware which has been tested and listed by UL bears the appropriate label or symbol for the types and sizes of doors required and compliance with the requirements of the required label and function of the opening wherever possible.

C. Products
   1. Mechanical Deadbolt, SOUTHERN 1010A:
      a. Lock size to be approximately 4/1/2" x 3" x 1-1/4". Deadbolt to be ¾" x 1-1/2" hot rolled steel with 5/8" throw. Deadbolt locking and unlocking activated by key only.
      b. Provide extended bolt throw at food pass locations as required by hollow metal fabrication. DEC shall coordinate with hardware and hollow metal manufacturers.

## 2.3 ELECTRO-MECHANICAL LOCKS FOR SECURITY DOORS

A. Acceptable Manufacturers

1. Except as otherwise specified herein, the equipment and materials of this article shall be products of the following Manufacturer:
   a. Southern Folger Detention Equipment Company (SOUTHERN), San Antonio, TX

B. The lock shall be 24 VDC motor operated security locks for individual swinging doors: Locks shall be frame mounted, complete with integral electronic components. Equal to SOUTHERN 10120AMD:
   1. Functions:
      a. Locks to operate electrically through either 24 VDC constant duty motors. Locks to be remotely unlocked electrically by momentary contact switch, or mechanically operated by key at the lock.
      b. Refer to the requirements of the Emergency Release function of the door control system specified in Division 28. The electrically controlled locks shall be furnished with the capabilities of a half cycle function when controlled with the Emergency Release control function. The lock shall operate as if it's a full cycle lock with normal door control function.
      c. Half Cycle Operation
         1) When a momentary signal is applied to the unlock input, the latchbolt shall retract. The latchbolt shall remain mechanically retracted. When power is removed, the latchbolt remains retracted.
         2) When a momentary signal is applied to the lock input, the latchbolt shall extend, locking the door if closed and allowing the door to be slam-locked if open.
      d. Manual Operation
         1) Each lock shall have local manual key override lock/unlock feature. Keyed one side (K1), Keyed two sides (K2).
         2) Rotating the key shall mechanically retract the latchbolt. Removing the key shall extend the bolt, locking the door if closed and allowing the door to be slam-locked if open.
   2. Components
      a. Mechanical
         1) Lock shall operate as a fail-secure slam-lock. Unlocks when energized.
         2) Lock body shall be made of steel or stainless steel.
         3) Lock shall be supplied with a security key cylinder protection pipe to protect the key cylinder. The protection pipe will be supplied unpainted for installation in the hollow metal frame by the hollow metal manufacturer.
         4) Cylinder extensions shall be provided for locks keyed two sides or keyed stop side unless provisions are allowed for recessed pocket in hollow metal.
         5) Cylinder shields shall not be required on exterior side of exterior frames in recreation yards.
      b. Electrical
         1) 10120 Motor Operated Lock:
            a) Lock shall operate when supplied with 24 VDC.
            b) Single Phase, 3.3 amp max.
            c) Lock shall be provided with a lock status switch to provide interlocking capabilities.
            d) Switches shall be of the snap acting mechanical type. UL listed and rated at least 5 amps.
            e) Locks shall be factory wired to a plug disconnect.
            f) Lock status switch shall be capable of providing the following indications:
            g) Deadlocked indication

h) Unsecure indication

c. Features: Where specified by the security hardware/door schedule, the following features shall be provided:
   1) Local Electric Keyswitch (LEK): Day key provides local electric operation and may be disabled remotely via central control point. Master key provides both electric and Mechanical operation. Refer to the requirements of the door control system specified in Division 28.
   2) Remote Latch Holdback (RLHB): Latchbolt is retracted by the push of a button at the control panel and remains mechanically retracted until button is pushed a second time.
   3) Key Operated Mechanical Latch Holdback (KLHB): Latchbolt is retracted locally by key and remains mechanically retracted until relocked by key.
   4) Key Switch (KS): Door is electrically unlocked by key operated switch at the lock.
   5) Lockset shall be supplied with high security Mogul Key Cylinders to match existing, unless otherwise specified.

d. Weather resistant motor housing shall be constructed of a minimum ¼" (6.4MM) steel plate, framed and stiffened as required.

e. Removable front cover panel shall be constructed of 10-gauge galvanized steel.

f. The doorjamb and vertical members shall be free of hooks or lugs used for locking or any other purpose.

C. Electro-Mechanical (Swing) Gate Lock equal to SOUTHERN 1050SD:

1. Function:
   a. Fence post mounted 115VAC, 1 phase, 60Hz, 12amp inrush current, 0.6amp seated current - continuous-duty solenoid actuated gate lock.
   b. Deadlocks automatically when gate is closed.
   c. Bolt is retracted electrically at control panel and remains retracted until gate is opened.
   d. Bolt is retracted mechanically with key from either side, and remains retracted until relocked by key.
   e. Internal switches monitor deadlocked condition of the deadbolt.
   f. Furnish galvanized, including case and cover.
   g. Provide six-tumbler lock.
   h. Provide with interlock feature, if required.
   i. All electrically operated hardware shall be furnished with both male and female Molex connectors.

## 2.4 KEYING AND KEYS

A. Keying and Keys
1. The owner shall provide an approved key schedule to the DEC at the time of detention hardware submittal review.

B. Key Control System:
1. Mogul key Cylinders shall match SCF/CDF existing Facility keying, and shall be keyed in sets and master keyed, sub-master keyed etc. to a level as directed by the Owner, for inclusion into the existing Morse Watchman's key system.
   a. Provide six (6) keys per master code.

b. Provide six (6) keys per change key code.
c. Provide fifteen (15) key blanks of Solano proprietary keyway.

2. The DEC shall be responsible for all keys and in the unlikely event any key is lost, the DEC shall bear all costs incurred in having locks re-keyed. The DEC shall turn all keys over to the Owner as directed by the Owner for inclusion into the existing key cabinet.

3. When requested by the Owner, in writing, the DEC shall surrender any or all keys assigned to him.

4. All keys shall be stamped with a maximum of ten (10) characters, as directed by Owner. Each key shall be such that meets the 2006 NFPA-101 Life Safety Code (22.7.5) to identify key(s) by touch and sight. This system shall be coordinated and installed by the facility maintenance staff after closeout to satisfy this code requirement.

## PART 3 - EXECUTION

### 3.1 GENERAL REQUIREMENTS

A. Examine and inspect all surfaces, anchors, and grounds that are to receive materials, fixtures, assemblies, and equipment specified herein. Check location, "rough in", and field dimensions prior to beginning work. Report all unsatisfactory conditions in writing to the Architect-Engineer and general contractor.
1. Do not begin installation until all unsatisfactory conditions have been corrected.

B. Verify all dimensions and be responsible for their correctness. No extra compensation will be allowed for differences between actual measurements and the dimensions indicated on the drawings.

### 3.2 INSTALLATION

A. Install security materials and accessories in accordance with the final shop drawings, manufacturer's data, and as herein specified.
1. Provide manufacturer's supervision of installation, including testing and interfacing of systems.

B. Install all components and complete system as indicated and in accordance with manufacturer's recommendations and instructions.

C. Nuts of all bolted work shall be drawn tight and threads battered or welded. Bolting may be used in the installation of detention equipment provided that the nuts are not accessible to inmates or exposed to view. Bolts shall be special oval head or flat head Torx security type. Screws shall be the same material and finished to match the applied hardware item. Other types of security bolts are unacceptable unless specifically approved by the Architect-Engineer. Provide two sets of wrenches for each size bolt used.

### 3.3 ADJUSTING

A. Final Adjustments: Prior to final inspection check and re-adjust all components to operate within their designed capacity. All components shall be adjusted and tested to verify correct operation prior to final inspection.

B. All devices shall be tested for specified and manufacturer described operation.

C. All tests required by local agencies shall be performed.

D. All tests required by Owner and Owner's representative shall be performed.

E. Systems not meeting the minimum level of acceptability as defined in the test procedures shall be repaired and retested.

F. Provide documentation of test procedures and results.

G. Equipment manufacturer's representative shall certify that the systems are installed and operate as specified.

H. All costs to test and retest systems shall be the responsibility of the Detention Equipment Contractor.

## 3.4 SECURITY HARDWARE SCHEDULE

A. GENERAL NOTES:

1. **Provide a doorstop equal to Ives FS18L at all door openings in accordance with 087163.2.1.E.7, unless otherwise instructed by the Architect/Consultant**.
2. Any door greater than 3'-2" in width and/or 7'-4" in height shall receive four (4) hinges
3. Hardware groups SH1 – SH3 are not used. Hardware groups SH4 – SH8 are not used.
4. DEC is responsible for counts, quantities, handing and correct nomenclature of all material provided under and related to this scope of work.

**SH3A – A113.1 / A129.1**

| UNIT | PART | CATALOG NO. | FINISH | MANUFACTURER |
|---|---|---|---|---|
| 3EA | HINGE | 204FMSS | US32D | SOUTHERN FOLGER |
| 1EA | LOCK | 10120AMD-1 | US26D | SOUTHERN FOLGER |
| 1EA | CYLINDER | MOGUL | US26D | SOUTHERN FOLGER |
| 1EA | DPS | 200MRS-TB | US26D | SOUTHERN FOLGER |
| 1EA | FOOD PASS LOCK | 1010AM | GALV | SOUTHERN FOLGER |
| 1EA | FOOD PASS CYLINDER | MOGUL | US26D | SOUTHERN FOLGER |
| 2EA | FOOD PASS HINGE | 203FP | US26D | SOUTHERN FOLGER |
| 1EA | RAISED PULL | 212C | US26D | SOUTHERN FOLGER |
| 1EA | RECESSED PULL | 214S | US26D | SOUTHERN FOLGER |
| 1EA | THRESHOLD | S204A | AL | REESE |
| 1EA | WEATHERSTRIP | 797B/DB469C | AL | REESE |

***NOTE: PROVIDE 797 WEATHERSTRIP AROUND CUFFPORT.***

**SH9 – G01, G08 and G12**

| UNIT | PART | CATALOG NO. | FINISH | MANUFACTURER |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| 1EA | LOCK | 1050SD-2 | GALV | SOUTHERN FOLGER |
| 2EA | CYLINDER | MOGUL | US26D | SOUTHERN FOLGER |

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# SECTION 087163 – DETENTION DOOR HARDWARE

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and provisions of contract, including General and Supplementary Conditions and Division 01 specification Sections apply to Work in this Section.

### 1.2 SUMMARY

A. This Section includes the following:

1. Electrical and Mechanical Security Hardware for Swinging Gates.

B. Related Sections include the following:
1. Division 08 Section 083463 for Detention Hollow Metal
2. Division 08 Section 088853 for Security Glazing
3. Division 26 for Electrical requirements.
4. Divisions 27 and 28 for Security Electronic requirements.
5. Division 32 Section 323113.53 “High Security Chain Link Fences and Gates.”

### 1.3 SCOPE AND RESPONSIBILITIES

A. Under the requirements of this specification, the DEC shall be responsible for furnishing and installing all hardware as specified, in all locations unless shown.

### 1.4 SUBMITTALS

A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections. All submittals shall be supplied on USB drive.

B. Product Data: Manufacturer's printed product data and catalog cuts indicating product characteristics, performance and limiting criteria.

C. Shop Drawings: For each type of hardware item: Include plans, wiring diagrams, method of construction, installation and attachment details and other information necessary to show compliance with requirements.

D. Hardware schedule coordinated with doors, frames, and related work to ensure proper size, thickness, hand and function of door hardware.

1. Hardware Schedule Content: Based on hardware indicated, organize schedule into “hardware sets” indicating complete designations of every item required for each door or opening. Include the following information:
a. Type, style, **exact** function, size, and finish of each hardware item.

b. Name and manufacturer of each item.
c. Fastenings and other pertinent information.
d. Location of each hardware set cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.
   1) Door numbers and frame types in schedule to match door numbers and frame types shown on Drawings.
   2) Hardware sets shall match specified hardware sets found at the end of this specification section. Hardware set extensions (i.e.: "SH1.a") used to signify hardware sets with additional hardware requirements are acceptable.

e. Explanation of all abbreviations, symbols, and codes contained in schedule.
f. Mounting locations for hardware.
g. Door and frame sizes and materials.

2. Submittal Sequence: Submit schedule at earliest possible date, particularly where acceptance of Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include with schedule the product data, shop drawings of other work affected by door hardware, and other information essential to the coordinated review of schedule.

3. The DEC is responsible for counts, quantities, proper handing and correct nomenclature of all material provided under, and related to, this scope of work.

E. Keying Schedule: The owner shall provide an approved key schedule to the DEC at the time of detention hardware submittal review.

F. Submittal of written confirmation from the hardware manufacturer showing individual field technicians as approved installers shall be required.

G. Operating/Maintenance Manuals: Furnish O&M Manuals, as outlined in Division 1, for all security hardware and all security locking devices. Provide detailed parts lists and cutsheets for all items with mechanical moving parts or electrical components on the approved security hardware schedule. These manuals shall include instructions for the care of the materials, parts list to aid the Owner in ordering replacement parts, as well as instructions for contacting the appropriate personnel not only during the warranty period, but beyond. Manuals shall also include the final approved key schedule and "as built" shop drawings of all components. The Detention Equipment Contractor must have full time employees trained in the maintenance and repair of this equipment.

## 1.5 DELIVERY, STORAGE AND HANDLING

A. Packing and Marking: Each piece of security hardware furnished under this Section shall be packaged and marked according to the hardware set and door number listed in the approved hardware schedule.

B. Deliver all components cartoned or crated to provide protection during transit and job storage.

C. Inspect all components upon delivery for damage. Damages may be repaired, provided the repaired items are equal in all respects to new work and acceptable to the Architect-Engineer; otherwise, remove and replace damaged items as directed.

D. Store all components in a locked storage area for all components deemed necessary by the Detention Equipment Contractor. Do not store any materials directly on the ground or concrete. Provide adequate ventilation and protection to insure materials are kept dry, clean and secure. Store all materials in the manner and order as prescribed by the Detention Equipment Contractor and/or manufacturer.

1.6 COORDINATION

A. Examine the drawings and specifications of other trades whose work may influence the installation and/or operation of the detention hardware. Prior to the start of work, review the project drawings and specifications and coordinate work with all other trades and Divisions of the Specifications affecting Work of this Section.

1. Responsibilities for electrical and mechanical hardware installation shall include the following:

a. Furnish and install door locks, door position switches, limit switches, lock feature switches and push buttons, as required for the system to perform the functions as defined in the "Door Control" section of the Division 28 specifications.
b. Coordinate the integration and interfacing of the products and equipment specified in this section with Division 28 (SSI) specified, and in accordance with shop drawings and submittals approved by the Architect / Consultant.
c. Review all control submittals submitted by Division 28 (SSI) and confirm that all scheduled controls and monitoring will function in accordance with the specified function. **A written confirmation of this review shall be submitted to the Architect / Consultant.**
d. Coordinate the power requirements with all equipment furnished in this section.

1.7 MAINTENANCE

A. Contractor shall furnish spare parts required in each section, packaged to protect parts from damage and to allow for easy storage.

B. Supplier of equipment shall stock replacement parts for each system and be able to replace any part of the system within 24 hours.

A. Provide spare door hardware parts as follows:

1. Hinges: 2 pair (4 total)
2. Door position switches: 1 (single)
3. Furnish the following material:
   a. Two (1) each of all locks specified (less cylinder).
   b. All parts shall be packaged and labeled to provide for long term storage.

PART 2 - PRODUCTS

2.1 GENERAL

A. Security design criteria are based upon the requirements and features of the products listed herein. The use of one manufacturer's numeric designation does not imply other manufacturer's products will not be accepted.

B. Fire Rated Openings: Provide hardware for fire-rated openings in compliance with NFPA Standard 80. This requirement takes precedence over other requirements for such hardware. Provide only hardware which has been tested and listed by UL, bears appropriate label or symbol for the types and sizes of doors required and compliance with the requirements of the required label and function of the opening wherever possible.

C. Acceptable Manufacturers

1. Except as otherwise specified herein, the equipment and materials of this section shall be products manufactured by one of the listed manufacturers and must be equal to the part specified in the product description.

D. Products/Manufacturers

1. Hinges: Southern Folger, Portland, Northwest Specialty Hardware
2. Pulls: Southern Folger, Portland, Northwest Specialty Hardware
3. Door Position Switches (DPS): Southern Folger, Sentrol
4. Door Stops: Ives
5. Silencers: Ives

E. Product Description

1. Hinges, SOUTHERN 204FMSS or approved equal:
   a. Full Mortise Detention Hinges shall be 4-1/2” x 4-1/2” x 0.188” thick investment cast 304 stainless steel with hospital tips and integral studs on both leaves. Pins shall be hardened stainless or alloy steel, concealed and non-removable. Each hinge shall be supplied with eight (8) ¼-20 flat head machine screws. All hinges and screws shall be US32D finished.
   b. Furnish three hinges for door through 84-inches in height and one additional hinge for each additional 30-inches of height or fraction thereof. Furnish three hinges for doors through 36-inches in width and one additional hinge for each additional 12-inches of width or fraction thereof.
   c. Except where otherwise indicated, hinges shall be mortised, 4-1/2" x 4-1/2", cast steel or stainless steel, ball bearing, with pins made non-removable by a concealed hardened roll pin. All hinges shall be furnished with 1/4-20 TORX FHMS.
   d. Hinges shall be certified, by an independent testing lab, to meet or exceed the cycle requirements of ASTM 1758, Grade 1A.
   e. Hinges furnished for use on labeled fire doors shall also comply with the requirements of NFPA 80.
2. Full surface hinges, equal to Southern Folger 203FS/203FP where indicated on architectural details for food pass applications in rated openings.
3. Strikes: All locks and latches shall be furnished with manufacturer's standard strikes complete with dust boxes to fully conceal the strike pocket. Where monitor strikes are specified, provide strikes as appropriate for the lock specified. All monitor strikes shall be designed to fit within a 2" face frame without protruding beyond the 2" frame depth.
4. Fasteners:

a. Manufacturer hardware to conform to published template, generally prepared for machine screw installation. Do not provide hardware, which has been prepared for self-tapping of sheet metal screws.
b. Furnish screws for installation with each hardware item. All exposed screw heads, whether door is open or closed, shall be Torx (with security stud) flat-head or oval head screws except as otherwise indicated. Screws shall be the same material and finished to match the applied hardware item. Other types of security screws are unacceptable unless specifically approved by the Architect-Consultant.

5. Pull:
   a. Grip Type Door Pulls shall be cast of brass or bronze with satin finish of approximately US26D unless specified otherwise in hardware schedule. Approximate overall length, 8-11/16"; handhold, 5-1/4"; grip clearance, 1-1/2"; attachment holes, 7-3/4" o.c. Provide two (2) 3/8-16 x 5/8" flat head pinned Torx-plus screws of same finish and material as pull.
   b. Flush Type Door Pulls shall be cast of brass or bronze with satin finish of approximately US26D unless specified otherwise in hardware schedule. Size 4" x 5" x 1/8" x pocket rip 1" deep. Provide four (4) ¼-20 x 3/8" flat head Torx screws of same finish and material as pull.
6. Door Position Switch, SOUTHERN 200MRS, or as required by hardware schedule:
   a. Recessed Magnetic Door Position Switch-Triple Biased shall be a five-reed switch magnet mortised type assembly used for remotely monitoring the door status/position. The device shall be triple bias for tamper resistance.
   b. The device shall be moisture resistant and fit within a 2" hollow metal jamb or head. The device shall be field adjustable on 2 axis and supplied with a 5' vinyl jacketed lead wire and a 3-pin Molex connector. The device shall be all steel construction. The switch and magnet shall be encased in epoxy resin.
   c. Where this device is used in an exterior location, provide a complete water-tight installation.
7. High Security Closer (where required) LCN #4210/4510T series shall be surface mounted with security screws at all exposed locations and shall have fully adjustable spring tension. Closers shall have cast iron cylinders and two separately adjustable non-critical valves for closing speed and latching speed, plus a third valve for adjusting the hydraulic back-check. Closers shall be sized appropriately based on scheduled door width, per manufacturer's recommendations. A smooth molded case cover shall conceal the closer body. Closer to be located on the side of door/frame farthest from inmate contact, unless an exterior door. Mount closer for exterior doors on interior side of the door. Maximum opening clearance shall be 180-degrees. Parallel arm shall be used on the 4210 series closer, this closer shall be used at all locations not in direct contact with inmates. A track arm shall be used on the 4510T series closer, which shall be provided at dayrooms, and locations with direct inmate contact. Provide finish of standard powder coated aluminum. DEC shall be responsible for coordinating the installation of the closer with jobsite frame installation conditions prior to installation. Closer shall have sufficient force to fully close door to achieve a secured and locked indication. Closer body shall not be inhibited by, or touch the wall or any other object after installation. If the above conditions cannot be achieved, request direction from the Architect/Consultant, by providing suggested solution using LCN security grade products. DEC is responsible for proper closer placement and installation.
8. Wall Mounted Door Stops **(Wall mount only)** (Ives FS18L) shall be a tamper resistant device that is embedded into the wall with an epoxy resin adhesive. Bumper shall be 2" diameter x 3-1/2" long and made from a non-hazardous silicone elastomer, 80 durometer. The threaded and grooved steel mounting shank shall be 5/8" in diameter and embedded

into the bumper at least half the length of the bumper. Mounting shank shall extend 2-1/2" beyond the bumper bottom for embedding into the wall.

a. Provide wall-mounted door bumper **8"** off of the floor and 8" from edge of door when in the opened position. If the above conditions cannot be achieved, request direction from the Architect.

9. Thresholds: Provide thresholds as in "Detention Hardware Schedule", and where required on detention doors per architectural details. All doors into rated stairways shall be provided with Reese S204A thresholds (or approved equal).
10. Weatherstripping: Provide weatherstripping at all exterior doors equal to Reese DB469C door sweep plus 797B weatherstrip, or approved, at all heads and jambs (and astragals if pairs), After installation, razor cut gasketing into pieces not over 12" in length, installed per manufacturer's recommendations. Do not break weatherstrip at head of frame for closer installation. SILL SWEEP MUST BE FASTENED WITHIN ½" MAXIMUM FROM EDGE OF DOOR ON EACH SIDE.
11. Provide rain drips equal to Reese R199A and R201A at frame head and door bottom at all exterior doors install per manufacturers' recommendations. Apply head drip directly to door frame header ¼" above door opening.

## 2.2 MECHANICAL LOCKS FOR SECURITY DOORS

A. Acceptable Manufacturers

1. Except as otherwise specified herein, the equipment and materials of this section shall be products of the following Manufacturer, no exceptions:
   a. Southern Folger Detention Equipment Company (SOUTHERN), San Antonio, TX

B. Mechanical Locks and Accessories for Swinging Doors

1. Standard Features
   a. Lock case to be high tensile strength alloy steel with cold rolled steel cover
   b. All locks to operate by inserting a key into matching cylinder and rotating key to unlock the lock.
   c. All lock steel parts shall be zinc plated for corrosion protection and are suitable for both interior and exterior applications.
   d. Keyed One Side (K1) or Keyed Two Sides (K2).
   e. At rated locations, provide smoke gasketing, weather strip, sweeps, sill threshold, door skirts, plates, angles and/or additional material as required per the manufacturer's recommendations to obtain the appropriate label as per the architectural drawings. This requirement takes precedence over other requirements for scheduled hardware. Provide only hardware which has been tested and listed by UL bears the appropriate label or symbol for the types and sizes of doors required and compliance with the requirements of the required label and function of the opening wherever possible.

C. Products

1. Mechanical Deadbolt, SOUTHERN 1010A:
   a. Lock size to be approximately 4/1/2" x 3" x 1-1/4". Deadbolt to be ¾" x 1-1/2" hot rolled steel with 5/8" throw. Deadbolt locking and unlocking activated by key only.

b. Provide extended bolt throw at food pass locations as required by hollow metal fabrication. DEC shall coordinate with hardware and hollow metal manufacturers.

## 2.3 ELECTRO-MECHANICAL LOCKS FOR SECURITY DOORS

A. Acceptable Manufacturers

1. Except as otherwise specified herein, the equipment and materials of this article shall be products of the following Manufacturer:
   a. Southern Folger Detention Equipment Company (SOUTHERN), San Antonio, TX

B. The lock shall be 24 VDC motor operated security locks for individual swinging doors: Locks shall be frame mounted, complete with integral electronic components. Equal to SOUTHERN 10120AMD:

1. Functions:
   a. Locks to operate electrically through either 24 VDC constant duty motors. Locks to be remotely unlocked electrically by momentary contact switch, or mechanically operated by key at the lock.
   b. Refer to the requirements of the Emergency Release function of the door control system specified in Division 28. The electrically controlled locks shall be furnished with the capabilities of a half cycle function when controlled with the Emergency Release control function. The lock shall operate as if it's a full cycle lock with normal door control function.
   c. Half Cycle Operation
      1) When a momentary signal is applied to the unlock input, the latchbolt shall retract. The latchbolt shall remain mechanically retracted. When power is removed, the latchbolt remains retracted.
      2) When a momentary signal is applied to the lock input, the latchbolt shall extend, locking the door if closed and allowing the door to be slam-locked if open.
   d. Manual Operation
      1) Each lock shall have local manual key override lock/unlock feature. Keyed one side (K1), Keyed two sides (K2).
      2) Rotating the key shall mechanically retract the latchbolt. Removing the key shall extend the bolt, locking the door if closed and allowing the door to be slam-locked if open.
2. Components
   a. Mechanical
      1) Lock shall operate as a fail-secure slam-lock. Unlocks when energized.
      2) Lock body shall be made of steel or stainless steel.
      3) Lock shall be supplied with a security key cylinder protection pipe to protect the key cylinder. The protection pipe will be supplied unpainted for installation in the hollow metal frame by the hollow metal manufacturer.
      4) Cylinder extensions shall be provided for locks keyed two sides or keyed stop side unless provisions are allowed for recessed pocket in hollow metal.
      5) Cylinder shields shall not be required on exterior side of exterior frames in recreation yards.
   b. Electrical
      1) 10120 Motor Operated Lock:

a) Lock shall operate when supplied with 24 VDC.
b) Single Phase, 3.3 amp max.
c) Lock shall be provided with a lock status switch to provide interlocking capabilities.
d) Switches shall be of the snap acting mechanical type. UL listed and rated at least 5 amps.
e) Locks shall be factory wired to a plug disconnect.
f) Lock status switch shall be capable of providing the following indications:
g) Deadlocked indication
h) Unsecure indication

c. Features: Where specified by the security hardware/door schedule, the following features shall be provided:
1) Local Electric Keyswitch (LEK): Day key provides local electric operation and may be disabled remotely via central control point. Master key provides both electric and Mechanical operation. Refer to the requirements of the door control system specified in Division 28.
2) Remote Latch Holdback (RLHB): Latchbolt is retracted by the push of a button at the control panel and remains mechanically retracted until button is pushed a second time.
3) Key Operated Mechanical Latch Holdback (KLHB): Latchbolt is retracted locally by key and remains mechanically retracted until relocked by key.
4) Key Switch (KS): Door is electrically unlocked by key operated switch at the lock.
5) Lockset shall be supplied with high security Mogul Key Cylinders to match existing, unless otherwise specified.

d. Weather resistant motor housing shall be constructed of a minimum ¼" (6.4MM) steel plate, framed and stiffened as required.
e. Removable front cover panel shall be constructed of 10-gauge galvanized steel.
f. The doorjamb and vertical members shall be free of hooks or lugs used for locking or any other purpose.

**C. The lock shall be provided with constant duty solenoid operated motors for individual swinging gates: Locks shall be complete with integral electronic components Equal to SOUTHERN STEEL 10120AE. Lock shall be fence mounted in a custom protective galvanized box to match the existing facility (galvanized mounting by fence and gate contractor). Gates G08 and G12 will be monitored only and operated by keys. Gate G1 will be controlled and monitored:**

**1. Functions:**
**a. Locks to operate electrically through either constant duty solenoids or constant duty motors. Locks to be remotely unlocked electrically by momentary contact switch at G01, and mechanically operated by key at the lock at gates G08 and G12.**
**b. Refer to the requirements of the Emergency Release function of the door control system specified in Division 28 and approved SFM drawings to confirm these gates do not need to be on the emergency release system. If emergency release is required, provide 10120AMD locks.**
**c. Lock Operation**
**1) When a momentary signal is applied to the unlock input, the latchbolt shall retract, locking the door if closed and allowing the door to be slam-locked if open.**

**d. Manual Operation**
**1) Each lock shall have local manual key override lock/unlock feature. Keyed one side (K1), Keyed two sides (K2).**
**2) Rotating the key shall mechanically retract the latchbolt. Removing the key shall extend the bolt, locking the door if closed and allowing the door to be slam-locked if open.**

**2. Components**
**a. Mechanical**
**1) Lock shall operate as a fail-secure slam-lock. Unlocks when energized.**
**2) Lock body shall be made of steel or stainless steel.**
**3) Lock shall be supplied with a security key cylinder protection pipe to protect the key cylinder. The protection pipe shall be supplied unpainted and installed on the custom gate mount by the fence and gate contractor.**
**4) Cylinder extensions shall be provided for locks keyed two sides or keyed stop side unless provisions are allowed for recessed pocket in hollow metal.**
**5) Cylinder shields shall not be required on exterior side of exterior frames in recreation yards.**
**b. Electrical**
**1) 10120 Motor Operated Lock:**
**a) Lock shall be supplied with 115 VAC single phase, 60 Hz., 12.0 inrush, 0.6 amp seated power.**
**b) Lock shall be provided with a lock status switch to provide interlocking capabilities.**
**c) Switches shall be of the snap acting mechanical type. UL listed and rated at least 5 amps.**
**d) Locks shall be factory wired to a plug disconnect.**
**e) Lock status switch shall be capable of providing the following indications:**
**f) Deadlocked indication**
**g) Unsecure indication**
**c. Features: Where specified by the security hardware/door schedule, the following features shall be provided:**
**1) Key Switch (KS): Door is electrically unlocked by key operated switch at the lock.**
**d. Lockset shall be supplied with high security Mogul Key Cylinders to match existing, unless otherwise specified.**
**e. Weather resistant motor housing shall be constructed of a minimum ¼" (6.4MM) steel plate, framed and stiffened as required.**
**f. Removable front cover panel shall be constructed of 10-gauge galvanized steel.**
**g. The doorjamb and vertical members shall be free of hooks or lugs used for locking or any other purpose.**

D. ~~**Electro-Mechanical (Swing) Gate Lock equal to SOUTHERN 1050SD**~~ **- NOT USED** (per 12-4-17 keying conference call).

2.4 KEYING AND KEYS

A. Keying and Keys

1. The owner shall provide an approved key schedule to the DEC at the time of detention hardware submittal review.

B. Key Control System:

1. Mogul key Cylinders shall match SCF/CDF existing Facility keying, and shall be keyed in sets and master keyed, sub-master keyed etc. to a level as directed by the Owner, for inclusion into the existing Morse Watchman's key system.
   a. Provide six (6) keys per master code.
   b. Provide six (6) keys per change key code.
   c. Provide fifteen (15) key blanks of Solano proprietary keyway.

2. The DEC shall be responsible for all keys and in the unlikely event any key is lost, the DEC shall bear all costs incurred in having locks re-keyed. The DEC shall turn all keys over to the Owner as directed by the Owner for inclusion into the existing key cabinet.

3. When requested by the Owner, in writing, the DEC shall surrender any or all keys assigned to him.

4. All keys shall be stamped with a maximum of ten (10) characters, as directed by Owner. Each key shall be such that meets the 2015 NFPA-101 Life Safety Code (22.7.5) to identify key(s) by touch and sight. This system shall be coordinated and installed by the facility maintenance staff after closeout to satisfy this code requirement.

## PART 3 - EXECUTION

### 3.1 GENERAL REQUIREMENTS

A. Examine and inspect all surfaces, anchors, and grounds that are to receive materials, fixtures, assemblies, and equipment specified herein. Check location, "rough in", and field dimensions prior to beginning work. Report all unsatisfactory conditions in writing to the Architect-Engineer and general contractor.

1. Do not begin installation until all unsatisfactory conditions have been corrected.

B. Verify all dimensions and be responsible for their correctness. No extra compensation will be allowed for differences between actual measurements and the dimensions indicated on the drawings.

### 3.2 INSTALLATION

A. Install security materials and accessories in accordance with the final shop drawings, manufacturer's data, and as herein specified.

1. Provide manufacturer's supervision of installation, including testing and interfacing of systems.

B. Install all components and complete system as indicated and in accordance with manufacturer's recommendations and instructions.

C. Nuts of all bolted work shall be drawn tight and threads battered or welded. Bolting may be used in the installation of detention equipment provided that the nuts are not accessible to inmates or exposed to view. Bolts shall be special oval head or flat head Torx security type. Screws shall be the same material and finished to match the applied hardware item. Other types of security bolts are unacceptable unless specifically approved by the Architect-Engineer. Provide two sets of wrenches for each size bolt used.

3.3 ADJUSTING

A. Final Adjustments: Prior to final inspection check and re-adjust all components to operate within their designed capacity. All components shall be adjusted and tested to verify correct operation prior to final inspection.

B. All devices shall be tested for specified and manufacturer described operation.

C. All tests required by local agencies shall be performed.

D. All tests required by Owner and Owner's representative shall be performed.

E. Systems not meeting the minimum level of acceptability as defined in the test procedures shall be repaired and retested.

F. Provide documentation of test procedures and results.

G. Equipment manufacturer's representative shall certify that the systems are installed and operate as specified.

H. All costs to test and retest systems shall be the responsibility of the Detention Equipment Contractor.

3.4 SECURITY HARDWARE SCHEDULE

A. GENERAL NOTES:

1. **Provide a doorstop equal to Ives FS18L at all door openings in accordance with 087163.2.1.E.8, unless otherwise instructed by the Architect/Consultant**.
2. Any door greater than 3’-2” in width and/or 7’-4” in height shall receive four (4) hinges
3. Hardware groups SH1 – SH3 are not used. Hardware groups SH4 – SH8 are not used.
4. DEC is responsible for counts, quantities, handing and correct nomenclature of all material provided under and related to this scope of work.

**SH3A – A113.1 / A129.1**

| UNIT | PART | CATALOG NO. | FINISH | MANUFACTURER |
|---|---|---|---|---|
| 3EA | HINGE | 204FMSS | US32D | SOUTHERN FOLGER |
| 1EA | LOCK | 10120AMD-1 | US26D | SOUTHERN FOLGER |
| 1EA | CYLINDER | MOGUL | US26D | SOUTHERN FOLGER |

| | | | | |
|---|---|---|---|---|
| 1EA | DPS | 200MRS-TB | US26D | SOUTHERN FOLGER |
| 1EA | FOOD PASS LOCK | 1010AM | GALV | SOUTHERN FOLGER |
| 1EA | FOOD PASS CYLINDER | MOGUL | US26D | SOUTHERN FOLGER |
| 2EA | FOOD PASS HINGE | 203FP | US26D | SOUTHERN FOLGER |
| 1EA | RAISED PULL | 212C | US26D | SOUTHERN FOLGER |
| 1EA | RECESSED PULL | 214S | US26D | SOUTHERN FOLGER |
| 1EA | THRESHOLD | S204A | AL | REESE |
| 1EA | WEATHERSTRIP | 797B/DB469C | AL | REESE |

***NOTE: PROVIDE 797 WEATHERSTRIP AROUND CUFFPORT.***

**SH9 – G01, G08 and G12**

| UNIT | PART | CATALOG NO. | FINISH | MANUFACTURER |
|---|---|---|---|---|
| 1EA | LOCK | ~~1050SD-2~~ **10120AE** | GALV | SOUTHERN FOLGER |
| 2EA | CYLINDER | MOGUL | US26D | SOUTHERN FOLGER |

***NOTE: 10120AE SHALL BE MOUNTED IN A CUSTOM GALVANIZED WEATHER PROOF BOX, FABRICATED BY THE FENCE AND GATE INSTALLER.***

END OF SECTION 087163

# SECTION 08 74 00 – ACCESS CONTROL HARDWARE

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes commercial door hardware for the following:
   1. Swinging doors.
   2. Sliding Doors
   3. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:
   1. Mechanical door hardware.
   2. Electromechanical door hardware.
   3. Stand alone electronic access control door hardware.
   4. Digital electronic cylinders.
   5. Integrated Wiegand access control door hardware.
   6. Wireless access control door hardware.
   7. IP-enabled integrated access control door hardware.
   8. Power transfer devices and wiring harnesses.
   9. Monitoring and signaling equipment.
   10. Access control cards and credentials.
   11. Stand alone access control application software.
   12. Electrified and access control door hardware power supplies, back-ups and surge protection.

C. Related Sections:
   1. Division 08 Section “Door Hardware Set”.
   2. Division 08 Section “Hollow Metal Doors and Frames”.
   3. Division 08 Section “Flush Wood Doors”.
   4. Division 28 Section “Access Control”.
   5. Division 26 Sections for connections to electrical power system and for low-voltage wiring work.
   6. Division 28 Sections "Access Control" for access control devices installed at door openings and provided as part of a security access system.
   7. Division 28 Section "Intrusion Detection" for detection devices installed at door openings and provided as part of an intrusion detection system.
   8. Division 28 Section "Fire Detection and Alarm" for connections to building fire alarm system.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
   1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
   2. ICC/IBC - International Building Code.
   3. NFPA 70 - National Electrical Code.
   4. NFPA 80 - Fire Doors and Windows.
   5. NFPA 101 - Life Safety Code.
   6. NFPA 105 - Installation of Smoke Door Assemblies.
   7. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards:
   1. ANSI/BHMA Certified Product Standards – A156 Series.
   2. UL10C – Positive Pressure Fire Tests of Door Assemblies.

F. Products installed, but not provided under this Section include the following. Coordination to remain a requirement of this Section.
   1. Security or High Security keyed cylinders, including provisions for temporary construction keying, provided for mechanical override at access control locking hardware to be furnished under Division 08 Section "Door Hardware". Permanent cores and keys to be installed by Owner.

## 1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
   1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
   2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
   3. Content: Include the following information:
      a. Type, style, function, size, label, hand, and finish of each door hardware item.
      b. Manufacturer of each item.
      c. Fastenings and other pertinent information.
      d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
      e. Explanation of abbreviations, symbols, and codes contained in schedule.
      f. Mounting locations for door hardware.
      g. Door and frame sizes and materials.
      h. System Operational Descriptions: Complete system operational narratives for access controlled openings defining the owner's prescribed requirements for the

opening functionality. Narratives include, but are not limited to, the following situations: normal secured/unsecured state of door; authorized access; authorized egress; unauthorized access; unauthorized egress; fire alarm and loss of power conditions, and interfaces with other building control systems.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:
   1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
      a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
      b. Complete (risers, point-to-point) access control system block wiring diagrams.
   2. Electrical Coordination: Coordinate with related Division 26 Electrical Sections the voltages and wiring details required at electrically controlled and operated hardware openings.
   3. Proof of Certification: Provide copy of manufacturer(s) official certification or accreditation document indicating proof of status as a qualified and authorized provider of the primary integrated access control components.

D. Keying Schedule: Reference Division 08 Section "Door Hardware".

E. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete standard door and access control hardware installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and telephone number of the supplier/integrator providing the installation and the nearest service representatives for each item of equipment included in the system. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.
   1. As-Built Drawings: During system installation, the Contractor to maintain a separate hard copy set of drawings, elevation diagrams, and wiring diagrams of the access control system to be used for record drawings. This set to be kept up to date by the Contractor with all changes and additions to the access control system accurately recorded.

G. Warranties and Maintenance: Special warranties and maintenance agreements specified in this Section.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum[5] years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Integrator Qualifications (Access Control Door Hardware): Systems Integrators, verifiably factory trained and certified by the primary product manufacturers, with a minimum[3] years documented experience installing complete access control systems hardware similar in material, design, and scope to that indicated for this Project and whose work has resulted in construction with a proven record of successful in-service performance. Qualifications include, but are not necessarily limited, to the following:
   1. References: Provide a list of references for similar projects including contact name, phone number, name and type of project.
   2. Professional Staffing: Firms to have a dedicated access control systems integration department with full time, experienced professionals on staff experienced in providing on site consulting services for both electrified door hardware and integrated access control systems installations.
   3. Factory Training: Installation and service technicians are to be competent factory trained and certified personnel capable of maintaining the system.
   4. Service Center: Firms to have a service center capable of providing training, in-stock parts, and emergency maintenance and repairs at the Project site with 24-hour/7-days a week maximum response time.

C. Supplier Qualifications: Supplier, verifiably authorized and in good standing with the primary product manufacturers, with a minimum[3] years experience supplying integrated access control systems similar in material, design, and scope to that indicated for this Project and whose work has resulted in construction with a proven record of successful in-service performance.

D. Integrated Wiegand Output, Wireless, and IP-Enabled access control products are required to be supplied and installed only through designated ASSA ABLOY "Authorized Channel Partner" (ACP) and “Certified Integrator” (CI) accounts.

E. Source Limitations: Obtain each type and variety of Door Hardware specified in this Section from a single source, qualified supplier unless otherwise indicated.
   1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
   2. Provide integrated access control door hardware from the same manufacturer as standard mechanical door hardware, unless otherwise indicated.

F. Regulatory Requirements: Comply with NFPA 70, NFPA 80, NFPA 101 and ANSI A117.1 requirements and guidelines as directed in the model building code including, but not limited to, the following:
   1. NFPA 70 "National Electrical Code", including electrical components, devices, and accessories listed and labeled as defined in Article 100 by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
   2. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1 as follows:

a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
b. Door Closers: Comply with the following maximum opening-force requirements indicated:
1) Interior Hinged Doors: 5 lbf applied perpendicular to door.
2) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

3. NFPA 101: Comply with the following for means of egress doors:
a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.

4. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252 (neutral pressure at 40" above sill) or UL-10C.
a. Test Pressure: Positive pressure labeling.

5. The installed access control system shall conform to all local jurisdiction requirements.

G. Keying Conference: Reference Section 087100 “Door Hardware.”

H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), Systems Integrator(s), and Contractor(s) to review proper methods and procedures for receiving, handling, and installing door and access control hardware to manufacturer's recommendations and according to specifications.
1. Prior to installation of door hardware, arrange for manufacturers' representatives to hold a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures.

I. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedules.

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
1. Access control firmware and software: Where approved and directed, inventory upon receipt and store electronic access control equipment in a secure, temperature and humidity controlled environment in original manufacturer's sealed containers.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

## 1.6 COORDINATION

A. Integrated Access Control Door Hardware and Electrical Coordination: Coordinate the layout and installation of scheduled integrated access control door hardware, and related access control equipment, with required connections to source power junction boxes, power supplies, detection and monitoring hardware and fire alarm system.
   1. Access Control System Interface: The integrated access control hardware to interface and be connected to the access control system described under Division 28 "Access Control Systems". Coordinate the installation and configuration of the electrified door hardware and access control systems firmware and software with the hardware specified in this Section.

B. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

C. Door and Frame Preparation: Related Division 08 Sections (Steel, Aluminum and Wood) doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

## 1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
   1. Structural failures including excessive deflection, cracking, or breakage.
   2. Faulty operation of the hardware.
   3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods:
   1. Two years for electromechanical and integrated access control door hardware.
   2. Five years for motorized electric latch retraction exit devices. Ten years for mortise locks and latches.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of standard and access control door hardware.

B. Maintenance Service: Beginning at Substantial Completion, and running concurrent with the specified warranty period, provide continuous (12) months full maintenance including repair and replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door opening operation. Provide parts and supplies as used in the manufacture and installation of original products.

1.9 SCOPE OF WORK

A. Access Control Site Management System: Furnish and install at the indicated locations the specified integrated access control door hardware for a completely operational access control and security site management system. System includes, but is not necessarily limited, to the following:
   1. Electrified integrated access control locks and exit hardware, special tools, operating manuals, and required cabling and accessories as detailed below and listed in the Access Control Hardware Sets at the end of Part 3.
      a. Provide manufacturer approved integrated access control locks and exit hardware that are functionally compatible with the specified access control equipment interfaces.
   2. Contractor to provide the following:
      a. Contractor will be responsible for ensuring that each computer hardware component includes the required interfaces, expansion boards, and peripherals that will be necessary to allow the system to operate as described within this specification and as indicated on the drawings.
      b. Power Sourcing, Network Switches and Wireless Access Points: Quantity as required to accommodate installed access control (and video surveillance) devices.
      c. Network Control Processor Connections:
         1) LAN/Ethernet communication ports (jacks) and network interface cards as needed, CAT5e (CAT6) cabling from network router/switch to network control processor, outlet and cover plates and/or patch cables required for network connection within each designated IT/Telecom room.
         2) Required static IP addresses.
   3. Power Supplies, including battery, uninterrupted backup power supply (UPS) and separately fused surge protection, required for the integrated access control door hardware.
   4. Installation, final configuration and commissioning of integrated access control door hardware, power supplies and related accessories.

5. Provide manufacturer required power controllers, interface boards, and programming that may be required for approved electric latch retraction exit devices supplied under Division 08 Section "Door Hardware."
6. Electrical contractor, Division 26, to provide the following:
   a. Source power wiring (120VAC) as required for the integrated access control door hardware and power supplies. This includes quad outlets as required on a dedicated circuit in the designated IT/Telecom room(s) and the related conduit, stub-in, junction boxes and connectors required for the source power delivery and connections.
   b. Provide required conduit, stub-in, junction and back boxes for the integrated access control door hardware at each access controlled opening per plan drawings and specs. Supply and install conduit between the aforementioned devices and between the electrical junction boxes, power supplies and access control equipment located on or above the door opening.
      1) At electrified hardware power transfers provide conduit on the secured side of the opening from the power transfer, thru-wire hinge, or serviceable panel location on the frame jamb to the related power supplies and access control equipment.
   c. Electrical Contractor to provide all 120VAC cabling connections and terminations from the electrical junction boxes to these electrical devices.
7. Access Control System Integrator to provide the following:
   a. Low voltage wiring (12/24VDC) and communication required for electrified and integrated access control door hardware, remote card readers, keypads, or display terminals, monitoring and signaling switches, and power supplies. Work includes related connectors, final terminations, and hook-ups required for a complete and functional access controlled opening in accordance with applicable codes and specified system operational narratives.
8. Final connections to fire alarm system, if required, by electrical and fire alarm system contractors.
9. Provide permits, submittals and approvals required by the authority having jurisdiction, prior to commencing with work.

## PART 2 - PRODUCTS

### 2.1 SCHEDULED DOOR HARDWARE

A. General: Provide integrated access control door hardware and accessories for each designated opening to comply with requirements in this Section and with the Access Control Hardware Sets listed at the end of Part 3.
   1. Access Control Hardware Sets: Requirements for quantity, item, model, design, grade, finish, size, and other distinctive qualities of each type of integrated door and access control hardware are indicated in the Access Control Hardware Sets at the end of Part 3.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of mechanical and electrified door hardware are indicated in the Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

C. System Design: The electrified door hardware specified to include standardized components regularly manufactured and utilized within the source manufacturer’s product lines.
   1. Electronic integrated locking hardware to be non-proprietary in design and implementations, providing for an open protocol platform across multiple access control systems manufacturers and software applications. The installed integrated product is to be part of a single, cohesive access control system.

D. Substitutions: Requests for substitution and product approval for inclusive mechanical and electrified access control door hardware, in compliance with specifications, must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01 "Substitution Procedures". Approval of requests is at the discretion of the architect, owner, and their designated consultants.

E. The electrified access control door hardware contained in this Section represents a complete engineered system. If alternate products are submitted, it is the responsibility of the Supplier to provide an acceptable complete and working system layout, including re-engineering of elevation and wiring diagrams, as applicable. Complete systems to include at a minimum the required power supplies, power transfers, and electrified and integrated locking hardware and accessories.

## 2.2 POWER TRANSFER DEVICES

A. Electrified Quick Connect Transfer Hinges: Provide electrified transfer hinges with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.
   1. Acceptable Manufacturers:
      a. McKinney Products (MK) - QC (# wires) Option.

A. Provide mortar guard enclosure on steel frames installed at masonry openings for each electrical hinge specified.

B. Electric Door Hardware Cords: Provide electric transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.
   1. Acceptable Manufacturers:
      a. McKinney Products (MK) - Inner Door Cord 3 inches: QC-C003P.
      b. McKinney Products (MK) - Inner Door Cord 3 foot door: QC-C206P.
      c. McKinney Products (MK) - Inner Door Cord 4 foot door: QC-C306P.
      d. McKinney Products (MK) - Inner Door Cord 15 feet: QC-C1500P.

e. McKinney Products (MK) - Hinge to Junction Panel 15 feet: QC-C1500P.
f. Provide one each of the following tools as part of the base bid contract:
   1) McKinney Products (MK) - Electrical Connecting Kit: QC-R001.
   2) McKinney Products (MK) - Connector Hand Tool: QC-R003.

## 2.3 DIGITAL CYLINDERS AND KEYS

A. Digital Cylinders: Provide original manufacturer cylinders to meet the following minimal requirements:
   1. Cylinders operate as key-based product.
   2. Cylinders combine both electronic technology and mechanical pinning for two independent forms of security protection.
      a. Mechanical protection includes:
         1) Three locking elements consisting of a slider mechanism, a sidebar mechanism with tumbler rotation and pin tumbler elevation.
         2) Lock tumblers with dual-axis action, with one axis utilized for pin tumbler rotation and the other axis utilized for positioning key cuts.
         3) Automatic mechanical relock upon removal of the key without the aid of battery power.
      b. Electronic protection includes:
         1) Unique security code for every system.
         2) Electronic communication protected by minimum of 64-bit DES encryption.
      c. Cylinders automatically relock upon removal of the key without the aid of battery power.
   3. Cylinders shall install without requiring any wiring or electricity and are capable of retrofitting existing hardware without any special door or door frame modifications.
      a. Cylinders to provide time-stamped electronic audit with no less than 750 operations or attempted operations and stored in non-volatile memory within the cylinder and accessible with an administrative key that holds no less than 2000 records.
      b. Provide scheduling with no less than 1000 user groups per cylinder and 1000 individual users per user group.
      c. Retrofit into rim, mortise, or key-in-lever cylinder types, and auxiliary locks (deadbolts, padlocks).

B. Digital Keys: Provide original manufacturer keys to meet the following minimum requirements:
   1. Keys to combine both electronic technology and mechanical pinning for two independent forms of security protection.
      a. Mechanical Security Features:
         1) Keys to be protected by U.S. Utility patent to ensure against unlawful key duplication.
         2) Key must have no fewer than 6 mechanical cuts with varying depths and angles to each cut.
         3) Key must be no less than .125” thick for strength.

4) Capable of providing a single master key with over 1,000,000 (1 million) usable, not interchangeable change keys in a single keyway.

b. Electronic Security Features:

1) Key electronic security codes are to be unique to any system with electronic communication a minimum 64-bit DES encryption.

2) Keys to provide access control functions with non-volatile system programming allowing loss of battery life to retain key access rights, and/or audit records.

2. Keys to allow different schedules for up to 30 different cylinder groups.
3. Keys to operate cylinder type products with a minimum capacity of 1000 user groups per key and 1000 individual users per user group.
4. Keys to provide a time-stamped audit for up to the most recent 1000 operations or attempted operations.
5. Keys are powered by a watch-style battery, model CR2025.
6. Keys to provide multiple level battery indicator via flashing LED and audible tone.
7. Keys to be compact in design and operate in a similar manner as mechanical key.
8. Keys shall not be limited by a timeframe to unlock the cylinder once inserted, if key is properly authorized.
9. Keys to require no additional maintenance other than regular battery replacement.
10. Key Quantities: Provide the following:
    a. E3 Dynamic User Key: Two per each cylinder keyset.
    b. Control Key: Two.

C. Programming Devices: Provide stations for the programming of keys. Provide the necessary cables and system dongles for full operation.
1. Provide one local programming device.
2. Provide one mobile programming device.
3. Provide one remote wall programming device.

D. Digital Electronic Cylinder System Software: Provide digital cylinder manufacturer's original management software supporting the following features:
1. Provide web hosted Basic version of the software.
2. Provide web hosted Remote Plus version of the software.
3. Provide web hosted Enterprise Plus version of the software.
4. Provide user web hosted Enterprise Plus version of the software.
5. Auditing capability of the digital cylinder and the key.
6. Product management by the system software with the following provisions:
    a. Lost or stolen keys to be deactivated from the system.
    b. User schedules set uniquely for each key holder.
    c. Software access protected by password and unique system authorization key.
    d. System capacity to operate up to 65,535 keys.

E. Acceptable Manufacturers:
1. Medeco High Security Locks (MC) - CLIQ Digital Cylinders and Keys.

## 2.4 DIGITAL ELECTRONIC CYLINDERS AND KEYS

A. Digital Cylinders: Provide original manufacturer cylinders to meet the following minimum requirements:

1. Provide cylinders to retrofit into new or existing hardware without modifications. Provide cylinders and keys with integral power without the need for wires or electricity.
2. Provide electronic access control functions for rim, mortise, or key-in-lever cylinder types, and auxiliary locks (deadbolts, padlocks, cam locks) as specified in the hardware sets listed under Part 3.
3. Communications between cylinder/key/software are AES encrypted.
4. Provide system compatibility with small format interchangeable core cylinder systems.
5. Cylinders to provide access control functions with non-volatile system programming allowing loss of battery life to retain key access rights, and/or audit records.
6. 2000 audit events stored in cylinder.
7. Electronic only cylinder powered by the key.

B. Digital Keys: Provide original manufacturer keys to meet the following minimum requirements:
1. Single, multi-function keys perform all user, administrative, and core removal operations.
2. Key and cylinder shall be designed for use on interior and exterior with a operating temperature of -40 Degrees F to 140 Degrees F.
3. One piece stainless steel with hardened tip.
4. Provide special industrial keys with hardened stainless steel housings.
5. Provide keys which are bundled with individual wall outlet chargers and USB cables.
6. Up to 1800 openings per charge.
7. Keys automatically power down when left in the cylinder.
8. Access 16,000 cylinders maximum.
9. Audit 10,000 events maximum.
10. All programming done at key.

C. Programming Stations: Provide stations for the programming and charging of keys. Provide the necessary cables and system dongles for full operation.
1. Provide one desktop programming station.
2. Provide one mobile programmer.
3. Provide one remote wall programmer.

D. Digital Electronic Cylinder System Software: Provide digital cylinder manufacturer's original management software supporting the following features:
1. Provide web hosted Basic version of the software.
2. Provide web hosted Web+ version of the software.
3. Provide web hosted Web Advanced version of the software.
4. Provide user hosted Solo version of the software.
5. Provide user hosted Web Advanced version of the software.
6. Product management by the system software with the following provisions:
    a. Deactivate lost or stolen keys.
    b. User schedules set uniquely for each key holder.
    c. Full audit reports.
    d. Physical access to the key is not required.
7. Software access protected by password and unique system authorization key.

E. Acceptable Manufacturers
1. Medeco High Security Locks (MC) –XT Series.

## 2.5 INTEGRATED WIEGAND OUTPUT LOCKING DEVICES – MULTI-CLASS READER

A. Integrated Wiegand Output Multi-Class Mortise Locks: Wiegand output ANSI A156.13, Grade 1, mortise lockset with integrated card reader, request-to-exit signaling, door position status switch, and latchbolt monitoring in one complete unit. Hard wired, solenoid driven locking/unlocking control of the lever handle trim, 3/4" deadlocking anti-friction latch, and 1" case-hardened steel deadbolt. Lock is U.L listed and labeled for use on up to 3 hour fire rated openings. Available with or without keyed high security cylinder override.
   1. Open architecture, hard wired platform supports centralized control of locking units with new or existing Wiegand compatible access control systems. Latchbolt monitoring and door position switch act in conjunction to report door-in-frame (DPS) and door latched (door closed and latched) conditions.
   2. Integrated reader supports the following credentials:
      a. 125kHz proximity credentials: HID, AWID, Indala, and EM4102.
      b. 13.56 MHz proximity credentials: HID iClass, HID iClass SE, SE for MIFARE Classic, DESFire EV1.
   3. 12VDC external power supply required for reader and lock, with optional 24VDC lock solenoid. Fail safe or fail secure options.
   4. Energy Efficient Design: Provide lock bodies which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.
   5. Installation requires only one cable run from the lock to the access control panel without requirements for additional proprietary lock panel interface boards or modules.
   6. Installation to include manufacturer's access control panel interface board or module where required for Wiegand output protocol.
      a. Acceptable Manufacturers:
         1) Sargent Manufacturing (SA) – M1 8200 Series.

## 2.6 ELECTROMAGNETIC LOCKING DEVICES

A. Surface Electromagnetic Locks (Heavy Duty): Electromagnetic locks to be surface mounted type conforming to ANSI A156.23, Grade 1 with minimum holding force strength of 1,200 pounds. Locks to be capable of either 12 or 24 voltage and be UL listed for use on fire rated door assemblies. Electronics are to be fully sealed against tampering and allow exterior weatherproof applications. As indicated in Hardware Sets, provide specified mounting brackets and housings. Power supply to be by the same manufacturer as the lock with combined products having a lifetime replacement warranty.
   1. Acceptable Manufacturers:
      a. Securitron (SU) – M62 Series.

## 2.7 ELECTROMECHANICAL CONVENTIONAL EXIT DEVICES

A. Electrified Conventional Push Rail Devices (Heavy Duty): Subject to same compliance standards and requirements as mechanical exit devices, electrified devices to be of type and design as specified below.
   1. Acceptable Manufacturers:
      a. Sargent Manufacturing (SA) - 80 Series.
      b. No Substitution – Facility Standard.

B. Electrified Options: As indicated in hardware sets, provide electrified exit device options including: electric latch retraction , electric dogging, outside door trim control, exit alarm, delayed egress, latchbolt monitoring, lock/unlock status monitoring, touchbar monitoring and request-to-exit signaling. Unless otherwise indicated, provide electrified exit devices standard as fail secure.

## 2.8 INTEGRATED WIEGAND OUTPUT EXIT DEVICES – MULTI-CLASS READER

A. Integrated Wiegand Output Multi-Class Exit Hardware: Wiegand output ANSI 156.3 Grade 1 rim, mortise, and vertical rod exit device hardware with integrated proximity card reader, latchbolt and touchbar monitoring, and request-to-exit signaling, in one complete unit. Hard wired, solenoid driven locking/unlocking control of the lever handle exit trim with 3/4" throw latch bolt. U.L listed and labeled for either panic or "fire exit hardware" for use on up to 3 hour fire rated openings. Available with or without keyed high security cylinder override.
   1. Open architecture, hard wired platform supports centralized control of locking units with new or existing Wiegand compatible access control systems. Inside push bar (request-to-exit) signaling and door position (open/closed status) monitoring (via separately connected DPS).
   2. Integrated reader supports the following credentials:
      a. 125kHz proximity credentials: HID, AWID, Indala, and EM4102.
      b. 13.56 MHz proximity credentials: HID iClass, HID iClass SE, SE for MIFARE Classic, DESFire EV1.
   3. 12VDC external power supply required for reader. 24VDC required for solenoid operated exit trim. Fail safe or fail secure options.
   4. Installation requires only one cable run from the exit hardware to the access control panel without requirements for additional proprietary lock panel interface boards or modules.
   5. Competitor Alternates Allowed Option>Installation to include manufacturer's access control panel interface board or module where required for Wiegand output protocol.
   6. Acceptable Manufacturers:
      a. Sargent Manufacturing (SA) – M1 80 Series.

## 2.9 WIRELESS ACCESS CONTROL EXIT DEVICES

## 2.10 ELECTRONIC ACCESSORIES

A. Exit Delay Locking Systems: Exit delay locking systems are fully integrated units consisting of a minimum 1200 pound holding force magnetic lock, movement initiating device, reset bypass switch, and exit delay timer module. Unit to include an adjustable initiation gap allowing door travel of up to 1 inch before going into alarm condition. Operates on either 12VDC or 24VDC.
   1. Acceptable Manufacturers:
      a. Securitron (SU) - iMXD Series.

## 2.11 CABLES AND WIRING

A. Comply with Division 28 Section " Electronic Safety and Security."

B. Data Line Supervision: System to include alarm initiation capability in response to opening, closing, shorting, or grounding of data transmission lines.

C. Install appropriate number of conductor pairs, in the wire gage (AWG) recommended by manufacturer, corresponding to the electronic locking functions specified, amperage drawn and distances covered between the power supplies, power transfer devices, electrified hardware and access control equipment.

2.12 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.13 ACCESS CONTROL HARDWARE FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Where specified, finishes on locksets, latchsets, exit devices and push/pull trim to incorporate an FDA recognized antimicrobial coating (MicroShield™) listed for use on equipment as a suppressant to the growth and spread of a broad range of bacteria, algae, fungus, mold and mildew.

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Examine roughing-in for electrical source power to verify actual locations of wiring connections before electrified and integrated access control door hardware installation.

C. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

## 3.2 PREPARATION

A. Doors and frames at scheduled access controlled openings to be properly prepared to receive specified electrified and access control hardware and connections without additional in-field modifications.

## 3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
   1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
   1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
   2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
   3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
   4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

E. Boxed Power Supplies: Verify locations with Architect.
   1. Configuration: Provide the least number of power supplies required to adequately serve doors with access control equipment.

F. Final connect the system control switches (integrated reader locking hardware, remote readers, keypads, etc.), and monitoring and signaling equipment to the related Controller devices at each opening to properly operate the electrified door and access control hardware according to system operational narratives.

G. Stand Alone System Application Software: Install, and test stand alone system application software for the complete and proper operation of systems involved.

H. Networked System Application Software: Reference Division 28 Section "Access Control Systems".

## 3.4 FIELD QUALITY CONTROL

A. Field Inspection: Perform a final inspection of the installed door hardware and access control system and state in report whether installed work complies with or deviates from requirements, including whether each component representing the opening assembly is properly installed, adjusted, operating and performing to system operational narratives.

B. Commissioning and Testing Schedule: Reference Division 28 Section "Access Control System."

## 3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

## 3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. and provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

## 3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

## 3.8 DOOR HARDWARE SCHEDULE

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

B. Refer to Section 080671, Door Hardware Schedule, for hardware sets.

**END OF SECTION 08 74 00**

# SECTION 08 83 00 - MIRRORS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section includes the following types of silvered flat glass mirrors:
   1. Non-Detention Glass mirrors.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Mirrors. Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.

B. LEED Submittals:

   1. Product Data for Credit IEQ 4.1: For adhesives, documentation including printed statement of VOC content.

### 1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from moisture, condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors.

### 1.5 FIELD CONDITIONS

A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

## PART 2 - PRODUCTS

2.1 FABRICATION

A. Fabricate mirrors in the shop to greatest extent possible.

B. Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.

## PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.

B. Verify compatibility with and suitability of substrates, including compatibility of existing finishes or primers with mirror mastic.

C. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 INSTALLATION

A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.
1. GANA Publications: “Glazing Manual" and "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."

B. Provide a minimum airspace of 1/8 inch between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.

C. Install mirrors with mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.

3.3 CLEANING AND PROTECTION

A. Protect mirrors from breakage and contaminating substances resulting from construction operations.

B. Do not permit edges of mirrors to be exposed to standing water.

C. Maintain environmental conditions that prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.

D. Clean exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Clean mirrors as recommended in writing by mirror manufacturer.

**END OF SECTION 08 83 00**

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# SECTION 088853 - SECURITY GLAZING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Section 013513.16, General Detention Work Requirements.

### 1.2 SUMMARY

A. This Section includes the following:

1. Security glazing.
2. Glazing accessories.

B. Related Sections: The following Sections contain requirements that relate to this Section.

1. Division 07 Section 079200 “Joint Sealants” for security sealants.
2. Division 08 Section 081113 “Hollow Metal Doors and Frames.”
3. Division 08 Section 083463 “Detention Doors & Frames.”

### 1.3 SCOPE AND RESPONSIBILITIES

A. Under the requirements of this specification, the DEC shall be responsible for furnishing and installing all glass and glazing accessories, as specified, in all locations, unless indicated otherwise.

B. Refer to the Modular Metal Detention Wall Panel System section for the related Scope of Work provided in that Section. Fully coordinate this Scope of Work with the Scope of Work shown in the Modular Metal Detention Wall Panel System sections

### 1.4 PERFORMANCE REQUIREMENTS

A. Provide security glazing that complies with the requirements listed below as indicated by the test ratings for specific glazing types.

1. H.P. White Laboratory, Inc.; HPW TP-0500.00.
2. American Society for Testing and Materials; ASTM F1915-12.
3. Underwriter’s Laboratories, Inc.; UL 752, UL 972.

1.5 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.

B. Product data for each security glazing type, including type of materials, thickness, installation requirements, method of test, and performance. Submit 2 copies of the most recent literature & cleaning instructions and any other documentation deemed necessary to demonstrate compliance to the specification.

C. Test reports showing compliance with specified requirements. **SUBMITTAL MUST INCLUDE CURRENT UL TEST REPORTS AND CURRENT PHYSICAL ATTACK AND CONTAINMENT REPORTS PER ASTM F1915-12, AND EVERY OTHER ASTM, UL, WMFL, AND HP WHITE REPORT LISTED PER EACH INDIVIDUAL GLASS TYPE SPECIFIED HEREIN.**

D. Certification by manufacturer that products supplied comply with performance requirements specified.

E. Maintenance data covering cleaning and protection requirements to include in the Operation and Maintenance Manual specified in Division 1.

F. **Upon request** of the Architect, submit 2 samples, 12" square, of each type of security glazing product.

G. Submit a composite detail of the glass and frame assembly. This detail shall show and define all products in the assembly including, but not limited to, the following: Frame, glass stop, glass, setting blocks, glazing tape, and sealant. All products used in the glazing composite must be compatible.

H. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentage by weight of postconsumer and preconsumer recycled content. a. Include statements indicating cost for each product having recycled content.

1.6 QUALITY ASSURANCE

A. Comply with ASTM F1915-12 containment test for forced entry performance. Round robin testing is not acceptable.

B. Certified Safety Glazing: Category II products complying with test requirements of 16 CFR 1201 and ANSI Z97.1, certified by Safety Glazing Certification Council, and permanently labeled.

C. Manufacturer Qualifications: Firm with minimum 5 years experience in manufacturing security glazing products that are similar to those indicated for this Project and that have a record of successful in-service performance.

D. Installer Qualifications: Engage an experienced Installer who has a minimum of 5 years experience in installing security glazing similar to that required for this Project.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect products according to manufacturer's recommendations. Specifically, avoid damage to glass edges, and prevent damage from temperature changes, sunlight, and moisture.

1. Furnish polycarbonate materials with a strippable water resistant masking paper on exposed surfaces.

1.8 PROJECT CONDITIONS

A. Environmental Conditions: Do not install glazing when either air or substrate temperature exceeds the range recommended by sealant manufacturer or when substrate is wet, damp, or covered with snow, ice, or frost.

B. Install bulk sealants only at air and substrate temperatures above 40 deg F (4 deg C).

1.9 WARRANTY – LAMINATED PRODUCTS

A. Warranty: Submit a written warranty, executed by manufacturer, agreeing to replace laminates that delaminate within 5 years from date of Substantial Completion. If delamination damage occurs and upon inspection is found beyond a reasonable doubt to be caused by security sealant contact with raw glazing edge, the DEC shall be responsible for replacing the glazing at their expense.

B. Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Global Security Glazing (Polycarbonate, Laminated Polycarbonate, Glass-Clad Polycarbonate & Fire Rated Glass
2. Sheffield Plastics (Polycarbonate & Laminated Polycarbonate) (Pending Testing)
3. LTI Smart Glass (Glass-Clad Polycarbonate & Fire Rated Glass) (Pending Testing)

B. Available Products: Unless pre-approved prior to bidding, provide the products specified.

C. The DEC and glazing manufacturer agree to comply with the requirements as defined in section 3.4 and to provide materials and warranty as required by the contract documents using the materials listed in section 2.5.

## 2.2 MATERIALS

A. Float Glass:

1. Clear Heat Strengthened Glass: ASTM C 1048, Condition A (uncoated surfaces), Class 1 (clear), Kind HS (heat strengthened).
2. Tinted Heat-Strengthened Glass: ASTM C 1048, Condition A (uncoated surfaces), Class 2 (tinted, heat-absorbing, and light-reducing), Kind HS (heat strengthened), tint color as specified with security glazing type.
3. Clear Tempered Glass: ASTM C 1048, Condition A (uncoated surfaces), Class 1 (clear), Kind FT (fully tempered).
4. Chemically Tempered Glass: ASTM C 1036, Class 1 (clear) chemically tempered; edges seamed prior to tempering
5. ASTM C 1048, Condition A (uncoated surfaces), Class 1 (clear), Kind HS (heat strengthened).

B. Polycarbonate Sheet: Rigid, flat polycarbonate sheet; thickness as indicated.

1. Relative Burning Characteristics: Average extent of burning less than 1 inch, when tested per ASTM D 635, using the thickness of material indicated for Project.

## 2.3 GLASS-CLAD POLYCARBONATE LAMINATES

A. Type SG1 – Room A120 only

1. 1-3/8” Clear UL level 5, equal to Global Security Glazing Secure-Tem + Poly SP513. Overall make-up is proprietary.

B. Type SG2 – Grade 2 Interior

1. 3/4” clear glass clad polycarbonate laminate, equal to Global Security Glazing Secur-Tem + Poly SP019, or approved equal. H.P. White TP-0500.02 Level IV forced entry, WMFL Level III, ASTM F1915-12 Grade 2 – 40 minute containment, ASTM F 1233 9mm ballistic rating.

    a. 1/8” Clear heat strengthened glass
    b. .050” Urethane
    c. 1/4” Polycarbonate
    d. .025” Urethane
    e. 1/8” Polycarbonate
    f. .050” Urethane
    g. 1/8” Clear heat strengthened glass

2. NOTE: PROVIDE SG2 INSULATED AIR GAP UNITS WITH ¼" GRAY SOLARBAN 70XL LOW-E HS GLASS AT EXTERIOR LOCATIONS.
Note: Containment ratings and physical attack ratings will be limited or omitted when installed in commercial doors and frames.

C. Type SG3 – Interior Grade 3

1. 11/16" (Nominal) clear glass clad polycarbonate equal to Global Security Glazing Secur-Tem + Poly 2116 or approved equal. H.P. White TP-0500.02 Level II forced entry, ASTM F1915-12 Grade 3 – 20 minute containment, H.P. White TP-0500.02 Level B ballistic rating (Spall; no penetration), ASTM F 1233-08 Class 2.7, ASTM C 1036-01, ASTM C 1048-04, ASTM C 1349-04, CPSC 16 CFR 1201 (Category I and II); of the following makeup:

a. 1/8" Heat strengthened glass
b. .050" Urethane
c. 3/8" Polycarbonate
d. .050" Urethane
e. 1/8" Clear heat strengthened glass
Note: Containment ratings and physical attack ratings will be limited or omitted when installed in commercial doors and frames.

D. Type SG3A – Grade 3 Exterior

1. 1-5/16" (Nominal) gray 1/4" gray Solarban 70XL Low-E HS glass clad polycarbonate laminate air-gap unit equal to Global Security Glazing Secur-Tem + 2116 or approved equal. H.P. White TP-0500.02 Level II forced entry, ASTM F1915-12 Grade 3 – 20 minute containment, H.P. White TP-0500.02 Level B ballistic rating (Spall; no penetration), ASTM F 1233-08 Class 2.7, ASTM C 1036-01, ASTM C 1048-04, ASTM C 1349-04, CPSC 16 CFR 1201 (Category I and II); of the following makeup:

a. 1/4" Gray Solarban 70XL Low-E HS glass
b. 3/8" Airspace
c. 1/8" Heat strengthened glass
d. .050" Urethane
e. 3/8" Polycarbonate
f. .050" Urethane
g. 1/8" Clear heat strengthened glass
Note: Containment ratings and physical attack ratings will be limited or omitted when installed in commercial doors and frames.

## 2.4 FABRICATION

A. Fabricate glazing with bite and edge clearance dimensions, including tolerances, as recommended by manufacturer and GANA "Glazing Manual." Exception: Where specific bite dimensions are indicated on drawings, as required for proper securement of glazing in frames, comply with those dimensions.

RFI 0582
BLDG A&B - Glazing Stop Depth
5/8" glazing stops at the frames acceptable

B. Cut or drill holes in laminated units as required or indicated.

C. Grind exposed edges smooth, using methods recommended by manufacturer.

D. Coordinate speak-port locations as indicated on architectural drawings, with glass manufacturer.

## 2.5 GLAZING ACCESSORIES

A. Installation Materials-General: Select products that have appropriate performance characteristics as recommended by glazing manufacturer and that are compatible with materials they will contact.

1. Provide a letter from the glass manufacturer that states all glazing materials submitted are compatible with the glass submitted.

B. Glazing Tape:

1. Pre-shimmed, 100 percent solids, polyisobutylene-butyl rubber with internal spacer rod.
2. At fire rated openings, provide Rectorseal Blaze Seal.

C. Glazing Sealant: 2.5

1. Provide at exterior side of exterior security glazing only: One part silicone rubber meeting Federal Specification TT-S-00230C, Class A, ASTM C-920 Type S, Grade NS, Class 25; Equal to Dow Corning 795.

D. Security Sealant:

1. Provide at all interior security glazing only: Dynaflex SC. One part non-sag tamper resistant elastomeric STPU meeting Federal Specifications TT-S-00230C, Type II, Class B and ASTM C-920-98, Type S, Grade NS, Class 12.5 as manufactured by Picora. When applying directly to a polycarbonate surface, application area must be primed with Picora P-120 primer prior to use as required per published manufacturer recommendations.

E. Setting Blocks:

1. TPR (Thermoplastic rubber) with 70-90 shore “A” durometer hardness, chemically compatible with glazing components.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine frames and rabbets in which glazing is to be installed for possible damaging conditions. In particular, check for conditions that would void the manufacturer's warranty.

1. Verify that minimum edge engagement of framing is 1 inch (25 mm).

B. Submit Installer's report describing unacceptable conditions.

C. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean surfaces to receive glazing just before installing glazing.

3.3 INSTALLATION – GENERAL

A. Comply with recommendations for installation contained in the GANA "Glazing Manual" and "Sealant Manual" except when specifically not recommended or prohibited by the glazing or glazing accessory manufacturer; comply with manufacturers' recommendations.

B. Protect glazing from edge and surface damage during handling and installation.

C. Do not install glazing that has edge or surface damage or defects that reduce glazing strength or diminish appearance.

D. Permanently adhere setting and edge blocks to frame.

E. Do not block weep holes.

F. Applied Stops: Fasten as indicated, after glazing has been set in frame. Do not exert excess force on glazing and glazing spacers.

G. Remove protective masking paper on polycarbonate materials only as required to set glazing.

3.4 TAPE GLAZING

A. Install tape continuously, placed so that when compressed the exposed face will be 1/8 inch (3 mm nominal) below face of framing.

B. Do not use joints in tape, except at corners; seal joints with compatible sealant

C. After installation of stops, install security sealant over exposed tape on **both** sides of all security glass/polycarbonate provided per this specification section and per 2.5.D.1 above

1. Security sealant shall be installed as a cap bead only and is never to come in contact with the raw cut edge of the glazing material. Setting blocks shall be installed in a heal bead of glazing sealant equal to Dow Corning 795 per 3.3.D above. If security sealant is found on raw glazing edge during inspection, the DEC shall be responsible for replacing the glass at their expense.

D. Apply fillet bead of Dow Corning 795 glazing sealant over exposed tape on exterior side of exterior glazing.

## 3.5 PROTECTION AND CLEANING

A. Apply warning tape or bands across opening without touching glazing, immediately after installing glazing in frames.

B. Do not apply tape or labels to glazing; remove temporary labels.

C. Protect glazing during subsequent construction operations; remove dirt, contaminants, staining agents and other deposits promptly using manufacturer's recommended procedures.

D. Replace glazing that is damaged.

E. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer that ensures that security glazing is without damage or deterioration at the time of Substantial Completion.

F. Remove protective masking paper from polycarbonate glazing just prior to cleaning.

G. Wash both sides of glazing not more than 10 days before inspections for Substantial Completion.

## 3.6 OWNER PERSONNEL INSTRUCTION

A. Have manufacturers' maintenance instructions on hand at time of instruction.

B. Instruct designated Owner personnel on maintaining security glazing.

END OF SECTION

# SECTION 08 91 19 - FIXED LOUVERS

## PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Horizontal Louver: Louver with horizontal blades (i.e., the axes of the blades are horizontal).

C. Vertical Louver: Louver with vertical blades (i.e., the axes of the blades are vertical).

D. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

E. Wind-Driven-Rain-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing according to AMCA 500-L.

1.3 INFORMATIONAL SUBMITTALS

A. Product Data: For each type of product.

1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. Windborne-debris-impact-resistance test reports.

1.4 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

## PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

2.2 MATERIALS

A. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.3 FABRICATION

A. Factory assemble louvers to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.
   1. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern where indicated.
   2. Horizontal Mullions: Provide horizontal mullions at joints where indicated.

C. Maintain equal louver blade spacing including separation between blades and frames at head and sill**,** to produce uniform appearance.

D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
   1. Frame Type: Channel unless otherwise indicated.

E. Include supports, anchorages, and accessories required for complete assembly.

F. Provide vertical mullions of type and at spacings indicated, but not more than is recommended by manufacturer, or 72 inches o.c., whichever is less.
   1. Exterior Corners: Prefabricated corner units with mitered and welded blades and with fully recessed mullions at corners.

G. Provide subsills made of same material as louvers for recessed louvers.

H. Join frame members to each other and to fixed louver blades with fillet welds concealed from view unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Protect unpainted galvanized and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

F. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 079200 "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

A. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
   1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

**END OF SECTION 08 91 19**

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# SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
1. Non-load-bearing steel framing systems for interior partitions.
2. Suspension systems for interior ceilings and soffits.
3. Grid suspension systems for gypsum board ceilings.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Studs and Runners: Provide documentation that framing members' certification is according to SIFA's "Code Compliance Certification Program for Cold-Formed Steel Structural and Non-Structural Framing Members."

B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

### 1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For firestop tracks, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

B. Horizontal Deflection: For wall assemblies, limited to 1/240 of the wall height based on horizontal loading of 5 lbf/sq. ft.

2.2 FRAMING SYSTEMS

A. Studs and Runners: ASTM C 645. Use either steel studs and runners or embossed steel studs and runners.
   1. Steel Studs and Runners:
      a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**:**
         1) CEMCO; California Expanded Metal Products Co.
         2) MRI Steel Framing, LLC.
         3) Steel Network, Inc. (The).
      b. Minimum Base-Metal Thickness: As indicated on Drawings.
      c. Depth: As indicated on Drawings.
      d. Backing/Blocking: Shall be provided for all wall and ceiling finishes and for the supporting and anchorage of products, fixtures and equipment for all trades, including, but not limited to, toilet partitions, toilet room accessories, casework, mirrors, trim, applied wall finishes, artwork, wall bumpers, downspout straps, plumbing and electrical fixtures, etc. Coordinate size, type and location of backing and supports with manufacturer or supplier of items requiring backing/blocking.

B. Slip-Type Head Joints: Where indicated, provide the following:
   1. Clip System: Clips designed for use in head-of-wall deflection conditions that provide a positive attachment of studs to runners while allowing 3-inch minimum vertical movement.
      a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
         1) CEMCO; California Expanded Metal Products Co.; Deflex Clips.
         2) ClarkDietrich Building Systems; FTC3.
         3) Fire Trak Corp; RediKlip.
         4) Steel Network, Inc. (The); VertiClip SLD Series.
   2. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
   3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
      a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
         1) CEMCO; California Expanded Metal Products Co.; SLP-TRK Slotted Deflection Track.
         2) ClarkDietrich Building Systems; SLP-TRK Slotted Deflection Track.

C. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. CEMCO; California Expanded Metal Products Co.; FAS Track.
b. Fire Trak Corp; Fire Trak System attached to studs with Fire Trak Posi Klip.
c. Steel Network, Inc.

D. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 0.0179 inch , and depth required to fit insulation thickness indicated.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. MRI Steel Framing, LLC.

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.

B. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.

C. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. Chicago Metallic Corporation; .
b. United State Gypsum Company; Drywall Suspension System.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.
1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.
   1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C 841 that apply to framing installation.
   2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 that apply to framing installation.
   3. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C 844 that apply to framing installation.
   4. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

D. Install bracing at terminations in assemblies.

E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
   1. Single-Layer Application: As required by horizontal deflection performance requirements unless otherwise indicated.
   2. Multilayer Application: As required by horizontal deflection performance requirements unless otherwise indicated.
   3. Tile Backing Panels: As required by horizontal deflection performance requirements unless otherwise indicated.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
   1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.

2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
   a. Install two studs at each jamb unless otherwise indicated.
   b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
   c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

E. Direct Furring:
   1. Screw to wood framing.
   2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

F. Z-Shaped Furring Members:
   1. Erect insulation, specified in Section 072100 "Thermal Insulation," vertically and hold in place with Z-shaped furring members spaced 24 inches o.c.
   2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
   3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

## 3.5 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
   1. Hangers: 48 inches o.c.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
      a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Do not attach hangers to steel roof deck.
5. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
6. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
7. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

**END OF SECTION 09 22 16**

# SECTION 09 29 00 - GYPSUM BOARD

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
1. Interior gypsum board.
2. Tile backing panels.
3. Texture finishes.

RFI 0132 — Gypsum Board Texture Finish — Mock-up Requirement

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.
3. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regionally manufactured materials. Include statement indicating cost for each regionally manufactured material.

    a. Include statement indicating location of manufacturer and distance to Project for each regionally manufactured material.
    b. Include statement indicating location of manufacturer and point of extraction, harvest, or recovery for each raw material used in regionally extracted and manufactured materials. Indicate distance to Project and fraction by weight of each regionally manufactured material that is regionally extracted.

4. Product Data for Credit IEQ 4.1: For adhesives used to laminate gypsum board panels to substrates, documentation including printed statement of VOC content.
5. Laboratory Test Reports for Credit IEQ 4: For adhesives used to laminate gypsum board panels to substrates, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

RFI 239 Drywall In Unconditioned Space Is not Required 1

1.4 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.

1 B. ~~Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.~~

C. Do not install panels that are wet, moisture damaged, and mold damaged.
1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

**PART 2 - PRODUCTS**

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

C. Ceiling and wall materials shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 GYPSUM BOARD, GENERAL

A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Regional Materials: Products shall be manufactured within 100 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.

C. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Gypsum Wallboard: ASTM C 1396/C 1396M.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. Georgia-Pacific Building Products.
      b. National Gypsum Company.
      c. USG.
   3. Thickness: 1/2 inch .
   4. Long Edges: Tapered.

B. Gypsum Board, Type X: ASTM C 1396/C 1396M.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. Georgia-Pacific Building Products.
      b. National Gypsum Company.
      c. USG.
   3. Thickness: 5/8 inch .
   4. Long Edges: Tapered.

C. Gypsum Ceiling Board: ASTM C 1396/C 1396M.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. Georgia-Pacific Building Products.
      b. National Gypsum Company.
      c. USG.
   3. Thickness: 5/8 inch .
   4. Long Edges: Tapered.

D. Impact-Resistant Gypsum Board: ASTM C 1396/C 1396M gypsum board, tested according to ASTM C 1629/C 1629M.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. Georgia-Pacific Building Products.
      b. National Gypsum Company.
      c. USG.
   3. Core: 5/8 inch , Type X.
   4. Surface Abrasion: ASTM C 1629/C 1629M, meets or exceeds Level 3 requirements.

5. Indentation: ASTM C 1629/C 1629M, meets or exceeds Level 3 requirements.
6. Soft-Body Impact: ASTM C 1629/C 1629M, meets or exceeds Level 3 requirements.
7. Hard-Body Impact: ASTM C 1629/C 1629M, meets or exceeds Level 3 requirements according to test in Annex A1.
8. Long Edges: Tapered.
9. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

## 2.4 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or ASTM C 1325, with manufacturer's standard edges.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. CertainTeed Corporation.
      b. National Gypsum Company.
      c. United States Gypsum Company.
   3. Thickness: 5/8 inch .
   4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

B. Water-Resistant Gypsum Backing Board: ASTM C 1396/C 1396M, with manufacturer's standard edges.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. CertainTeed Corporation.
      b. Georgia-Pacific Building Products.
      c. United States Gypsum Company.

## 2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.
   1. Material: Paper-faced galvanized-steel sheet.
   2. Shapes:
      a. Cornerbead.
      b. U-Bead: J-shaped; exposed short flange does not receive joint compound.
      c. Expansion (control) joint.

B. Exterior Trim: ASTM C 1047.
   1. Material: Hot-dip galvanized-steel sheet, plastic, or rolled zinc.
   2. Shapes:
      a. Cornerbead.
      b. LC-Bead: J-shaped; exposed long flange receives joint compound.
      c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
   1. Finish Coat: For third coat, use setting-type, sandable topping compound.
   2. Skim Coat: For final coat of Level 5 finish, use high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.

C. Joint Compound for Tile Backing Panels:
   1. Cementitious Backer Units: As recommended by backer unit manufacturer.
   2. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.

2.7 AUXILIARY MATERIALS

A. Sound-Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
   1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

B. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. Hilti, Inc.
      b. Pecora Corporation.
      c. United States Gypsum Company.
   3. Sealant shall have a VOC content of 250 g/L or less.
   4. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Thermal Insulation: As specified in Section 072100.

D. Self-Adhering Sheet Waterproofing: As specified in Section 071326.

2.8 TEXTURE FINISHES

A. Primer: As recommended by textured finish manufacturer.

B. Basis of Design; United States Gypsum Company Sheetrock Unaggregated Wall and Ceiling Spray Texture: Water-based, job-mixed, polystyrene aggregate finish with flame-spread and smoke-developed indexes of not more than 25 when tested according to ASTM E 84.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. United States Gypsum Company.
      b. Georgia-Pacific Building Products.
      c. National Gypsum Company.
   2. Texture: Orange Peel.
   3. Refer to manufacturer's surface preparation along with air and surface temperatures minimums required for texture installation.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
   1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
   2. Fit gypsum panels around ducts, pipes, and conduits.

3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

## 3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:
1. Wallboard Type: Vertical surfaces unless otherwise indicated.
2. Type X: Where required for fire-resistance-rated assembly.
3. Ceiling Type: Ceiling surfaces.

B. Single-Layer Application:
1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
   a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
   b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:
1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.

2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers with screws; fasten face layers with adhesive and supplementary fasteners.

D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.

## 3.4 APPLYING TILE BACKING PANELS

A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions and install at locations indicated to receive tile. Install with 1/4-inch gap where panels abut other construction or penetrations.

B. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.

C. Water-Resistant Backing Board: Install where indicated with 1/4-inch gap where panels abut other construction or penetrations.

D. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

## 3.5 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:
1. Cornerbead: Use at outside corners unless otherwise indicated.
2. U-Bead: Use at exposed panel edges.

D. Exterior Trim: Install in the following locations:
1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges.

3.6 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
   1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
   2. Level 2: Panels that are substrate for tile.
   1. Level 3: At panel surfaces that will not be exposed to view unless otherwise indicated.
   2. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
      a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
   3. Level 5: Where indicated on Drawings.
      a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

B. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

C. Cementitious Backer Units: Finish according to manufacturer's written instructions.

1.2 APPLYING TEXTURE FINISHES

A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.

B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture matching approved mockup and free of starved spots or other evidence of thin application or of application patterns.

C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture-finish manufacturer's written instructions.

1.3 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

**END OF SECTION 09 29 00**

# SECTION 09 30 13 - CERAMIC TILING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
1. Ceramic tile.
2. Tile backing panels.
3. Waterproof membrane for thinset applications.
4. Metal edge strips.

### 1.3 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."

C. Module Size: Actual tile size plus joint width indicated.

D. Face Size: Actual tile size, excluding spacer lugs.

### 1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

### 1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:
1. Product Data: For adhesives, indicating VOC content.


Waterproof membrane for thinset applications

2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
3. Laboratory Test Reports: For sealers, indicating compliance with requirements for low-emitting materials.

## 1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
   2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

## 1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

## 1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

## 1.9 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joints that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Provide manufacturer's standard form in which manufacturer agrees to repair or replace tile that fail in materials or workmanship within One year specified warranty period.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Source Limitations for Tile: Obtain tile of each type and color or finish from single source or producer.
   1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.
   1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.
   2. Obtain waterproof membrane, except for sheet products, from manufacturer of setting and grouting materials.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:
   1. Stone thresholds.
   2. Waterproof membrane.
   3. Cementitious backer units.
   4. Metal edge strips.

### 2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
   1. Provide tile complying with Standard grade requirements unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
   1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

2.3 TILE PRODUCTS

A. Ceramic Tile: Glazed porcelain tile.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
a. Daltile.
b. American Olean; a division of Dal-Tile Corporation.
c. American Marazzi Tile, Inc.
3. Certification: Tile certified by the Porcelain Tile Certification Agency.
4. Tile Color, Glaze, and Pattern: As selected by Architect from manufacturer's full range.
5. Grout Color: As selected by Architect from manufacturer's full range.
6. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
a. Wainscot Cap: Surface bullnose, module size same as adjoining flat tile.
b. Tapered Transition Tile: Shape designed to effect transition between thickness of tile floor and adjoining floor finishes of different thickness, tapered to provide reduction in thickness from 1/2 to 1/4 inch across nominal 4-inch dimension.

B. Accessories: Provide vitreous china accessories of type and size indicated, suitable for installing by same method as used for adjoining wall tile.
1. One paper holder at each water closet.
2. Color and Finish: Match adjoining glazed wall tile.

2.4 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.

B. Marble Thresholds: ASTM C 503/C 503M, with a minimum abrasion resistance of 10 according to ASTM C 1353 or ASTM C 241/C 241M and with honed finish.
1. Description: Uniform, fine- to medium-grained white stone with gray veining.
2. Description: Match Architect's sample.

2.5 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 or ASTM C 1325, Type A, in maximum lengths available to minimize end-to-end butt joints.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Georgia-Pacific Building Products; .
b. United States Gypsum Company; DUROCK Cement Board.

2. Thickness: 5/8 inch.

## 2.6 WATERPROOF MEMBRANE

A. General: Manufacturer's standard product, selected from the following that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Waterproofing and Tile-Setting Adhesive: One-part, fluid-applied product intended for use as both waterproofing and tile-setting adhesive in a two-step process.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Boiardi Products Corporation; a QEP company; .
   b. Bostik, Inc; Hydroment Ultra-Set Advanced.
2. Adhesives shall have a VOC content of 65 g/L or less.
3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

## 2.7 SETTING MATERIALS

A. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.

## 2.8 GROUT MATERIALS

A. Sand-Portland Cement Grout: ANSI A108.10, consisting of white or gray cement and white or colored aggregate as required to produce color indicated.

B. Grout for Pregrouted Tile Sheets: Same product used in factory to pregrout tile sheets.

## 2.9 MISCELLANEOUS MATERIALS

A. Vapor-Retarder Membrane: Polyethylene sheeting, ASTM D 4397, 4.0 mils thick.

B. Metal Edge Strips: Angle or L-shaped, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; white zinc alloy exposed-edge material.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. Blanke Corporation.
   b. Ceramic Tool Company, Inc.

c. Schluter Systems L.P.

C. Floor Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Custom Building Products; Grout and Tile Sealer.
   b. Jamo Inc; Grout and Tile Sealer.

2. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

## PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
2. Verify that concrete substrates for tile floors installed with bonded mortar bed comply with surface finish requirements in ANSI A108.01 for installations indicated.
   a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
   b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 CERAMIC TILE INSTALLATION

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
    a. Exterior tile floors.
    b. Tile floors in wet areas.
    c. Tile swimming pool decks.
    d. Tile floors in laundries.
    e. Tile floors consisting of tiles 8 by 8 inches or larger.
    f. Tile floors consisting of rib-backed tiles.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.

F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Porcelain Tile: 1/4 inch .

H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

I. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
   1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

J. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
   1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in modified dry-set mortar (thinset).
   2. Do not extend cleavage membrane under thresholds set in standard dry-set mortar. Fill joints between such thresholds and adjoining tile set on cleavage membrane with elastomeric sealant.

K. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.

L. Floor Sealer: Apply floor sealer to cementitious grout joints according to floor-sealer manufacturer's written instructions. As soon as floor sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

## 3.4 TILE BACKING PANEL INSTALLATION

A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use modified dry-set mortar for bonding material unless otherwise directed in manufacturer's written instructions.

## 3.5 WATERPROOFING INSTALLATION

A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.

B. Allow waterproofing to cure and verify by testing that it is watertight before installing tile or setting materials over it.

## 3.6 ADJUSTING AND CLEANING

A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.

B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
   1. Remove grout residue from tile as soon as possible.

2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

## 3.7 PROTECTION

A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

## 3.8 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor:
1. Ceramic Tile Installation Floor Tiles: TCNA F111 and ANSI A108.1A; cement mortar bed (thickset) with cleavage membrane.
   a. Ceramic Tile Type: 2" x 2"
   b. Grout: Sand-portland cement grout.

B. Interior Wall Installations, Wood or Metal Studs or Furring:
1. Ceramic Tile Installation Insert designation: TCNA W244C or TCNA W244F; thinset mortar on cementitious backer units or fiber-cement backer board
   a. Ceramic Tile Type: 4 1/4" x 4 1/4"
   b. Grout: Sand-portland cement grout.

**END OF SECTION 09 30 13**

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# SECTION 09 51 23 - ACOUSTICAL TILE CEILINGS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
   1. Acoustical tiles for interior ceilings.
   2. Fully concealed, direct-hung, suspension systems.

B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

### 1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

### 1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:
   1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
   2. Product Data: For adhesives, indicating VOC content.
   3. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
   4. Laboratory Test Reports: For ceiling products, indicating compliance with requirements for low-emitting materials.

C. Samples: Full-size units of each color and pattern of ceiling tile required.

### 1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each acoustical tile ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.

B. Evaluation Reports: For each acoustical tile ceiling suspension system and anchor and fastener type, from ICC-ES.

C. Field quality-control reports.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Acoustical Ceiling Units: Full-size tiles equal to 2 percent of quantity installed.
   2. Suspension-System Components: Quantity of each concealed grid and exposed component equal to 2 percent of quantity installed.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical tiles, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical tiles, permit them to reach room temperature and a stabilized moisture content.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical tile ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
   1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical tile ceiling installation.

1.9 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joints that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Provide manufacturer's standard form in which manufacturer agrees to repair or replace tile that fail in materials or workmanship within one year specified warranty period.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

A. Source Limitations:
   1. Suspended Acoustical Tile Ceilings: Obtain each type of acoustical ceiling tile and its suspension system from single source from single manufacturer.
   2. Directly Attached Acoustical Tile Ceilings: Obtain each type of acoustical ceiling tile from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Ceiling products shall comply with the requirements CALGreen's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Seismic Performance: Suspended ceilings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

C. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Flame-Spread Index: Class according to ASTM E 1264.
2. Smoke-Developed Index: 450 or less.

2.3 ACOUSTICAL TILES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Armstrong World Industries, Inc.
2. CertainTeed Corporation.
3. United States Gypsum Company.

C. Acoustical Tile Standard: Provide manufacturer's standard tiles of configuration indicated that comply with ASTM E 1264 classifications as designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.

D. Recycled Content: Postconsumer recycled content ~~plus one-half of preconsumer recycled content not less than Insert value percent~~.

Pre-consumer requirement: 59.10%
Post-consumer requirement: 12.20%
RFI 0329
BLDG A&B Acoustical Tile Ceiling Recycled Content
See RFI for specifics

E. Thickness: 15/16 inch .

2.4 METAL SUSPENSION SYSTEM

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product:: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Armstrong World Industries, Inc.
2. United States Gypsum Company.

C. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

D. Direct-Hung, Double-WebSuspension System: Main and cross runners roll formed from and capped with cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 coating designation.
1. Structural Classification: Heavy-duty system.

2.5 ACCESSORIES

A. Wire Hangers, Braces, and Ties: Provide wires as follows:
1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.106-inch- diameter wire.

RFI 0478 *Acoustical Ceiling Tile Alternate Security Clips*

*"Alligator Clip" Security Clips Alternative, Locations Per RFI*

B. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

C. Security Clips: Provide mechanically fastened hold down clip designed to secure acoustical tiles in-place and limit access to plenum, by acoustical tile ceiling manufacturer or approved equal.

2.6 METAL EDGE MOLDINGS AND TRIM

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Armstrong World Industries, Inc.
2. Chicago Metallic Corporation.
3. United States Gypsum Company.

C. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations complying with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for of suspension-system runners.
1. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
2. Finish: Painted in color as selected from manufacturer's full range.

2.7 MISCELLANEOUS MATERIALS

A. Acoustical Tile Adhesive: Type recommended in writing by acoustical tile manufacturer, bearing UL label for Class 0-25 flame spread.
1. Adhesives shall have a VOC content of Insert value g/L or less.
2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing and substrates to which acoustical tile ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine acoustical tiles before installation. Reject acoustical tiles that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Testing Substrates: Before adhesively bonding tiles to wet-placed substrates such as cast-in-place concrete or plaster, test and verify that moisture level is below tile manufacturer's recommended limits.

B. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.

C. Layout openings for penetrations centered on the penetrating items.

### 3.3 INSTALLATION OF SUSPENDED ACOUSTICAL TILE CEILINGS

A. Install suspended acoustical tile ceilings according to ASTM C 636/C 636M, seismic design requirements, and manufacturer's written instructions.

B. Suspend ceiling hangers from building's structural members and as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
   2. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
   4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
   5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.

6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
8. Do not attach hangers to steel deck tabs.
9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical tiles.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends. Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Arrange directionally patterned acoustical tiles as follows:
1. As indicated on reflected ceiling plans.
2. Install tiles with pattern running in one direction parallel to long axis of space.
3. Install tiles in a basket-weave pattern.

G. Install acoustical tiles in coordination with suspension system and exposed moldings and trim. Place splines or suspension-system flanges into kerfed edges of tiles so tile-to-tile joints are interlocked.
1. Fit adjoining tiles to form flush, tight joints. Scribe and cut tiles for accurate fit at borders and around penetrations through ceiling.
2. Hold tile field in compression by inserting leaf-type, spring-steel spacers between tiles and moldings, spaced 12 inches o.c.
3. Protect lighting fixtures and air ducts according to requirements indicated for fire-resistance-rated assembly.

H. Install edge moldings and trim of type indicated at perimeter of acoustical tile ceiling area and where necessary to conceal edges of acoustical units.

I. Arrange directionally patterned acoustical tiles with pattern running in one direction parallel to short axis of space.

3.4 ERECTION TOLERANCES

A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.

B. Directly Attached Ceilings: Install bottom surface of tiles to a tolerance of 1/8 inch in 12 feet and not exceeding 1/4 inch cumulatively.

C. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet, non-cumulative.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
   1. Periodic inspection during the installation of suspended ceiling grids according to ASCE/SEI 7.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

C. Perform the following tests and inspections of completed installations of acoustical tile ceiling hangers and anchors and fasteners in successive stages and when installation of ceiling suspension systems on each floor has reached 20 percent completion, but no tiles have been installed. Do not proceed with installations of acoustical tile ceiling hangers for the next area until test results for previously completed installations of acoustical tile ceiling hangers show compliance with requirements.
   1. Within each test area, testing agency will select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf of tension.
   2. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.

D. Acoustical tile ceiling hangers, anchors, and fasteners will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.6 ADJUSTING

A. Clean exposed surfaces of acoustical tile ceilings, including trim and edge moldings. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.

B. Remove and replace tiles and other ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

**END OF SECTION 09 51 23**

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# SECTION 09 61 05 - WATER VAPOR CONTROL FOR FLOORING

## PART 1 – GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings, documents and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes the furnishing, testing, and application of systems for the reduction of moisture vapor transmission and alkalinity control for interior concrete slabs requiring the installation of moisture-sensitive floor coverings; such as VCT, Resilient Tile, Resilient Sheet Flooring and Carpet.

B. Related Sections include the following:
   1. Section 033000 “Cast-In-Place Concrete” for curing requirements.
   2. Section 096536 “Static-Control Resilient Flooring” for installation requirements.
   3. Section 096519 “Resilient Tile Flooring” for installation requirements.
   4. Section 096813 “Tile Carpeting” for installation requirements.

### 1.3 REFERENCES

A. ASTM E 96 Standard Test Methods for Water Vapor Transmission of Materials.

B. ASTM D 4541 Standard Test Method for Pull-Off Adhesion Strength of Coatings Using Portable Tester.

C. ASTM D 1308 Standard Test Method for Effect of Household Chemicals on Clear/ Pigmented Organic Finishes

D. ASTM D 1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride Testing of Concrete Sub Floors.

E. ASTM F 710 Concrete Alkalinity (pH) Testing.

F. ASTM F 2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

### 1.4 ACTION SUBMITTALS

A. Product data for each type of product and process specified.

## 1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For water vapor emission control system, signed by product manufacturer.

B. Installer's Certificates: Signed by manufacturer certifying that installer complies with requirements.

C. Manufacturer's Qualifications: Submit list of product use and performance history, for the same formulation and system design, listing reference sources. Similar projects shall have documented minimum initial water vapor transmission rates of 20 lbs per 1000 ft² per 24 hours to 3 lbs per 1000 ft² per 24, and have resulted in maintained water vapor reduction rate of less than 3 lbs per 1000 ft² per 24 hours when tested according to ASTM 1869.98

D. Material Test Reports: For each water vapor emission control system product.

E. Field Quality Control Reports: Test results for water vapor emissions specified in this Section.

F. Warranty: Special warranty specified in this Section.

G. Report by manufacturer's technician documenting that proper application procedures have been followed.

## 1.6 QUALITY ASSURANCE

A. Installer's Qualifications: Manufacturer-certified or approved installer with no less than five years experience installing the system.

B. Manufacturer's Qualifications
   1. Manufacturer shall have ten years experience in manufacturing water vapor reduction systems. The water vapor reduction system must be specifically formulated and marketed for water vapor reduction and alkalinity control without change of system design for a minimum period of five years.

C. Manufacturer's technician(s) to be on site to supervise installation.

## 1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to the job site in their original unopened containers, clearly labeled with the manufacturer's name and brand designation.
B. Store products in an approved ventilated dry area; protect from dampness, freezing, and direct sun light. Product should not be stored in areas with temperatures in excess of 90 °F or below 50 °F.

C. Handle product in a manner that will prevent breakage of containers and damage products.

## 1.8 PROJECT/SITE CONDITIONS

A. Environmental Conditions: Comply with manufacturer's requirements.

B. Protection: Protect water vapor emission control system to prevent damage from active rain or topical water for a minimum period of 24 hours from time of application.

1.9 WARRANTY

A. Manufacturer's Warranty: Warrant water vapor control system against manufacturing defects and improper installation:
   1. Warranty shall not exclude cracks.
   2. Cover costs of treatment materials, flooring, adhesives, coatings, patching materials and labor to replace system and flooring and to move, store, and reinstall furniture and equipment at no additional cost to Owner.
   3. Warranty period: 15 years from Substantial Completion.

**PART 2 – PRODUCTS**

2.1 MATERIALS, GENERAL

A. Source Limitations: Obtain primary water vapor control materials and accessories from a single source from a single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Systems capable of reducing moisture emission levels from 15 pounds to less than 3.0 pounds per 1000 sq. ft. per 24 hours when tested to ASTM F 1869.

B. System resistant to long term 14 pH (alkalinity) exposure per ASTM D1308.

C. Concrete adhesion strength up to 500 psi per ASTM D 4541.

D. System compatible with adhesives, floor coverings and floor coating materials.

2.3 MATERIALS

A. VOC Content of Water Vapor Control System: Provide water vapor control systems, for use inside the weatherproofing system, that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   1. Primers, sealers, and undercoatings: 70 g/L.

2.4 WATER VAPOR CONTROL SYSTEM

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   1. Koester American Corporation “VAP I 2000.”
   2. Advanced Moisture Control “Vapor-Green FC”
   3. Ardex “MC Ultra” Moisture Control System.
   4. Approved equal.

B. System Description:
   1. Epoxy-based coating.
   2. Perm Rating: 0.10 perm rating maximum per ASTM E96.
   3. Single coat system.

C. Accessories
   1. Primer: Manufacturer’s standard.
   2. Cementitious Underlayment: 100% Portland cement-based self-leveling compound as recommended by water vapor control system manufacturer.

**PART 3 – EXECUTION**

3.1 EXAMINATION

A. Acceptance of Conditions: Examine substrates, with Applicator present, where water vapor emission control system is to be applied.
   1. Proceed with application only after unsatisfactory conditions have been corrected. Beginning of installation indicates acceptance of existing substrate conditions.
   2. Notify Architect in writing of defects that would affect system performance

B. Field Testing of Existing Substrates: Conduct testing prior to installation of vapor control system:
   1. Conduct calcium chloride tests per ASTM D1869.
   2. Perform relative humidity test using in situ probes, ASTM F 2170.
   3. Test a minimum of 1 location for each room at each type of flooring material and as follows:
      a. Test a minimum of 3 locations in 1000 sq ft.
      b. Test one additional location for each ensuing 1000 sq ft, or portion thereof

3.2 PREPARATION

A. Protect other work from damage from cleaning, preparation, and application of water vapor emission control system. Provide temporary enclosure to confine spraying operation, and to ensure adequate ambient temperatures and ventilation conditions for application.

B. Slab Preparation: Comply with manufacturer's written instructions:
   1. Prepare concrete according to water vapor control system manufacturer's written instructions by grinding or shot blasting apparatus to manufacturer’s recommended Concrete Surface Profile.

2. Remove all defective materials and foreign matter such as dust, adhesives, leveling compounds, paint, dirt, floor hardeners, bond breakers, oil, grease, curing agents, form release agents, efflorescence, laitance.
3. Remove any reinforcing fibers visible after shot blasting.
4. Repair cracks in accordance with Manufacturer's recommendations.
5. Concrete Joints: Clean reveals according to water vapor controlsystem Manufacturer's written instructions.
6. Repair damaged or unsatisfactory concrete according to Manufacturer's written instructions.

## 3.3 APPLICATION

A. General: Apply system components in accordance with manufacturer's requirements to produce a uniform, monolithic barrier.
   1. Apply system at all concrete slabs to receive resilient flooring or tile carpeting.
   2. Spread Rate: Comply with barrier manufacturer's requirements.
   3. Slabs: Roller and squeegee applications methods to saturate slab surfaces.
   4. Cracks and Joints: Treat cracks, control joints, holes and slab imperfections with barrier in compliance with manufacturer's recommendations.
   5. Penetrations: Seal all penetrations to form a moisture and water tight surface.

B. Underlayment Application:
   1. Allow barrier to cure per manufacturer's requirements.
   2. Install self-leveling underlayment compound to barrier surface as recommended by barrier manufacturer.

## 3.4 FIELD QUALITY CONTROL

A. Post Installation Testing: Owner's Testing Agency to perform testing to confirm compliance with specified requirements as follows:
   1. ASTM F 1869 Calcium Chloride tests at a minimum of 10 locations.
   2. ASTM D 4541 pull-off adhesion at 2 locations to verify concrete adhesion strength. Minimum result: 600 psi or concrete cohesive failure.

B. If post-installation test results exceed specified requirements, take remedial steps at no additional cost to the Owner to bring vapor emissions into compliance with specified requirements.

## 3.5 PROTECTION

A. Protect barrier during cure periods from any kind of traffic, topical water, and contaminants.

**END OF SECTION 09 61 05**

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# SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
   1. Resilient base.
   2. Resilient molding accessories.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:

   1. Product Data for Credit IEQ 4.1: For adhesives, documentation including printed statement of VOC content.
   2. Product Data for Credit IEQ 4.3: For adhesives, documentation including printed statement of VOC content.
   3. Product Data for Credit IEQ 4.3: For resilient stair accessories, documentation from an independent testing agency indicating compliance with the FloorScore standard.

C. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

D. Samples: Full-size samples of each color and pattern of resilient base and resilient molding accessories.

### 1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

### 1.5 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.6 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:
   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

1.7 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joints that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Provide manufacturer's standard form in which manufacturer agrees to repair or replace tile that fail in materials or workmanship within one year specified warranty period.

**PART 2 - PRODUCTS**

2.1 PERFORMANCE REQUIREMENTS

A. FloorScore Compliance: Resilient base shall comply with requirements of FloorScore certification.

B. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 THERMOSET-RUBBER BASE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Burke Mercer Flooring Products, Division of Burke Industries Inc.
   2. Flexco.
   3. Roppe Corporation, USA.

B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).
   1. Style and Location:

a. Style A, Straight: Provide in areas with carpet.
b. Style B, Cove: Provide in areas with resilient flooring.
c. Style C, Butt to: Provide in areas indicated.

C. Thickness: 0.125 inch.

D. Height: 4 inches .

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Job formed or preformed.

G. Inside Corners: Job formed or preformed.

H. Colors: As selected by Architect from full range of industry colors.

2.3 VINYL BASE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Armstrong World Industries, Inc.
2. Burke Mercer Flooring Products, Division of Burke Industries Inc.
3. Roppe Corporation, USA.

B. Minimum Thickness: 0.125 inch.

C. Height: 4 inches .

D. Lengths: Coils in manufacturer's standard length.

E. Outside Corners: Job formed or preformed.

F. Inside Corners: Job formed or preformed.

G. Colors and Patterns: As selected by Architect from full range of industry colors.

2.4 RUBBER MOLDING ACCESSORY

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Roppe Corporation, USA.
2. VPI, LLC, Floor Products Division.

B. Description: Rubber cap for cove resilient flooring carpet bar for tackless installations nosing for carpet nosing for resilient flooring reducer strip for resilient flooring.

C. Profile and Dimensions: As indicated on drawings finish schedule.

D. Locations: Provide rubber molding accessories in areas indicated.

E. Colors and Patterns: As selected by Architect from full range of industry colors.

2.5 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
   1. Adhesives shall have a VOC content of 50 g/L or less except that adhesive for rubber stair treads shall have a VOC content of 60 g/L or less.

C. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of flooring, and in maximum available lengths to minimize running joints.

D. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stair-tread manufacturer.

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
   1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

B. Proceed with installation only after unsatisfactory conditions have been corrected.
   1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

C. Do not install resilient products until they are the same temperature as the space where they are to be installed.
   1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

H. Job-Formed Corners:
1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
   a. Form without producing discoloration (whitening) at bends.
2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
   a. Miter or cope corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:
1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum horizontal surfaces thoroughly.
3. Damp-mop horizontal surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from resilient stair treads before applying liquid floor polish.

1. Apply one coat(s).

E. Cover resilient products subject to wear and foot traffic until Substantial Completion.

**END OF SECTION 09 65 13**

# SECTION 09 65 19 - RESILIENT TILE FLOORING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
   1. Vinyl floor tile.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:
   1. Product Data for Credit IEQ 4.1: For adhesives, sealants, documentation including printed statement of VOC content.
   2. Product Data for Credit IEQ 4.3: For adhesives and chemical-bonding compounds, documentation including printed statement of VOC content.
   3. Product Data for Credit IEQ 4.3: For resilient tile flooring, documentation from an independent testing agency indicating compliance with the FloorScore standard.

C. Samples: Full-size units of each color and pattern of floor tile required.
   1. For heat-welding bead, manufacturer's standard-size Samples, but not less than 9 inches long, of each color required.

D. Product Schedule: For floor tile.

### 1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

### 1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.
   1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.7 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:
   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.

B. Close spaces to traffic during floor tile installation.

C. Close spaces to traffic for 48 hours after floor tile installation.

D. Install floor tile after other finishing operations, including painting, have been completed.

1.8 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joints that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Provide manufacturer's standard form in which manufacturer agrees to repair or replace tile that fail in materials or workmanship within standard specified warranty period.

**PART 2 - PRODUCTS**

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

B. FloorScore Compliance: Resilient tile flooring shall comply with requirements of FloorScore certification.

2.2 VINYL FLOOR TILE

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   1. Armstrong World Industries, Inc;
   2. Burke Mercer Flooring Products, Division of Burke Industries Inc;
   3. Roppe Corporation, USA;

B. Tile Standard: ASTM F 1700.
   1. Class: As indicated by product designations.
   2. Type: A, smooth surface.

C. Thickness: 0.080 inch.

D. Size: 12 by 12 inches.

E. Colors and Patterns Match Architect's sample.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
   1. Adhesives shall comply with the following limits for VOC content:
      a. Vinyl Composition Tile Adhesives: 50 g/L or less.

C. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
   1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
   3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.

4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:
   a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
   b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until they are the same temperature as the space where they are to be installed.
   1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
   1. Lay tiles square with room axis.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
   1. Lay tiles with grain running in one direction.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

## 3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.

B. Perform the following operations immediately after completing floor tile installation:
   1. Remove adhesive and other blemishes from exposed surfaces.
   2. Sweep and vacuum surfaces thoroughly.
   3. Damp-mop surfaces to remove marks and soil.

C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.
   1. Apply one coat(s).

E. Cover floor tile until Substantial Completion.

**END OF SECTION 09 65 19**

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# SECTION 09 65 36 - STATIC-CONTROL RESILIENT FLOORING

## PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Static-dissipative, rubber floor tile with base

B. Related Requirements:
   1. Section 033000 “Cast In Place Concrete” for self-leveling product.
   2. Section 096105 “Water Vapor Control for Flooring” for vapor control components.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review methods and procedures related to static-control resilient flooring including, but not limited to, the following:
      a. Examination and preparation of substrates to receive static-control resilient flooring.
      b. Installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each type of static-control resilient flooring. Include floor-covering layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
   1. Show details of special patterns.
   2. Show locations of inscribed maintenance tiles.
   3. Submit grounding diagram showing location of grounding strips and connections.

C. Samples for Initial Selection: For each type of static-control resilient flooring.

D. Samples for Verification: For each type of static-control resilient flooring, of size indicated below:
   1. Floor Tile: Full-size units.

E. Product Schedule: For static-control resilient flooring. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for static-control resilient flooring.

C. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of static-control resilient flooring to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for static-control resilient flooring.
   1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store static-control resilient flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer but not less than 50 deg F or more than 90 deg F.
   1. Floor Tile: Store on flat surfaces.

1.10 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 85 deg F, in spaces to receive static-control resilient flooring during the following time periods:
   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during static-control resilient flooring installation.

D. Close spaces to traffic for 48 hours after static-control resilient flooring installation.

E. Install static-control resilient flooring after other finishing operations, including painting, have been completed.

## PART 2 – PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

A. Static-Dissipative Properties: Provide static-control resilient flooring with static-control properties indicated as determined by testing identical products per test method indicated by an independent testing and inspecting agency.
   1. Electrical Resistance: Test per ASTM F 150 with 100-V applied voltage.
      a. Average greater than 1 megohm and less than or equal to 1000 megohms when test specimens are tested surface to ground.
   2. Static Decay: 5000 to zero V in less than 0.25 seconds when tested per FED-STD 101C/4046.1.

B. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

### 2.2 STATIC-DISSIPATIVE RESILIENT FLOOR COVERINGS

A. Static-Dissipative Rubber Floor Tile: ASTM F 1344; except in manufacturer's standard hardness when tested per ASTM D 2240 using Shore, Type A durometer.
   1. Smooth-Surface Floor Tile: Class I-B (homogenous rubber, through-mottled pattern).
      a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
         1) Armstrong
         2) Approved equal.
      b. Thickness: 1/8 inch.
      c. Size: 12 by 12 inches.
      d. Static Coefficient of Friction: 0.88 minimum, CBC 2013, 11B-302.

### 2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified portland cement or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated. Refer to section 03 30 00 for self-leveling product.

B. Static-Control Adhesive: Provided or approved by manufacturer; type that maintains electrical continuity of floor-covering system to ground connection.
   1. Adhesives shall comply with the following limits for VOC content:
      a. Rubber Floor Adhesives: Not more than 60 g/L.

C. Grounding Strips: Provided or approved by manufacturer; type and size that maintains electrical continuity of floor-covering system to ground connection.

1 D. Maintenance Floor Tiles: Special floor tiles inscribed "Conductive floor. Do not wax."

E. Floor Polish: Provide protective, static-control liquid floor polish products as recommended by floor-covering manufacturer.

RFI 0083 — Static Control Flooring 1 — Post Signage in conspicuous location in lieu of inscribed tile

**PART 3 – EXECUTION**

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion or static-control characteristics of floor coverings.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of static-control resilient flooring and electrical continuity of floor-covering systems.

B. Concrete Substrates: Prepare according to ASTM F 710.
1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with floor- covering adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
   a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
   b. Perform relative-humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative-humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install static-control resilient flooring until it is same temperature as space where it is to be installed.
   1. Move static-control resilient flooring and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum substrates to be covered by static-control resilient flooring immediately before installation.

RFI 0083 — Static Control Flooring — Chemically bonded seams not required — 1

## 3.3 INSTALLATION, GENERAL

A. Install static-control resilient flooring according to manufacturer's written instructions.

B. Embed grounding strips in static-control adhesive. Extend grounding strips beyond perimeter of static-control resilient floor-covering surfaces to ground connections.

C. Scribe, cut, and fit static-control resilient flooring to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

D. Extend static-control resilient flooring into toe spaces, door reveals, closets, and similar openings. Extend static-control resilient flooring to center of door openings.

E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on static-control resilient flooring as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

F. Install static-control resilient flooring on covers for telephone and electrical ducts, and similar items in installation areas. Maintain overall continuity of color and pattern with pieces of static-control resilient flooring installed on covers. Tightly adhere static-control resilient flooring edges to substrates that abut covers and to cover perimeters.

G. Adhere static-control resilient flooring to substrates using a full spread of static-control adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

1 H. Seamless Installation:
   1. Chemically Bonded Seams: Bond seams with chemical-bonding compound to permanently fuse sections into a seamless floor covering. Prepare seams and apply compound to produce tightly fitted seams without gaps, overlays, or excess bonding compound on floor-covering surfaces.

## 3.4 FLOOR-TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so floor tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half floor tile at perimeter.
   1. Lay floor tiles square with room axis unless otherwise indicated.

C. Match floor tiles for color and pattern by selecting floor tiles from cartons in same sequence as manufactured and packaged if so numbered. Discard broken, cracked, chipped, or deformed floor tiles.
   1. Lay static-dissipative floor tiles with grain running in one direction.

3.5 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified testing agency to test electrical resistance of static-control resilient flooring for compliance with requirements.
   1. Arrange for testing after static-control adhesives have fully cured and static-control resilient flooring has stabilized to ambient conditions and after ground connections are completed.
   2. Arrange for testing of static-control resilient flooring before and after performing floor polish procedures.

B. Static-control resilient flooring will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of static- control resilient flooring.

B. Perform the following operations immediately after completing static-control resilient flooring:
   1. Remove static-control adhesive and other blemishes from exposed surfaces.
   2. Sweep and vacuum surfaces thoroughly.
   3. Damp-mop surfaces to remove marks and soil.

C. Protect static-control resilient flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
   1. Do not wax static-control resilient flooring.
   2. If recommended in writing by manufacturer, apply protective static-control floor polish formulated to maintain or enhance floor covering's electrical properties; ensure static-control resilient flooring surfaces are free from soil, static-control adhesive, and surface blemishes.
      a. Verify that both floor polish and its application method are approved by manufacturer and that floor polish will not leave an insulating film that reduces static-control resilient flooring's effectiveness for static control.

D. Cover static-control resilient flooring until Substantial Completion.

**END OF SECTION 09 65 36**

# SECTION 09 67 23 - RESINOUS FLOORING

## PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes resinous flooring systems.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.

B. LEED Submittals:

1. Product Data for Credit IEQ 4.2: For liquid-applied flooring components, documentation including printed statement of VOC content.

C. Samples for Verification: For each resinous flooring system required, 6 inches square, applied to a rigid backing by Installer for this Project.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each resinous flooring component, from manufacturer.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For resinous flooring to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.

B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.

C. Close spaces to traffic during resinous flooring application and for 24 hours after application unless manufacturer recommends a longer period.

1.10 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joints that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Provide manufacturer's standard form in which manufacturer agrees to repair or replace tile that fail in materials or workmanship within one year specified warranty period.

**PART 2 - PRODUCTS**

2.1 PERFORMANCE REQUIREMENTS

A. VOC Content of Liquid-Applied Flooring Components: Not more than 100 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Flammability: Self-extinguishing according to ASTM D 635.

2.2 MANUFACTURERS

A. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Obtain secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from manufacturer recommended in writing by manufacturer of primary materials.

2.3 RESINOUS FLOORING

A. Resinous Flooring System: Abrasion-, impact-, and chemical-resistant, aggregate-filled, and resin-based monolithic floor surfacing designed to produce a seamless floor and integral cove base.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. BASF Construction Chemicals, Inc.; “Ucrete HPF” (1/4” Fake Blend – BX500).
      b. Dur-A-Flex, Inc.

c. Garland Company, Inc. (The).
d. Sika Corporation U.S.

B. System Characteristics:
1. Color and Pattern: As selected by Architect from manufacturer's full range.
2. Wearing Surface: Textured for slip resistance.
3. Overall System Thickness: 1/4 inch.

C. Primer: Type recommended by resinous flooring manufacturer for substrate and resinous flooring system indicated.

D. Reinforcing Membrane: Flexible resin formulation that is recommended by resinous flooring manufacturer for substrate and resinous flooring system indicated and that inhibits substrate cracks from reflecting through resinous flooring.
1. Formulation Description: 100 percent solids.
a. Provide fiberglass scrim embedded in reinforcing membrane.

E. Body Coats:
1. Number of Coats: Two.
2. Thickness of Coats: 1/16 inch .
3. Aggregates: Colored quartz (ceramic-coated silica).

F. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:
1. Compressive Strength: minimum according to ASTM C 579.
2. Tensile Strength: minimum according to ASTM C 307.
3. Flexural Modulus of Elasticity: minimum according to ASTM C 580.
4. Water Absorption: maximum according to ASTM C 413.
5. Shrinkage: maximum according to ASTM C 531.
6. Indentation: maximum according to MIL-D-3134J.
7. Impact Resistance: No chipping, cracking, or delamination and not more than 1/16-inch permanent indentation according to MIL-D-3134J.
8. Resistance to Elevated Temperature: No slip or flow of more than 1/16 inch according to MIL-D-3134J.
9. Abrasion Resistance: maximum weight loss according to ASTM D 4060.
10. Hardness: Insert value, Shore D according to ASTM D 2240.
11. Critical Radiant Flux: 0.45 W/sq. cm or greater according to NFPA 253.

## PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry substrate for resinous flooring application.

B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.

1. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
   a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with application of resinous flooring only after substrates have maximum moisture-vapor-emission rate of 4.5 lb of water/1000 sq. ft. of slab area in 24 hours.
   b. Plastic Sheet Test: ASTM D 4263. Proceed with application only after testing indicates absence of moisture in substrates.
   c. Relative Humidity Test: Use in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
2. Alkalinity and Adhesion Testing: Verify that concrete substrates have pH within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.

C. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

3.2 APPLICATION

A. Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
   1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
   2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
   3. Expansion and Isolation Joint Treatment: At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.

B. Primer: Apply primer over prepared substrate at manufacturer's recommended spreading rate.

C. Reinforcing Membrane: Apply reinforcing membrane to substrate cracks.

D. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details, including those for taping, mixing, priming, troweling, sanding, and top coating of cove base. Round internal and external corners.

E. Self-Leveling Body Coats: Apply self-leveling slurry body coats in thickness indicated for flooring system.
   1. Aggregates: Broadcast aggregates at rate recommended by manufacturer and, after resin is cured, remove excess aggregates to provide surface texture indicated.

3.3 PROTECTION

A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

**END OF SECTION 09 67 23**

# SECTION 09 68 13 - TILE CARPETING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section includes modular carpet tile.

B. Related Requirements:
1. Section 033000 “Cast In Place Concrete” for self-leveling product.
2. Section 096105 “Water Vapor Control for Flooring” for vapor control components.

### 1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:
   a. Review delivery, storage, and handling procedures.
   b. Review ambient conditions and ventilation procedures.
   c. Review subfloor preparation procedures.

### 1.4 ACTION SUBMITTALS

A. LEED Submittals:
1. Product Data for Credit IEQ 4.3: For flooring system elements, documentation from an independent testing agency indicating compliance with CRI's "Green Label Plus" testing program for carpet tile; include documentation of VOC concentrations for carpet tile and installation adhesives per CALGreen.

B. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
1. Carpet Tile: Full-size Sample.
2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- long Samples.

C. Samples for Verification: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
1. Carpet Tile: Full-size Sample.
2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- long Samples.

D. Sustainable Product Certification: Provide ANSI/NSF 140 certification for carpet products.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd..

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI's "CRI Carpet Installation Standard."

1.9 FIELD CONDITIONS

A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.10 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
   1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
   2. Failures include, but are not limited to, the following:
      a. More than 10 percent edge raveling, snags, and runs.
      b. Dimensional instability.
      c. Excess static discharge.
      d. Loss of tuft-bind strength.
      e. Loss of face fiber.
      f. Delamination.
   3. Warranty Period: 10 years from date of Substantial Completion.

## PART 2 - PRODUCTS

2.1 CARPET TILE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Shaw LLC.
   2. Mannington Mills, Inc.
   3. Mohawk Group (The); Mohawk Carpet, LLC.

B. Color: As selected by Architect from manufacturer's full range.

C. Pattern: Ashlar provide sample layout to Architect.

D. Fiber Content: Eco solution nylon.

E. Pile Characteristic: Multi-level pattern loop.

F. Total Weight: ~~15 oz./sq. yd~~ for finished carpet tile.

RFI 0055 BLDG A - Carpet Tile Increase 17 oz. carpet in lieu of 15 oz. is accepted.

G. Size: 24 by 24 inches .

H. Applied Treatments:
   1. Antimicrobial Treatment: Manufacturer's standard treatment that protects carpet tiles as follows:
      a. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria, not less than 1-mm halo of inhibition for gram-negative bacteria, and no fungal growth, according to AATCC 174.

I. Performance Characteristics:
   1. Sustainable Product Certification: level certification according to ANSI/NSF 140.
   2. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm according to NFPA 253.
   3. Tuft Bind: Not less than 3 lbf according to ASTM D 1335.
   4. Delamination: Not less than 3.5 lbf/in. according to ASTM D 3936.

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer. Refer to section 03 30 00 for self-leveling product.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.
   1. VOC Content: 50 g/L or less.

C. Metal Edge/Transition Strips: Extruded aluminum with mill finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.

B. Examine carpet tile for type, color, pattern, and potential defects.

C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
   1. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
      a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
      b. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
      c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.

D. Wood Subfloors: Verify the following:
   1. Underlayment over subfloor complies with requirements specified in Section 061600 "Sheathing."
   2. Underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.

E. Metal Subfloors: Verify the following:
   1. Underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.

F. Painted Subfloors: Perform bond test recommended in writing by adhesive manufacturer.
   1. Access Flooring Systems: Verify the following:
   2. Access floor substrate is compatible with carpet tile and adhesive if any.
   3. Underlayment surface is flat, smooth, evenly planed, tightly jointed, and free of irregularities, gaps greater than 1/8 inch, protrusions more than 1/32 inch, and substances that may interfere with adhesive bond or show through surface.

G. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI's "CRI Carpet Installation Standards" and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.

C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.

D. Metal Substrates: Clean grease, oil, soil and rust, and prime if recommended in writing by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet tile manufacturer's written installation instructions.

B. Installation Method: Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive.

C. Maintain dye-lot integrity. Do not mix dye lots in same area.

D. Maintain pile-direction patterns recommended in writing by carpet tile manufacturer.

E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.

H. Install pattern parallel to walls and borders.

I. Access Flooring: Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:
   1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
   2. Remove yarns that protrude from carpet tile surface.
   3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI's "CRI Carpet Installation Standard," Section 20, "Protecting Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

**END OF SECTION 09 68 13**

# SECTION 09 77 00 FIBERGLASS REINFORCED PANELS

## PART 1 GENERAL

### 1.1 SUMMARY

A. Section includes:

1. Fiberglass reinforced wall panels (FRP).

### 1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's recommendation for sealant.

B. LEED Submittals:

1. "Product Data for Credit IEQ 4.1" Subparagraph below applies to LEED-NC, LEED-CI, and LEED-CS; coordinate with requirements for adhesives and sealants.
2. Product Data for Credit IEQ 4.1: For sealants, documentation including printed statement of VOC content.
   a. Product Data for Credit IEQ 4.4: For laminating adhesive and composite wood products used in factory-laminated plastic panels, documentation indicating that product contains no urea formaldehyde.

C. Shop Drawings: Show installation details for FRP wall panels, including plans, elevations, sections, details, and attachments to other Work.

D. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors, textures, and patterns available for FRP panels indicated. Include samples of installation devices and accessories.

E. Samples for Verification: 8-by-11-inch units of each type of FRP wall panel indicated; in sets for each color, texture, and pattern, showing the full range of variations expected in these characteristics. Include samples of installation devices and accessories.

### 1.3 QUALITY ASSURANCE

A. Fire Performance Characteristics: Provide FRP materials that have been tested and bear the UL label and marking, or marking of other testing agency acceptable to the State Fire Marshall indicating fire performance characteristics tested in accordance with ASTM E 84.

1. Flame Spread: Class C.
2. Smoke Developed: 450 or less.

### 1.4 PROJECT CONDITIONS

A. Environmental Conditions: Maintain a constant minimum temperature of 60 degrees F in installation areas for at least 10 days before and 10 days after application of materials.

1.5 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joints that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Provide manufacturer's standard form in which manufacturer agrees to repair or replace tile that fail in materials or workmanship within One year warranty period.

**PART 2 PRODUCTS**

2.1 MATERIALS

A. Fiberglass Reinforced Panels:

B. Color, Pattern and Texture: Provide FRP materials in colors and patterns as selected by the Architect from manufacturer’s standard colors and patterns.

2.2 MANUFACTURERS

A. Acceptable manufacturers: Lasco Board, Marlite FRP, Sequentia

2.3 ACCESSORY ITEMS

A. Rivets: High impact thermo plastic drive rivets, color to match paneling.

B. Substrate Filler: Non-staining latex based filler compatible with substrate and as recommended by the manufacturer.

C. Substrate Primer/Sealer: Silicone sealant specifically formulated for use with FRP wall panels.

D. PVC Moldings: Extruded PVC, with one piece cap and wall flange tapering to feather edge, inside and outside corners, color to match paneling.

**PART 3 EXECUTION**

3.1 EXAMINATION

A. Verify that conditions are satisfactory for the installation of FRP panels, in accordance with manufacturer’s instructions.

B. If unsatisfactory conditions exist, do not commence the installation until such conditions have been corrected. Beginning installation means acceptance of existing conditions.

3.2 PREPARATION

A. Clean wall and panel surfaces of contaminants detrimental to adhesive and panel performance.

3.3 INSTALLATION

A. Install panels in accordance with manufacturer’s instructions, using adhesive application method.

B. Adhesive: Comply with manufacturer’s instructions regarding materials, method of application, spread rate, drying time, open time and temperature and humidity limitations.

C. Joints: Finish snugly, neatly, and as inconspicuously as possible using manufacturer’s materials for the purpose.

D. Trim: Apply at seams, corners and terminations as indicated on Drawings. Exposed edges not allowed.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning installed products.

**END OF SECTION 09 77 00**

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# SECTION 09 91 13 - EXTERIOR PAINTING

## PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes surface preparation and the application of paint systems on exterior substrates.
   1. Steel and iron.
   2. Galvanized metal.

1.3 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

D. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

E. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

F. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.
   1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
   2. Indicate VOC content.

B. Samples for Initial Selection: For each type of topcoat product.

C. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
      a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
      b. Other Items: Architect will designate items or areas required.
   2. Final approval of color selections will be based on mockups.
      a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
   3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Dunn-Edwards Corporation.
2. Kelly-Moore Paint Company Inc.
3. PPG Architectural Finishes, Inc.
4. Sherwin-Williams Company (The).

C. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in the Exterior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

B. VOC Content: For field applications, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
1. Primers, Sealers, and Undercoaters: 100 g/L.

C. Colors: As selected by Architect from manufacturer's full range.
1. Ten percent of surface area will be painted with deep tones.

2.3 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

## PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

C. Proceed with coating application only after unsatisfactory conditions have been corrected.
1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer.
   1. SSPC-SP 2.
   2. SSPC-SP 3.
   3. SSPC-SP 7/NACE No. 4.
   4. SSPC-SP 11.

E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
   1. Use applicators and techniques suited for paint and substrate indicated.
   2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
   3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
   4. Paint entire exposed surface of window frames and sashes.
   5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
   6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
   1. Paint the following work where exposed to view:
      a. Equipment, including panelboards and switch gear.
      b. Uninsulated metal piping.
      c. Uninsulated plastic piping.
      d. Pipe hangers and supports.
      e. Metal conduit.
      f. Tanks that do not have factory-applied final finishes.

RFI 0483 Dry Film Thickness Testing Clarification

Dry Film Thickness Testing Requirement May Be Omitted

## 3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
   1. Contractor shall touch up and restore painted surfaces damaged by testing.
   2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

## 3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

## 3.6 EXTERIOR PAINTING SCHEDULE

A. Steel and Iron Substrates:
   1. Alkyd System :
      a. Prime Coat: Primer, alkyd, anticorrosive, for metal, MPI #79.
      b. Prime Coat: Shop primer specified in Section where substrate is specified.
      c. Prime Coat: Primer, metal, surface tolerant, MPI #23.
      d. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
      e. Topcoat: Alkyd, exterior, flat (MPI Gloss Level 1), MPI #8.
      f. Topcoat: Alkyd, exterior, semi-gloss (MPI Gloss Level 5), MPI #94.
      g. Topcoat: Alkyd, exterior, gloss (MPI Gloss Level 6), MPI #9.

B. Galvanized-Metal Substrates:
   1. Latex System :
      a. Prime Coat: Primer, galvanized, cementitious, MPI #26.
      b. Prime Coat: Primer, galvanized, water based, MPI #134.
      c. Intermediate Coat: Latex, exterior, matching topcoat.
      d. Topcoat: Latex, exterior, flat (MPI Gloss Level 1), MPI #10.
      e. Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4), MPI #15.
      f. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11.
      g. Topcoat: Latex, exterior, gloss (MPI Gloss Level 6), MPI #119.
   2. Water-Based Light Industrial Coating System MPI EXT 5.3G:
      a. Prime Coat: Primer, galvanized, cementitious, MPI #26.
      b. Prime Coat: Primer, galvanized, water based, MPI #134.
      c. Prime Coat: Primer, epoxy, anti-corrosive, MPI #101.
      d. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
      e. Topcoat: Light industrial coating, exterior, water based (MPI Gloss Level 3), MPI #161.
      f. Topcoat: Light industrial coating, exterior, water based, semi-gloss (MPI Gloss Level 5), MPI #163.
      g. Topcoat: Light industrial coating, exterior, water based, gloss (MPI Gloss Level 6), MPI #164.

**END OF SECTION 09 91 13**

# SECTION 09 91 23 - INTERIOR PAINTING

## PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes surface preparation and the application of paint systems on interior substrates.
   1. Cement board.
   2. Steel and iron.
   3. Gypsum board.

1.3 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.
   1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
   2. Indicate VOC content.

B. Sustainable Design Submittals:

   1. Product Data: For paints and coatings, indicating VOC content.

2. Laboratory Test Reports: For paints and coatings, indicating compliance with requirements for low-emitting materials.

C. Samples for Initial Selection: For each type of topcoat product.

D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
      a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
      b. Other Items: Architect will designate items or areas required.
   2. Final approval of color selections will be based on mockups.
      a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
   3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

## PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Dunn-Edwards Corporation.
2. Kelly-Moore Paint Company Inc.
3. Pratt & Lambert.
4. Sherwin-Williams Company (The).

C. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in the Interior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

B. Material Compatibility:
1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

C. VOC Content: For field applications that are inside the weatherproofing system, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
1. Flat Paints and Coatings: 50 g/L.
2. Primers, Sealers, and Undercoaters: 100 g/L.
3. Rust-Preventive Coatings: 100 g/L.

D. Low-Emitting Materials: For field applications that are inside the weatherproofing system, 90 percent of paints and coatings shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

E. Colors: As selected by Architect from manufacturer's full range.
1. Thirty percent of surface area will be painted with deep tones.

2.3 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
   1. Fiber-Cement Board: 12 percent.
   2. Gypsum Board: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.

   1. Application of coating indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer.
   1. SSPC-SP 2.
   2. SSPC-SP 3.
   3. SSPC-SP 7/NACE No. 4.
   4. SSPC-SP 11.

E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

   1. Use applicators and techniques suited for paint and substrate indicated.
   2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
   3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
   4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
   5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

   1. Paint the following work where exposed in equipment rooms:
      a. Equipment, including panelboards and switch gear.
      b. Uninsulated metal piping.
      c. Uninsulated plastic piping.
      d. Pipe hangers and supports.
      e. Metal conduit.
      f. Tanks that do not have factory-applied final finishes.

g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.

2. Paint the following work where exposed in occupied spaces:
   a. Equipment, including panelboards.
   b. Uninsulated metal piping.
   c. Uninsulated plastic piping.
   d. Pipe hangers and supports.
   e. Metal conduit.
   f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
   g. Other items as directed by Architect.
3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

RFI 0483 Dry Film Thickness Testing Clarification

Dry Film Thickness Testing Requirement May Be Omitted

## 3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

## 3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

## 3.6 INTERIOR PAINTING SCHEDULE

A. Cement Board Substrates:
1. Latex System MPI INT 3.3A:
   a. Prime Coat: Primer, alkali resistant, water based, MPI #3.
   b. Intermediate Coat: Latex, interior, matching topcoat.
   c. Topcoat: Latex, interior, flat (MPI Gloss Level 1), MPI #53.
   d. Topcoat: Latex, interior (MPI Gloss Level 2), MPI #44.
   e. Topcoat: Latex, interior (MPI Gloss Level 3), MPI #52.
   f. Topcoat: Latex, interior (MPI Gloss Level 4), MPI #43.
   g. Topcoat: Latex, interior, semi-gloss (MPI Gloss Level 5), MPI #54.

h. Topcoat: Latex, interior, gloss (MPI Gloss Level 6, except minimum gloss of 65 units at 60 degrees), MPI #114.

2. Institutional Low-Odor/VOC Latex System MPI INT 3.3G:
   a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
   b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
   c. Topcoat: Latex, interior, institutional low odor/VOC, flat (MPI Gloss Level 1), MPI #143.
   d. Topcoat: Latex, interior, institutional low odor/VOC (MPI Gloss Level 2), MPI #144.
   e. Topcoat: Latex, interior, institutional low odor/VOC (MPI Gloss Level 3), MPI #145.
   f. Topcoat: Latex, interior, institutional low odor/VOC (MPI Gloss Level 4), MPI #146.
   g. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147.
   h. Topcoat: Latex, interior, institutional low odor/VOC, gloss (MPI Gloss Level 6), MPI #148.
3. High-Performance Architectural Latex System MPI INT 3.3B:
   a. Prime Coat: Primer, alkali resistant, water based, MPI #3.
   b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
   c. Topcoat: Latex, interior, high performance architectural (MPI Gloss Level 2), MPI #138.
   d. Topcoat: Latex, interior, high performance architectural (MPI Gloss Level 3), MPI #139.
   e. Topcoat: Latex, interior, high performance architectural (MPI Gloss Level 4), MPI #140.
   f. Topcoat: Latex, interior, high performance architectural, semi-gloss (MPI Gloss Level 5), MPI #141.
4. Water-Based Light Industrial Coating System :
   a. Prime Coat: Primer, alkali resistant, water based, MPI #3.
   b. Intermediate Coat: Light industrial coating, interior, water based, matching topcoat.
   c. Topcoat: Light industrial coating, interior, water based (MPI Gloss Level 3), MPI #151.
   d. Topcoat: Light industrial coating, interior, water based, semi-gloss (MPI Gloss Level 5), MPI #153.
   e. Topcoat: Light industrial coating, interior, water based, gloss (MPI Gloss Level 6), MPI #154.

B. Steel Substrates:
1. High-Performance Architectural Latex System MPI INT 5.1R:
   a. Prime Coat: Primer, alkyd, quick dry, for metal, MPI #76.
   b. Prime Coat: Primer, alkyd, anti-corrosive, for metal, MPI #79.
   c. Prime Coat: Shop primer specified in Section where substrate is specified.
   d. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
   e. Topcoat: Latex, interior, high performance architectural (MPI Gloss Level 2), MPI #138.
   f. Topcoat: Latex, interior, high performance architectural (MPI Gloss Level 3), MPI #139.

g. Topcoat: Latex, interior, high performance architectural (MPI Gloss Level 4), MPI #140.
h. Topcoat: Latex, interior, high performance architectural, semi-gloss (MPI Gloss Level 5), MPI #141.

2. Water-Based Light Industrial Coating System MPI INT 5.1B:
a. Prime Coat: Primer, rust-inhibitive, water based MPI #107.
b. Intermediate Coat: Light industrial coating, interior, water based, matching topcoat.
c. Topcoat: Light industrial coating, interior, water based (MPI Gloss Level 3), MPI #151.
d. Topcoat: Light industrial coating, interior, water based, semi-gloss (MPI Gloss Level 5), MPI #153.
e. Topcoat: Light industrial coating, interior, water based, gloss (MPI Gloss Level 6), MPI #154.

C. Gypsum Board and Substrates:
1. Latex over Latex Sealer System MPI INT 9.2A:
a. Prime Coat: Primer sealer, latex, interior, MPI #50.
b. Prime Coat: Latex, interior, matching topcoat.
c. Intermediate Coat: Latex, interior, matching topcoat.
d. Topcoat: Latex, interior, flat (MPI Gloss Level 1), MPI #53.
e. Topcoat: Latex, interior (MPI Gloss Level 2), MPI #44.
f. Topcoat: Latex, interior (MPI Gloss Level 3), MPI #52.
g. Topcoat: Latex, interior (MPI Gloss Level 4), MPI #43.
h. Topcoat: Latex, interior, semi-gloss (MPI Gloss Level 5), MPI #54.
i. Topcoat: Latex, interior, gloss (MPI Gloss Level 6, except minimum gloss of 65 units at 60 degrees), MPI #114.

2. Institutional Low-Odor/VOC Latex System MPI INT 9.2M:
a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, institutional low odor/VOC, flat (MPI Gloss Level 1), MPI #143.
d. Topcoat: Latex, interior, institutional low odor/VOC (MPI Gloss Level 2), MPI #144.
e. Topcoat: Latex, interior, institutional low odor/VOC (MPI Gloss Level 3), MPI #145.
f. Topcoat: Latex, interior, institutional low odor/VOC (MPI Gloss Level 4), MPI #146.
g. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147.
h. Topcoat: Latex, interior, institutional low odor/VOC, gloss (MPI Gloss Level 6), MPI #148.

3. High-Performance Architectural Latex System MPI INT 9.2B:
a. Prime Coat: Primer sealer, latex, interior, MPI #50.
b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
c. Topcoat: Latex, interior, high performance architectural (MPI Gloss Level 2), MPI #138.
d. Topcoat: Latex, interior, high performance architectural (MPI Gloss Level 3), MPI #139.

e. Topcoat: Latex, interior, high performance architectural (MPI Gloss Level 4), MPI #140.
f. Topcoat: Latex, interior, high performance architectural, semi-gloss (MPI Gloss Level 5), MPI #141.

D. Insulation-Covering Substrates: Including pipe and duct coverings.

**END OF SECTION 09 91 23**

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# SECTION 10 14 23 - SIGNAGE

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
1. Panel signs.
2. Illuminated panel signs.
3. Room-identification signs.
4. Field-applied, vinyl-character signs.

### 1.3 ALLOWANCES

A. Allowances for room-identification signs are specified in Section 012100 "Allowances."

### 1.4 DEFINITIONS

A. Accessible: In accordance with the accessibility standard.

B. Illuminated: Illuminated by lighting source integrally constructed as part of the sign unit.

### 1.5 COORDINATION

A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.

B. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

### 1.6 ACTION SUBMITTALS

RFI 0082 — Signage Schedule — See RFI 0082 for Signage Schedule

A. Product Data: For each type of product.

B. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

### 1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

### 1.8 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer of products.

1.9 FIELD CONDITIONS

A. Field Measurements: Verify locations of anchorage devices embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Deterioration of finishes beyond normal weathering.
      b. Deterioration of embedded graphic image.
      c. Separation or delamination of sheet materials and components.
   2. Warranty Period: Five years from date of Substantial Completion.

**PART 2 - PRODUCTS**

2.1 PANEL SIGNS, GENERAL

A. Regional Materials: Panel signs shall be manufactured within 500 miles of Project site.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Division 01 "Quality Requirements," to design sign structure and anchorage of illuminated panel sign type(s) sign(s) to withstand design loads as indicated on Drawings.

B. Thermal Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes.

   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

C. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities for signs.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 SIGNS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or comparable product by one of the following:
   1. Weidner CA, Inc
   2. Ace Sign Systems, Inc.

3. Allen Industries, Inc.
4. ASI Sign Systems, Inc.
5. Mohawk Sign Systems.

C. Panel Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
   1. Illuminated Panel Sign: Backlighted construction with LED lighting including transformers, insulators, and other accessories for operability, with provision for servicing and concealing connections to building electrical system. Use tight or sealed joint construction to prevent unintentional light leakage. Space lamps apart from each other and away from sign surfaces as needed to illuminate evenly.
      a. Power: As indicated on electrical Drawings.
      b. Weeps: Provide weep holes to drain water at lowest part of exterior signs. Equip weeps with permanent baffles to block light leakage without inhibiting drainage.
   2. Solid-Sheet Sign, Returns, and Back: Acrylic sheet with finish specified in "Surface Finish and Applied Graphics" Subparagraph below and as follows:
      a. Thickness: Manufacturer's standard for size of sign.
      b. Surface-Applied Graphics: Applied vinyl film.
      c. Inset, Cutout Characters: Sign face routed to receive push-through acrylic graphics flush with the sign panel.
      d. Accessible Parking Stall Sign: Provide metal panel, reflectorized International Symbol of Accessibility sign, mounted on a single post, at every accessible parking stall.
      e. Accessible Route Signage: Provide metal panel, reflectorized International Symbol of Accessibility sign with directional arrow, mounted on a single post, at locations shown on drawings.
      f. International Accessible Sign: Provide metal panel, reflectorized International Symbol of Accessibility sign at locations shown on drawings.
   3. Exterior metal characters for building signage:
      Water jet cut aluminum plate letters ASTM B209 or ASTM B26/B26M cast aluminum. Font; Helvetica Medium all capital, 1” thick and 5/8” thick strokes.
   4. Engraved Plastic-Laminate Sign: Plastic-laminate face laminated to contrasting phenolic core to produce composite sheet.
      a. Composite-Sheet Thickness: Manufacturer's standard for size of sign.
      b. Engraved Graphics: Characters engraved through plastic-laminate face sheet to expose contrasting phenolic core.
      c. Plastic-Laminate Color and Pattern: As selected by Architect from manufacturer's full range.
      d. Core Color: Manufacturer's standard dark color.
   5. Surface Finish and Applied Graphics:
      a. Integral Acrylic Sheet Color: As selected by Architect from full range of industry colors.
   6. Text and Typeface: Accessible raised characters and Braille typeface as indicated by manufacturer's designation typeface as selected by Architect from manufacturer's full range. Finish raised characters to contrast with background color, and finish Braille to match background color.
   7. Flatness Tolerance: Sign panel shall remain flat or uniformly curved under installed conditions as indicated and within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner.

D. Room-Identification Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
   1. Laminated-Sheet Sign: face sheet with raised graphics laminated over subsurface graphics to acrylic backing sheet to produce composite sheet.
      a. Color(s): As selected by Architect from manufacturer's full range.
   2. Sign-Panel Perimeter: Finish edges smooth.
      a. Edge Condition: Beveled.
      b. Corner Condition in Elevation: Square.
   3. Frame:
      a. Frame Depth: Convex-curved frame to receive removable face sheet and changeable subsurface graphics.
      b. Profile: Beveled.
      c. Corner Condition in Elevation: Mitered.

## 2.4 FIELD-APPLIED, VINYL-CHARACTER SIGNS

A. Field-Applied, Vinyl-Character Sign: Prespaced characters die cut from 3- to 3.5-mil thick, weather-resistant vinyl film with release liner on the back and carrier film on the front for on-site alignment and application.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. Allen Markings International.
      b. ASI Sign Systems, Inc.
      c. Mohawk Sign Systems.
   3. Size: As scheduled.
   4. Substrate: As scheduled.
   5. Text and Font: As scheduled.

## 2.5 PANEL-SIGN MATERIALS

A. Steel Materials:
   1. For steel exposed to view on completion, provide materials having flat, smooth surfaces without blemishes. Do not use materials whose surfaces exhibit pitting, seam marks, roller marks, rolled trade names, or roughness.

B. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).

C. Plastic-Laminate Sheet: NEMA LD 3, general-purpose HGS grade, 0.048-inch nominal thickness.

D. Vinyl Film: UV-resistant vinyl film of nominal thickness indicated, with pressure-sensitive, permanent adhesive on back; die cut to form characters or images as indicated and suitable for exterior applications.

RFI 0191 Signage Security Fasteners Requirement
Refer to HP Fastener meeting notes in RFI 191

2.6 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
   1. For exterior exposure, furnish nonferrous-metal devices unless otherwise indicated.
   2. Exposed Metal-Fastener Components, General:
      a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
      b. Fastener Heads: For nonstructural connections, use screws and bolts with tamper-resistant Allen-head slots unless otherwise indicated.
   3. Sign Mounting Fasteners:
      a. Projecting Studs: Threaded studs with sleeve spacer, welded or brazed to back of sign material or screwed into back of sign assembly, unless otherwise indicated.
   4. Inserts: Furnish inserts to be set by other trades into concrete or masonry work.

B. Magnetic Tape: Manufacturer's standard magnetic tape with adhesive on one side.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.7 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
   1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
   2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
   3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
   4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
   5. Internally brace signs for stability and for securing fasteners.
   6. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

B. Surface-Engraved Graphics: Machine engrave characters and other graphic devices into panel surface indicated to produce precisely formed copy, incised to uniform depth.
   1. Engraved Metal: Fill engraved graphics with manufacturer's standard baked enamel.
   2. Engraved Opaque Acrylic Sheet: Fill engraved graphics with manufacturer's standard enamel.
   3. Face-Engraved Clear Acrylic Sheet: Fill engraved copy with manufacturer's standard enamel. Apply manufacturer's standard opaque background color coating to back face of acrylic sheet.

4. Engraved Plastic Laminate: Engrave through exposed face ply of plastic-laminate sheet to expose contrasting core ply.

C. Subsurface-Engraved Graphics: Reverse engrave back face of clear face-sheet material. Fill resulting copy with manufacturer's standard enamel. Apply opaque manufacturer's standard background color coating over enamel-filled copy.

D. Shop- and Subsurface-Applied Vinyl: Align vinyl film in final position and apply to surface. Firmly press film from the middle outward to obtain good bond without blisters or fishmouths.

E. Signs with Changeable Message Capability: Fabricate signs to allow insertion of changeable messages as follows:

1. For snap-in changeable inserts beneath removable face sheet, furnish one suction or other device to assist in removing face sheet. Furnish initial changeable insert. Subsequent changeable inserts are by Owner.
2. For slide-in changeable inserts, fabricate slot without burrs or constrictions that inhibit function. Furnish initial changeable insert. Subsequent changeable inserts are by Owner.
3. For frame to hold changeable sign panel, fabricate frame without burrs or constrictions that inhibit function. Furnish initial sign panel. Subsequent changeable sign panels are by Owner.

## 2.8 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.

D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

## 2.9 METALLIC-COATED STEEL FINISHES

A. Surface Preparation: Clean surfaces of oil and other contaminants. Use cleaning methods that do not leave residue. After cleaning, apply a conversion coating compatible with the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas and apply galvanizing repair paint, complying with SSPC-Paint 20, to comply with ASTM A 780/A 780M.

B. Factory Prime Finish: After cleaning and pretreating, apply an air-dried primer compatible with the organic coating to be applied over it.

C. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils.

2.10 STEEL FINISHES

A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, and prepare for coating according to coating manufacturer's written instructions.
1. For Baked-Enamel or Powder-Coat Finish: After cleaning, apply a conversion coating compatible with the organic coating to be applied over it.

B. Factory Prime Finish: After surface preparation and pretreatment, apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer.

C. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils.

## PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage work.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Verify that anchor inserts are correctly sized and located to accommodate signs.

D. Verify that electrical service is correctly sized and located to accommodate signs.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Install signs so they do not protrude or obstruct according to the accessibility standard.
3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Room-Identification Signs and Other Accessible Signage: Install in locations on walls according to accessibility standard.

C. Mounting Methods:
   1. Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
      a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.
      b. Thin or Hollow Surfaces: Place spacers on studs, place sign in position with spacers pinched between sign and substrate, and install washers and nuts on stud ends projecting through opposite side of surface, and tighten.
   2. Magnetic Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position.
   3. Shim-Plate Mounting: Provide 1/8-inch- thick, concealed aluminum shim plates with predrilled and countersunk holes, at locations indicated, and where other direct mounting methods are impractical. Attach plate with fasteners and anchors suitable for secure attachment to substrate. Attach signs to plate using method specified above.

D. Field-Applied, Vinyl-Character Signs: Clean and dry substrate. Align sign characters in final position before removing release liner. Remove release liner in stages, and apply and firmly press characters into final position. Press from the middle outward to obtain good bond without blisters or fishmouths. Remove carrier film without disturbing applied vinyl film.

E. Signs Mounted on Glass: Provide opaque sheet matching sign material and finish onto opposite side of glass to conceal back of sign.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

**END OF SECTION 10 14 23**

# SECTION 10 21 13.17 - PHENOLIC-CORE TOILET COMPARTMENTS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
   1. Phenolic-core toilet compartments configured as toilet enclosures entrance screens urinal screens.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.

B. LEED Submittals:

   1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings: For toilet compartments.
   1. Include plans, elevations, sections, details, and attachment details.
   2. Show locations of cutouts for compartment-mounted toilet accessories.
   3. Show locations of centerlines of toilet fixtures.
   4. Show locations of floor drains.
   5. Show ceiling grid, ceiling-mounted items, and overhead support or bracing locations.

D. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

### 1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet compartments to include in maintenance manuals.

### 1.5 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

RFI 0508 BLDG AB - Phenolic-Core Fire Rating Clarification
Class B fire rating in lieu of Class A

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: 25 or less.
   2. Smoke-Developed Index: 450 or less.

B. Recycled Content of Phenolic-Core Panel: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

C. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities for toilet compartments designated as accessible.

### 2.2 PHENOLIC-CORE TOILET COMPARMENTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Bobrick Washroom Equipment, Inc.
   2. Bradley Corporation; Mills Partitions.
   3. Global Steel Products Corp.
   4. Marlite.

C. Toilet-Enclosure Style: Floor anchored .

D. Entrance-Screen Style: Floor anchored .

E. Urinal-Screen Style: Wall hung.

F. Door, Panel, Screen, and Pilaster Construction: Solid phenolic-core panel material with melamine facing on both sides fused to substrate during panel manufacture (not separately laminated), and with eased and polished edges and no-sightline system. Provide minimum 3/4-inch- thick doors and pilasters and minimum 1/2-inch- thick panels.

G. Pilaster Shoes Sleeves (Caps): Formed from stainless-steel sheet, not less than 0.031-inch nominal thickness and 3 inches high, finished to match hardware.

H. Brackets (Fittings):
   1. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.

I. Phenolic-Panel Finish:
   1. Facing Sheet Finish: One color and pattern in each room.
   2. Color and Pattern: As selected by Architect from manufacturer's full range , with manufacturer's standard dark color core.
   3. Edge Color: Manufacturer's standard.

2.3 HARDWARE AND ACCESSORIES

A. Hardware and Accessories: Manufacturer's heavy-duty operating hardware and accessories.
   1. Hinges: Manufacturer's minimum 0.062-inch- thick stainless-steel continuous, cam type that swings to a closed or partially open position , allowing emergency access by lifting door. Mount with through-bolts.
   2. Latch and Keeper: Manufacturer's heavy-duty surface-mounted cast-stainless-steel latch unit designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible. Mount with through-bolts.
   3. Coat Hook: Manufacturer's heavy-duty combination cast-stainless-steel hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories. Mount with through-bolts.
   4. Door Pull: Manufacturer's heavy-duty cast-stainless-steel pull at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible. Mount with through-bolts.

B. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless-steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.4 MATERIALS

A. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.

B. Stainless-Steel Castings: ASTM A 743/A 743M.

2.5 FABRICATION

A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.

B. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.

C. Urinal-Screen Posts: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at tops and bottoms of posts. Provide shoes and sleeves (caps) at posts to conceal anchorage.

D. Door Size and Swings: Unless otherwise indicated, provide 24-inch- wide in-swinging doors for standard toilet compartments and 36-inch- wide out-swinging doors with a minimum 32-inch- wide clear opening for compartments designated as accessible.

## PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
   1. Confirm location and adequacy of blocking and supports required for installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
   1. Maximum Clearances:
      a. Pilasters and Panels: 1/2 inch.
      b. Panels and Walls: 1 inch.
   2. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.
      a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
      b. Align brackets at pilasters with brackets at walls.

B. Floor-Anchored Units: Set pilasters with anchors penetrating not less than 2 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust so tops of doors are level with tops of pilasters when doors are in closed position.

C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.3 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors and doors in entrance screens to return doors to fully closed position.

**END OF SECTION 10 21 13.17**

# SECTION 10 26 00 - WALL AND DOOR PROTECTION

## PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.1 ACTION SUBMITTALS SUBMITTALS

A. Submit in accordance with Section 01 33 00.

B. Shop Drawings: Indicate manufacturer, model, materials, size, operation, components, hardware, finish and installation details.

1.2 LEED SUBMITTALS:

1. Product Data for Credit IEQ 4.1: For adhesives, documentation including printed statement of VOC content.
2. Product Data for Credit IEQ 4.4: For particleboard, documentation indicating that products contain no urea formaldehyde.
3. Laboratory Test Reports for Credit IEQ 4: For adhesives, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.2 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain impact-resistant wall protection units from single source from single manufacturer.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of impact-resistant wall protection units and are based on the specific system indicated. Refer to Division 01 "Quality Requirements."

D. Revise subparagraph below to suit Project.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

E. Surface-Burning Characteristics: Provide impact-resistant, plastic wall protection units with surface-burning characteristics as determined by testing identical products per ASTM E 84, NFPA 255, or UL 723 by UL or another qualified testing agency.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Store impact-resistant wall protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
   1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.
   2. Store plastic wall protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.
   3. Store covers in a horizontal position.

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install impact-resistant wall protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F for not less than 72 hours before beginning installation, and for the remainder of the construction period.

**PART 2 - PRODUCTS**

2.1 MATERIALS

A. Corner Guards PVC Plastic: ASTM D 1784, Class 1, textured, chemical- and stain-resistant, high-impact-resistant PVC or acrylic-modified vinyl plastic with integral color throughout; extruded material, thickness as indicated.
   1. Impact Resistance: Minimum 25.4 ft lbf/in of notch when tested according to ASTM D 256, Test Method A.
   2. Chemical and Stain Resistance: Tested according to ASTM D 543.
   3. Self-extinguishing when tested according to ASTM D 635.
   4. Flame-Spread Index: 25 or less.
   5. Smoke-Developed Index: 450 or less.

B. Bullet Resistant Panels; Provide minimum level 5 protection panels. Basis of Design Insulguard Security Products, FG-500.

2.2 FABRICATION

A. Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.

B. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

2.3 METAL FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
   1. Remove tool and die marks and stretch lines, or blend into finish.
   2. Grind and polish surfaces to produce uniform finish, free of cross scratches.

3. Run grain of directional finishes with long dimension of each piece.
4. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

F. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
1. For impact-resistant wall protection units attached with adhesive or foam tape, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Complete finishing operations, including painting, before installing impact-resistant wall protection system components.

B. Before installation, clean substrate to remove dust, debris, and loose particles.

### 3.3 INSTALLATION

A. General: Install impact-resistant wall protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
1. Install impact-resistant wall protection units in locations and at mounting heights indicated on Drawings.
2. Provide splices, mounting hardware, anchors, and other accessories required for a complete installation.
   a. Provide anchoring devices to withstand imposed loads.
   b. Where splices occur in horizontal runs of more than 20 feet, splice aluminum retainers and plastic covers at different locations along the run, but not closer than 12 inches.
   c. Adjust end and top caps as required to ensure tight seams.

### 3.4 CLEANING

A. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

**END OF SECTION 10 26 00**

# SECTION 10 26 00 - WALL AND DOOR PROTECTION

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
   1. Corner guards.

### 1.3 REFERENCES

A. Standards:
   1. In accordance with the following standards

      a. National codes (IBC, UBC, SBCCI, BOCA and Life Safety)
      b. American Society for Testing and Materials (ASTM)
      c. Underwriters Laboratories (UL)
      d. California 01350 specification

### 1.4 ACTION SUBMITTALS

A. Product Data: Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes for each impact-resistant wall protection unit.

### 1.5 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain impact-resistant wall protection units from single source from single manufacturer.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of impact-resistant wall protection units and are based on the specific system indicated.

D. Aesthetics.

   1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

E. Surface-Burning Characteristics: Provide impact-resistant, plastic wall protection units with surface-burning characteristics as determined by testing identical products per ASTM E 84, NFPA 255, or UL 723 by UL or another qualified testing agency.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store impact-resistant wall protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
   1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.
   2. Store plastic wall protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.
      a. Store corner-guard covers in a vertical position.
      b. Store covers in a horizontal position.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install impact-resistant wall protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F for not less than 72 hours before beginning installation and for the remainder of the construction period.

**PART 2 - PRODUCTS**

2.1 MATERIALS

A. Stainless-Steel Sheet: ASTM A 240/A 240M.

B. Fasteners: Nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened.

2.2 CORNER GUARDS

A. Surface-Mounted, Metal Corner Guards fabricated from one-piece, formed stainless steel with formed edges; with 90 or 135 degree turn to match wall conditions.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide Construction Specialties Model CO-8M or comparable product by one of the following:
      a. Arden Architectural Specialties, Inc.
      b. Construction Specialties, Inc.
      c. IPC Door and Wall Protection Systems; Division of InPro Corporation.
      d. Pawling Corporation.
   3. Material: Stainless steel, Type 304
      a. Thickness: Minimum 0.0625 inch.
      b. Finish: Directional satin, No. 4.
   4. Wing Size: Nominal 2 by 2 inches.
   5. Corner Radius: 1/8 inch.

6. Mounting: adherered.

B. Surface-Mounted, engineered PETG Corner guards consisting of continuous retainer with snap-on cover.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide Construction Specialties Model SM-20AN or comparable product by one of the following:
      a. Arden Architectural Specialties, Inc.
      b. Construction Specialties, Inc.
      c. IPC Door and Wall Protection Systems; Division of InPro Corporation.
      d. Pawling Corporation.
   3. Material: Engineered PETG: Extruded material
      a. Thickness: Nominal 0.078 inch.
      b. Finish: Colors to be selected by Architect from one of manufacturer's available colors and patterns.
   4. Wing Size: Nominal 3 by 3 inches.
   5. Corner Radius: 1/4 inch.

2.3 ACCESSORIES

A. Color matched end caps to be provided for both partial and full height applications.

2.4 FABRICATION

A. Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.

B. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

2.5 METAL FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

   1. Remove tool and die marks and stretch lines, or blend into finish.
   2. Grind and polish surfaces to produce uniform finish, free of cross scratches.
   3. Run grain of directional finishes with long dimension of each piece.
   4. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

B. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

## PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.

1. For impact-resistant wall protection units attached with adhesive or foam tape, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Complete finishing operations, including painting, before installing impact-resistant wall protection system components.

B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

A. General: Install impact-resistant wall protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

B. Install the work of this section in strict accordance with the manufacturer's recommendations, using only approved mounting hardware and locating all components firmly into position.

3.4 CLEANING

A. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

**END OF SECTION 10 26 00**

# SECTION 10 28 00 - TOILET, BATH, AND LAUNDRY ACCESSORIES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
1. Public-use washroom accessories.
2. Underlavatory guards.
3. Custodial accessories.

### 1.3 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

### 1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Include electrical characteristics.

B. Samples: Full size, for each exposed product and for each finish specified.
1. Approved full-size Samples will be returned and may be used in the Work.

C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
1. Identify locations using room designations indicated.
2. Identify accessories using designations indicated.

### 1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For accessories to include in maintenance manuals.

1.6 WARRANTY

A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, visible silver spoilage defects.
   2. Warranty Period: 15 years from date of Substantial Completion.

**PART 2 - PRODUCTS**

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 PUBLIC-USE WASHROOM ACCESSORIES (REFER TO SECTION 3.3 ACCESSORY SCHEDULE)

A. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.

B. Toilet Tissue Dispenser:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   2. Basis-of-Design Product, Georgia Pacific 56784: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. American Specialties, Inc.; ASI Group.
      b. Bobrick Washroom Equipment, Inc.
      c. Bradley Corporation.
   3. Toilet Tissue Dispenser Capacity: 4-1/2- or 5-inch- diameter tissue rolls.
   4. Toilet Tissue Dispenser Operation: Noncontrol delivery with theft-resistant spindles.
   5. Lockset: Tumbler type.

C. Sanitary Napkin Disposal:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   2. Basis-of-Design Product, Bobrick B-270: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. American Specialties, Inc.; ASI Group.
      b. Bobrick Washroom Equipment, Inc.
      c. Bradley Corporation.
   3. Description: Toilet tissue dispenser and the following:
      a. Removable sanitary-napkin waste receptacle with self-closing, disposal-opening cover.

D. Paper Towel and Waste Receptacle:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product, Bobrick B-3942: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. American Specialties, Inc.; ASI Group.
   b. Bobrick Washroom Equipment, Inc.
   c. Bradley Corporation.
3. Mounting: Semi-recessed.
4. Minimum Capacity: 40 gal..
5. Material and Finish: Stainless steel, No. 4 finish (satin).
6. Lockset: Tumbler type for waste receptacle.

E. Liquid-Soap Dispenser:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product, Bobrick B-2111: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. American Specialties, Inc.; ASI Group.
   b. Bobrick Washroom Equipment, Inc.
   c. Bradley Corporation.
3. Description: Designed for dispensing antibacterial soap in liquid or lotion form.
4. Mounting: Horizontally oriented, surface mounted.
5. Capacity: 16oz..
6. Materials: Insert requirements for valve and reservoir materials and finishes.
7. Lockset: Tumbler type.
8. Refill Indicator: Window type.

F. Grab Bar:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product, Bobrick B-6809.99-36 and B-6809.99-48. Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. American Specialties, Inc.; ASI Group.
   b. Bobrick Washroom Equipment, Inc.
3. Mounting: Flanges with concealed fasteners.
4. Material: Stainless steel, 0.05 inch thick.
   a. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.
5. Outside Diameter: 1-1/2 inches.
6. Configuration and Length: As indicated on Drawings.

G. Seat-Cover Dispenser:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product, Bobrick B-301: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. American Specialties, Inc.; ASI Group.
b. Bobrick Washroom Equipment, Inc.
c. Bradley Corporation.

3. Mounting: Recessed.
4. Minimum Capacity: 250 seat covers.
5. Exposed Material and Finish: Stainless steel, No. 4 finish (satin).
6. Lockset: Tumbler type.

H. Mirror Unit Detention:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product, Bobrick B-290 2436: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. American Specialties, Inc.; ASI Group.
   b. Bobrick Washroom Equipment, Inc.
   c. Bradley Corporation.

A. Mirror Unit Non-Detention: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

I. Mirror Unit:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product, Bobrick B-165 2436: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. American Specialties, Inc.; ASI Group.
   b. Bobrick Washroom Equipment, Inc.
   c. Bradley Corporation.
3. ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

## 2.3 UNDERLAVATORY GUARDS

A. Underlavatory Guard :

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   Basis-of-Design Product, Truebro Lav Guard 2 E-Z series, subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. Plumberex Specialty Products, Inc.
   b. Truebro by IPS Corporation.
2. Description: Insulating pipe covering for supply and drain piping assemblies that prevents direct contact with and burns from piping; allow service access without removing coverings.
3. Material and Finish: Antimicrobial, molded plastic, white.

2.4 CUSTODIAL ACCESSORIES

A. Source Limitations: Obtain custodial accessories from single source from single manufacturer.

B. Shelf and Mop Holder:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product, Bobrick B-239: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. American Specialties, Inc.; ASI Group.
   b. Bobrick Washroom Equipment, Inc.
   c. Bradley Corporation.
   d. GAMCO Specialty Accessories; a division of Bobrick.
3. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
4. Length: 36 inches.
5. Hooks: Four.
6. Mop/Broom Holders: Three, spring-loaded, rubber hat, cam type.
7. Material and Finish: Stainless steel, No. 4 finish (satin).
   a. Shelf: Not less than nominal 0.05-inch- thick stainless steel.
   b. Rod: Approximately 1/4-inch- diameter stainless steel.

2.5 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.

B. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.

C. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

D. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

E. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.6 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

### 3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written instructions.

### 3.3 ACCESSORY SCHEDULE

| Item | Description | Bobrick | ASI | Gamco | Bradley | Acorn |
|---|---|---|---|---|---|---|
| CH | Clothes Hook | B-983 | | MSA-18 | | |
| CHV | Clothes Hook (Vandal Resistant) | B-981 | | | | |
| CHVM | Clothes Hook (Vandal Resistant - Multiple) | B-985 | | | SA-39 | |
| GB | Grab Bar | 6806 series | 3200 series | 150S | | |
| GBS | Grab Bar-Special | 5806 series | 3200 series | 150C Series | | |
| Grab Bar-Suicide-Resistant 1-1/2-inch O.D. satin finish stainless steel with exposed mounting flanges with 11-gauge stainless steel closure plate extending from underside of bar to wall, in sizes and configurations as indicated. | | | | MSA-14 | SA40 | |
| MIR | Mirror-Framed | 165-1830 | 0625A1830 | C-18x30 | | |
| MI-234 | Mirror-Unframed (Inmate Security) | | 107 | | | 1817 series |
| MHS | Mop Rack With Shelf, 36 inches long | 224 | 1308-3 | US-2 | 9983-30 | |
| PTD | Paper Towel Dispenser | 263 | 0245-SS | TD-5 | | |
| SD | Soap Dispenser | 2112 | 0326 | G58AP | | |
| SH | Metal Shelves, 48 inches by 8 inches | 298 | 0692 | S-8 series | | |

| Item | Description | Bobrick | ASI | Gamco | Bradley | Acorn |
|---|---|---|---|---|---|---|
| SNV | Sanitary Napkin Vendor Surface Mounted Free (Staff) | 282-25 | 0468 | NV-1FS | | |
| SND | Sanitary Napkin Disposal | 270 | 0852 | ND-1 | | |
| | | | | | | |
| | | | | | | |
| STH | Security Tissue Holder | | 9030 | MSA-1 | | |
| TPH | Toilet Paper Holder (Staff) | 685 | 0030 | TTD-5 | | |
| TSCD | Toilet Seat Cover Dispenser-Surface | 221 | 477SM | TSC-1 | | |

**END OF SECTION 10 28 00**

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# SECTION 10 28 00 - TOILET, BATH, AND LAUNDRY ACCESSORIES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
1. Public-use washroom accessories.
2. Underlavatory guards.
3. Custodial accessories.

### 1.3 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

### 1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Include electrical characteristics.

B. Samples: Full size, for each exposed product and for each finish specified.
1. Approved full-size Samples will be returned and may be used in the Work.

C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
1. Identify locations using room designations indicated.
2. Identify accessories using designations indicated.

### 1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For accessories to include in maintenance manuals.

1.6 WARRANTY

A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, visible silver spoilage defects.
   2. Warranty Period: 15 years from date of Substantial Completion.

**PART 2 - PRODUCTS**

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 PUBLIC-USE WASHROOM ACCESSORIES (REFER TO SECTION 3.3 ACCESSORY SCHEDULE)

A. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.

B. Toilet Tissue Dispenser:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   2. Basis-of-Design Product, Georgia Pacific 56784: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. American Specialties, Inc.; ASI Group.
      b. Bobrick Washroom Equipment, Inc.
      c. Bradley Corporation.
   3. Toilet Tissue Dispenser Capacity: 4-1/2- or 5-inch- diameter tissue rolls.
   4. Toilet Tissue Dispenser Operation: Noncontrol delivery with theft-resistant spindles.
   5. Lockset: Tumbler type.

C. Sanitary Napkin Disposal:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   2. Basis-of-Design Product, Bobrick B-270: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. American Specialties, Inc.; ASI Group.
      b. Bobrick Washroom Equipment, Inc.
      c. Bradley Corporation.
   3. Description: Toilet tissue dispenser and the following:
      a. Removable sanitary-napkin waste receptacle with self-closing, disposal-opening cover.

D. Paper Towel and Waste Receptacle:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product, Bobrick B-3942: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. American Specialties, Inc.; ASI Group.
   b. Bobrick Washroom Equipment, Inc.
   c. Bradley Corporation.
3. Mounting: Semi-recessed.
4. Minimum Capacity: 40 gal..
5. Material and Finish: Stainless steel, No. 4 finish (satin).
6. Lockset: Tumbler type for waste receptacle.

E. Liquid-Soap Dispenser:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product, Bobrick B-2111: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. American Specialties, Inc.; ASI Group.
   b. Bobrick Washroom Equipment, Inc.
   c. Bradley Corporation.
3. Description: Designed for dispensing antibacterial soap in liquid or lotion form.
4. Mounting: Horizontally oriented, surface mounted.
5. Capacity: 16oz..
6. Materials: Insert requirements for valve and reservoir materials and finishes.
7. Lockset: Tumbler type.
8. Refill Indicator: Window type.

F. Grab Bar:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product, Bobrick B-6809.99-36 and B-6809.99-48. Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. American Specialties, Inc.; ASI Group.
   b. Bobrick Washroom Equipment, Inc.
3. Mounting: Flanges with concealed fasteners.
4. Material: Stainless steel, 0.05 inch thick.
   a. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.
5. Outside Diameter: 1-1/2 inches.
6. Configuration and Length: As indicated on Drawings.

G. Seat-Cover Dispenser:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product, Bobrick B-301: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. American Specialties, Inc.; ASI Group.

b. Bobrick Washroom Equipment, Inc.
c. Bradley Corporation.

3. Mounting: Recessed.
4. Minimum Capacity: 250 seat covers.
5. Exposed Material and Finish: Stainless steel, No. 4 finish (satin).
6. Lockset: Tumbler type.

H. Mirror Unit Detention:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product, Bobrick B-290 2436: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
a. American Specialties, Inc.; ASI Group.
b. Bobrick Washroom Equipment, Inc.
c. Bradley Corporation.

A. Mirror Unit Non-Detention: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

I. Mirror Unit:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product, Bobrick B-165 2436: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
a. American Specialties, Inc.; ASI Group.
b. Bobrick Washroom Equipment, Inc.
c. Bradley Corporation.
3. ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

## 2.3 UNDERLAVATORY GUARDS

A. Underlavatory Guard :
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
Basis-of-Design Product, Truebro Lav Guard 2 E-Z series, subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
a. Plumberex Specialty Products, Inc.
b. Truebro by IPS Corporation.
2. Description: Insulating pipe covering for supply and drain piping assemblies that prevents direct contact with and burns from piping; allow service access without removing coverings.
3. Material and Finish: Antimicrobial, molded plastic, white.

2.4 CUSTODIAL ACCESSORIES

A. Source Limitations: Obtain custodial accessories from single source from single manufacturer.

B. Shelf and Mop Holder:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product, Bobrick B-239: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. American Specialties, Inc.; ASI Group.
   b. Bobrick Washroom Equipment, Inc.
   c. Bradley Corporation.
   d. GAMCO Specialty Accessories; a division of Bobrick.
3. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
4. Length: 36 inches.
5. Hooks: Four.
6. Mop/Broom Holders: Three, spring-loaded, rubber hat, cam type.
7. Material and Finish: Stainless steel, No. 4 finish (satin).
   a. Shelf: Not less than nominal 0.05-inch- thick stainless steel.
   b. Rod: Approximately 1/4-inch- diameter stainless steel.

2.5 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.

B. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.

C. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

D. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

E. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.6 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

### 3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written instructions.

### 3.3 ACCESSORY SCHEDULE

| Item | Description | Bobrick | ASI | Gamco | Bradley | Acorn |
|---|---|---|---|---|---|---|
| CH | Clothes Hook | B-983 | | MSA-18 | | |
| CHV | Clothes Hook (Vandal Resistant) | B-981 | | | | |
| CHVM | Clothes Hook (Vandal Resistant - Multiple) | B-985 | | | SA-39 | |
| GB | Grab Bar | 6806 series | 3200 series | 150S | | |
| GBS | Grab Bar-Special | 5806 series | 3200 series | 150C Series | | |
| Grab Bar-Suicide-Resistant 1-1/2-inch O.D. satin finish stainless steel with exposed mounting flanges with 11-gauge stainless steel closure plate extending from underside of bar to wall, in sizes and configurations as indicated. | | | | MSA-14 | SA40 | |
| MIR | Mirror-Framed | 165-1830 | 0625A1830 | C-18x30 | | |
| MI-234 | Mirror-Unframed (Inmate Security) | | 107 | | | 1817 series |
| MR | Mop Rack, 24 inches long | 223 | 0796A | MS-1 | | |
| PTD/WR | Paper Towel Dispenser/Waste Receptacle | B-3942 | 0469 | TW-1F | | |
| SD | Soap Dispenser | 2112 | 0326 | G58AP | | |
| SH | Metal Shelves, 48 inches by 8 inches | 298 | 0692 | S-8 series | | |

Delta 25
CB-003.3

| Item | Description | Bobrick | ASI | Gamco | Bradley | Acorn |
|---|---|---|---|---|---|---|
| SNV | Sanitary Napkin Vendor Surface Mounted Free (Staff) | 282-25 | 0468 | NV-1FS | | |
| SND | Sanitary Napkin Disposal | 270 | 0852 | ND-1 | | |
| | | | | | | |
| | | | | | | |
| STH | Security Tissue Holder | | 9030 | MSA-1 | | |
| TPH | Toilet Paper Holder (Staff) | 685 | 0030 | TTD-5 | | |
| TSCD | Toilet Seat Cover Dispenser-Surface | 221 | 477SM | TSC-1 | | |

**END OF SECTION 10 28 00**

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# SECTION 10 44 13 - FIRE PROTECTION CABINETS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
   1. Fire-protection cabinets for the following:
      a. Portable fire extinguishers.

### 1.3 UNIT PRICES

A. Work of this Section is affected by Insert name of unit price.

### 1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semirecessed-, or surface-mounting method and relationships of box and trim to surrounding construction.

B. Shop Drawings: For fire-protection cabinets. Include plans, elevations, sections, details, and attachments to other work.

C. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semirecessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.

### 1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

### 1.6 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

### 1.7 SEQUENCING

A. Apply decals on field-painted fire-protection cabinets after painting is complete.

## PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 SECURITY FIRE-PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. Larsens Manufacturing Company.
      b. JL Industries, Inc.; a division of the Activar Construction Products Group.
      c. Nystrom, Inc.

B. Cabinet Model No AL-2409-6R. Material: Formed sheet steel, primed 18 gauge thick base metal, semi-recessed.

C. Semi-Recessed Cabinet:
   1. Exposed Trim: 2-1/2” rolled edge semi-recessed. One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

D. Door Glazing: 1/8 inch thick clear acrylic.

E. Door Hardware: Cylinder lock with break-away handle at 48 inches maximum above finish floor. Hinge doors for 180 degree opening with continuous piano hinge. Provide roller type catch.

F. Accessories:
   1. Keys: Three per door lock.

2.3 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
   1. Weld joints and grind smooth.
   2. Provide factory-drilled mounting holes.
   3. Prepare doors and frames to receive locks.
   4. Install door locks at factory.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.
   1. Fabricate door frames of one-piece construction with edges flanged.
   2. Miter and weld perimeter door frames.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.4 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire-protection cabinets after assembly.

D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Examine roughing-in for hose valves and cabinets to verify actual locations of piping connections before cabinet installation.

B. Examine walls and partitions for suitable framing depth and blocking where recessed cabinets will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for recessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights indicated below:
   1. Fire-Protection Cabinets: 54 inches above finished floor to top of cabinet.

B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
   1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semi-recessed fire-protection cabinets.
   2. Provide inside latch and lock for break-glass panels.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.

E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

**END OF SECTION 10 44 13**

# SECTION 10 44 16 - FIRE EXTINGUISHERS

## PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher.

1.3 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.5 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Failure of hydrostatic test according to NFPA 10.
   b. Faulty operation of valves or release levers.
2. Warranty Period: Six years from date of Substantial Completion.

## PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

C. Type, size, and capacity for each fire protection cabinet and mounting bracket indicated.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Ansul Incorporated; Tyco International Ltd.
b. J. L. Industries, Inc.; a division of Activar Construction Products Group.
c. Larsen's Manufacturing Company.
d. Approved equal.

1. Valves: Manufacturer's standard.
2. Handles and Levers: Manufacturer's standard.
3. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.
4. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 2A:10B:C, 5-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.
   a. California State Fire Marshal Approved.

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.
   1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fire extinguishers in locations indicated and in compliance with requirements of authorities having jurisdiction. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
   1. Mounting Brackets: 48 inches above finished floor to top of fire extinguisher bracket.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

**END OF SECTION 10 44 16**

# SECTION 10 56 13 - METAL STORAGE SHELVING

## PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design metal storage shelving, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance for Case-Type Metal Storage Shelving: Capable of withstanding the loads indicated according to MH 28.1.

C. Structural Performance for Post-and-Beam Metal Storage Shelving: Capable of withstanding the loads indicated according to MH 28.2.

D. Seismic Performance: Metal storage shelving shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. Seismic Component Importance Factor: 1.0.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, construction details, material descriptions, dimensions of individual components and profiles, and finishes for metal storage shelving.

B. LEED Submittals:
1. Product Data for Credit IEQ 4.4: For particleboard, documentation indicating that product contains no urea formaldehyde.

C. Shop Drawings: For customized metal storage shelving. Include plans, elevations, sections, details, and attachments to other work. Include installation details of connectors, lateral bracing, and special bracing.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal storage shelving to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials from same production run that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Shelves: Full-size units equal to 5 percent of amount installed for each type indicated, but no fewer than five shelves.

2. Shelf-to-Post Connectors: Full-size units equal to 5 percent of amount installed for each type indicated, but no fewer than 10 connectors.
3. Shelf-Label Holders: Full-size units equal to 5 percent of amount installed for each type indicated, but no fewer than 10 holders.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain metal storage shelving from single source from single manufacturer.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install metal storage shelving until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.8 COORDINATION

A. Coordinate sizes and locations of blocking and backing required for installation of metal storage shelving attached to wall and ceiling assemblies.

B. Coordinate locations and installation of metal storage shelving that may interfere with ceiling systems including lighting, HVAC, speakers, sprinklers, access panels, electrical switches or outlets, and floor drains.

## PART 2 - PRODUCTS

2.1 MATERIALS

A. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with G60 zinc (galvanized) or A60 zinc-iron-alloy (galvannealed) coating.

B. Floor Anchors: Galvanized-steel, post-installed expansion anchors. Provide number per unit recommended by manufacturer unless additional anchors are indicated in calculations.

C. Wall Anchors: Manufacturer's standard, galvanized-steel anchors designed to secure metal storage shelving to adjacent wall. Provide one per shelving unit for each shelving unit adjacent to a wall unless additional anchors are indicated in calculations.

2.2 CASE-TYPE METAL STORAGE SHELVING

A. General: Factory-formed, field-assembled, freestanding, case-type metal storage shelving system, designed for shelves to span between and be supported by sheet metal end panels (without posts), with shelves adjustable over the height of shelving unit. Fabricate shelf units with end panel at each end so each unit is independent. Provide fixed top and bottom shelves, adjustable intermediate shelves, and accessories indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Adjustable Shelving Products; a division of Karp Associates, Inc.
b. Borroughs Corporation.
c. Lyon Workspace Products, LLC.

2.3 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.4 METALLIC-COATED STEEL-SHEET FINISHES

A. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry thickness.

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine floors for suitable conditions where metal storage shelving will be installed.

C. Examine walls to which metal storage shelving will be attached for properly located blocking, grounds, or other solid backing for attachment of support fasteners.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Vacuum finished floor and wet mop resilient flooring over which metal storage shelving is to be installed.

3.3 INSTALLATION

A. Install metal storage shelving level, plumb, square, rigid, true, and with shelves flat and free of dents or distortion. Make connections to form a rigid structure, free of buckling and warping.
   1. Install exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
   2. Install braces, straps, plates, brackets, and other reinforcements as needed to support shelf loading and as required for stability.
   3. Adjust post-base bolt leveler to achieve level and plumb installation.
   4. Anchor shelving units to floor with floor anchors through floor plate. Shim floor plate to achieve level and plumb installation.
   5. Install seismic restraints.
   6. Connect shelving units together.
   7. Install shelves in each shelving unit at spacing indicated on Drawings or, if not indicated, at equal spacing.

B. Accessories:
   1. Install finished end panels and trim at exposed ends of shelving units.
   2. Back Ledges: Install one per shelf.

3.4 ERECTION TOLERANCES

A. Erect metal storage shelving to a maximum tolerance from vertical of 1/2 inch in up to 10 feet of height, not exceeding 1 inch for heights taller than 10 feet.

B. Erect post-and-beam metal storage shelving to a maximum tolerance from vertical of 1/4 inch in 84 inches of height.

3.5 ADJUSTING

A. Adjust metal storage shelving so that connectors and other components engage accurately and securely.

B. Adjust and lubricate operable components to operate smoothly and easily, without binding or warping. Check and readjust operating hardware.

C. Touch up marred finishes or replace metal storage shelving that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by metal storage shelving manufacturer.

D. Replace metal storage shelving that has been damaged or has deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

**END OF SECTION 10 56 13**

# SECTION 11 05 13 - COMMON MOTOR REQUIREMENTS FOR EQUIPMENT

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, alternating-current, small and medium, squirrel-cage induction motors, installed at equipment manufacturer's factory, and motors shipped separately by equipment manufacturer for field installation.

### 1.3 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices and features to be compatible with the following:
   1. Motor controllers.
   2. Torque, speed, and horsepower requirements of the load.
   3. Ratings and characteristics of supply circuit and required control sequence.
   4. Ambient and environmental conditions of installation location.

## PART 2 - PRODUCTS

### 2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with requirements in this Section except when stricter requirements are specified in equipment schedules or Sections.

B. Comply with NEMA MG 1 unless otherwise indicated.

### 2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

## PART 3 - EXECUTION (Not Applicable)

**END OF SECTION 11 05 13**

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# SECTION 11 19 16 - DETENTION GUN LOCKERS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
   1. Pistol lockers.

### 1.3 COORDINATION

A. Coordinate installation of anchorages for detention gun lockers. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors that are to be embedded in adjacent construction. Deliver such items to Project site in time for installation.

B. Coordinate size and location of recesses in wall construction to receive recessed detention gun lockers.

### 1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for detention gun lockers.

B. LEED Submittals:

   1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings: For detention gun lockers.
   1. Include plans, elevations, sections, and attachment details.
   2. Indicate locations, dimensions, and profiles of wall and floor reinforcements.
   3. Indicate locations and installation details of built-in anchors.
   4. Show elevations and indicate dimensions of detention gun lockers, preparations for receiving anchors, and locations of anchorage.
   5. Show details of attachment of detention gun lockers to built-in anchors.

### 1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.6 FIELD CONDITIONS

A. Field Measurements: Verify openings for recessed detention gun lockers by field measurements before fabrication.

**PART 2 - PRODUCTS**

2.1 PERFORMANCE REQUIREMENTS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

2.2 PISTOL LOCKERS

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   1. Fasco Security Products; 6 Compartment Pistol Cabinet, FL-708-6-WP.
   2. American Innovative Manufacturing (AIM); 6 Compartment Pistol Cabinet, GC-106.
   3. American Jail Products, LLC; Pistol Locker, No. 325-6.
   4. Southern Folger Detention Equipment Company; Southern Pistol Locker, No. 600.

B. Cabinet: Minimum 36 inches wide by 29 inches high by 6 inches deep; 10ga steel doors and mounting angle. Line each compartment with mothproofed felt or nonabsorbing, closed-cell padding.
   1. Compartments: Six.

C. Doors: Formed from 3/16-inch- thick steel plate, supported by heavy-duty continuous bottom hinge.

D. Locks: type, keyed differently and master keyed; provide one lock for each compartment.
   1. Lock Preparation: Prepare door panel to accept cylinder specified in Section 087163 "Detention Door Hardware."

E. Mounting: Recessed, with mounting flange formed from same material as body.

F. Materials:
   1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
   2. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, CS (Commercial Steel), Type B; suitable for exposed applications.
   3. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, CS (Commercial Steel), Type B; free of scale, pitting, or surface defects; pickled and oiled.
   4. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666 or ASTM A 240/A 240M, austenitic stainless steel, Type 304.

G. Finishes:
   1. Steel Factory Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil for topcoat.
      a. Color and Gloss: As selected by Architect from manufacturer's full range.

2.3 FABRICATION

A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Coordinate dimensions and attachment methods of detention gun lockers with those of adjoining construction to produce integrated assemblies with closely fitting joints and with edges and surfaces aligned unless otherwise indicated.

C. Shear and punch metals cleanly and accurately. Remove burrs.

D. Form and grind edges and corners to be free of sharp edges or rough areas.

E. Form metal in maximum lengths to minimize joints. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.

F. Weld corners and seams continuously to comply with referenced AWS standard and the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. Finish exposed welds and surfaces smooth and blended at exposed connections so that no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
   5. Weld before finishing components to greatest extent possible. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

G. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure detention gun lockers rigidly in place and to support expected loads. Build in straps, plates, and brackets as needed to support and anchor fabricated items to adjoining construction. Reinforce formed-metal units as needed to attach and support other construction.

H. Cut, reinforce, drill, and tap detention gun lockers as indicated to receive hardware, fasteners, and similar items.

I. Form exposed work true to line and level with accurate angles, surfaces, and straight sharp edges.

J. Form exposed connections with hairline joints, flush and smooth using concealed fasteners where possible. Locate joints where least conspicuous.

2.4 ACCESSORIES

A. Concealed Bolts: ASTM A 307, Grade A unless otherwise indicated.

B. Embedded Plate Anchors: Fabricated from mild steel shapes and plates, minimum 3/16 inch thick; with minimum 1/2-inch- diameter, headed studs welded to back of plate.

C. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of detention gun lockers.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations of detention gun lockers before detention gun locker installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of detention gun lockers.

D. Inspect built-in and cast-in anchor installations, before installing detention gun lockers, to verify that anchor installations comply with requirements. Prepare inspection reports.
1. Remove and replace anchors where inspections indicate that they do not comply with specified requirements. Reinspect after repairs or replacements are made.
2. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.

E. Verify locations of detention gun lockers with those indicated on Shop Drawings.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing detention gun lockers to in-place construction. Include threaded fasteners for inserts, and other connectors.

B. Cutting, Fitting, and Placement: Obtain manufacturer's written approval for cutting, drilling, and fitting required for installing detention gun lockers. Set detention gun lockers accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in formwork for items that are to be built into or similar construction.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.

E. Adjust doors and latches of detention gun lockers to operate easily without binding. Verify that integral locking devices operate properly.

F. Assemble detention gun lockers requiring field assembly with security fasteners with no exposed fasteners on exposed faces and frames.

3.3 FIELD QUALITY CONTROL

A. Inspect installed products to verify compliance with requirements. Prepare inspection reports and indicate compliance with and deviations from the Contract Documents.

B. Remove and replace detention work if inspections indicate that work does not comply with specified requirements. Remove malfunctioning units; replace with new units.

C. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.

D. Prepare field quality-control certification that states installed products and their installation comply with requirements in the Contract Documents.

**END OF SECTION 11 19 16**

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# SECTION 11 31 00 - RESIDENTIAL APPLIANCES

## PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Cooking appliances.
2. Refrigeration appliances.

1.3 ALLOWANCES

A. Furnish residential appliances as part of residential appliance allowance.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include installation details, material descriptions, dimensions of individual components, and finishes for each appliance.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

B. LEED Submittals:

1. Product Data for : For appliances indicated, documentation that products are ENERGY STAR rated.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of appliance.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each residential appliance to include in operation and maintenance manuals.

## PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain residential appliances from single source.

2.2 PERFORMANCE REQUIREMENTS

A. Electrical Appliances: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with applicable provisions in CBC.

2.3 MICROWAVE OVENS at Break Rm A111

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Kenmore –204.76982610 Model # P11043APH-WJW
2. General Electric Company (GE Appliances).
3. Maytag; a division of Whirlpool Corporation.
4. Whirlpool Corporation.

RFI 0423

*BLDG A Refri Req @ Break Rm A111*

*GE, Whirlpool, Maytag: 21 cuft*

C. Microwave:
1. Capacity: 1.6 cu. ft..
2. Oven Door: Door with observation window and push handle.
3. Microwave Power Rating: Manufacturer's standard.
4. Electric Power Supply: 120 V, 60 Hz.
5. Controls: Digital panel controls and timer display.
6. Appliance Color/Finish: White.

2.4 REFRIGERATOR at Lactation Rm A125

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. Kenmore – Model # 99759, 2.4 Cu. Ft.
   b. General Electric Company (GE Appliances).
   c. Maytag; a division of Whirlpool Corporation.
   d. Whirlpool Corporation.
1. Energy Performance, ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product-labeling program.
2. Interior Panel(s): Manufacturer's standard.
   a. Panel Color: White.
2. Appliance Color/Finish: Black.
3. Dimensions:
   a. Width: 17.5”
   b. Depth: 20.1”
   c. Height: 24.8”

6.2 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

**PART 7 - EXECUTION**

7.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, power connections, and other conditions affecting installation and performance of residential appliances.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

7.2 INSTALLATION

A. Install appliances according to manufacturer's written instructions.

B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.

C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

**END OF SECTION 11 31 00**

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# SECTION 12 21 13 - LOUVER BLINDS

## PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Horizontal louver blinds with aluminum slats.

1.3 ALLOWANCES

A. Horizontal louver blinds are part of Window Covering Allowance.

1.4 ACTION SUBMITTALS

RFI 0352 — Louver Blind Sample Size: 6" sample in lieu of 12' acceptable

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, ~~12 inches long.~~

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For horizontal louver blinds to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Horizontal Louver Blinds: Full-size units equal to 5 percent of quantity installed for each size, color, texture, pattern, and gloss indicated, but no fewer than two units.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver horizontal louver blinds in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install horizontal louver blinds until construction and wet-work and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where horizontal louver blinds are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Source Limitations: Obtain horizontal louver blinds from single source from single manufacturer.

### 2.2 HORIZONTAL LOUVER BLINDS, ALUMINUM SLATS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Hunter Douglas Contract.
   2. Levolor Contract; a Newell Rubbermaid company.
   3. Springs Window Fashions; SWFcontract.

C. Slats: Aluminum; alloy and temper recommended by producer for type of use and finish indicated; with crowned profile and radius corners.
   1. Width: 1 inch .
   2. Thickness: Manufacturer's standard.
   3. Features:
      a. Lift-Cord Rout Holes: Minimum size required for lift cord and located near back (outside) edge of slat to maximize slat overlap and minimize light gaps between slats.

D. Headrail: Formed steel or extruded aluminum; long edges returned or rolled. Headrails fully enclose operating mechanisms on three sides.
   1. Manual Lift Mechanism:
      a. Lift-Cord Lock: Top locking; stops lift cord when blind is in fully opened or fully closed positions only; equipped with ring pull not more than 4 inches long.
   2. Manual Tilt Mechanism: Enclosed worm-gear mechanism and linkage rod that adjusts ladders.
      a. Tilt: Full.

E. Bottom Rail: Formed-steel or extruded-aluminum tube that secures and protects ends of ladders and lift cords and has plastic- or metal-capped ends.
   1. Type: Manufacturer's standard .

F. Lift Cords: Manufacturer's standard braided cord.

G. Ladders: Evenly spaced across headrail at spacing that prevents long-term slat sag.
   1. Type: Braided cord .

H. Valance: Manufacturer's standard.

I. Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.
   1. Type: As indicated.

J. Colors, Textures, Patterns, and Gloss:
   1. Slats: As selected by Architect from manufacturer's full range.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

A. Install horizontal louver blinds level and plumb, aligned and centered on openings, and aligned with adjacent units according to manufacturer's written instructions.
   1. Locate so exterior slat edges are not closer than 1 inch from interior faces of glass and not closer than 1/2 inch from interior faces of glazing frames through full operating ranges of blinds.
   2. Install mounting and intermediate brackets to prevent deflection of headrails.
   3. Install with clearances that prevent interference with adjacent blinds, adjacent construction, and operating hardware of glazed openings, other window treatments, and similar building components and furnishings.

B. Electrical Connections: Connect motorized operators to building electrical system.

### 3.3 ADJUSTING

A. Adjust horizontal louver blinds to operate free of binding or malfunction through full operating ranges.

### 3.4 CLEANING AND PROTECTION

A. Clean horizontal louver blind surfaces after installation according to manufacturer's written instructions.

B. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer that ensures that horizontal louver blinds are without damage or deterioration at time of Substantial Completion.

C. Replace damaged horizontal louver blinds that cannot be repaired in a manner approved by Architect before time of Substantial Completion.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain systems.

**END OF SECTION 12 21 13**

# SECTION 12 36 61.16 - SOLID SURFACING COUNTERTOPS

## PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Solid-surface-material countertops and backsplashes.

1.3 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site. Coordinate schedule with pre-installation conference for wood-veneer-faced cabinets and plastic-laminate-clad countertops.

1.4 ACTION SUBMITTALS

A. Product Data: For countertop materials.

B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

C. Samples for Initial Selection: For each type of material exposed to view.

D. Samples for Verification: For the following products:
   1. One full-size solid-surface-material countertop, with front edge and backsplash, 8 by 10 inches, of construction and in configuration specified.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and fabricator.

B. Woodwork Quality Standard Compliance Certificates:
   1. WI Certified Compliance Program certificates.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a licensee of WI's Certified Compliance Program.

B. Installer Qualifications: Fabricator of products or licensee of WI's Certified Compliance Program.

C. Certified Compliance

1. Before delivery to the jobsite the woodwork supplier shall provide a Woodwork Institute Certified Compliance Certificate indicating the millwork products being supplied and Certifying that these products fully meet the requirements of the Grade or Grades specified.
2. Each elevation of casework, each laminated plastic top, and each solid surface top shall bear a Woodwork Institute Certified Compliance Label.
3. At completion of installation the woodwork installer shall provide a Woodwork Institute Certified Compliance Certificate indicating the products installed, and Certifying that the installation of these products fully meets the requirements of the Grade or Grades specified.
4. All fees charged by the Woodwork Institute for their Certified Compliance Program are the responsibility of the millwork manufacturer and/or installer and shall be included in their bid.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements before countertop fabrication is complete.

1.8 COORDINATION

A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

**PART 2 - PRODUCTS**

2.1 SOLID-SURFACE-MATERIAL COUNTERTOPS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades indicated for construction, installation, and other requirements.
   1. Provide labels and certificates from WI certification program indicating that countertops, including installation, comply with requirements of grades specified.

B. Grade: Premium.

C. Configuration: Provide countertops with the following front and backsplash style:
   1. Front: 1 ½ inch, straight, slightly eased at top.
   2. Backsplash: Straight, slightly eased at corner.
   3. Endsplash: Matching backsplash.

D. Countertops: 1/2-inch- thick, solid surface material with front edge built up with same material.

E. Backsplashes: 1/2-inch- thick, solid surface material.

F. Fabrication: Fabricate tops in one piece with shop-applied edges unless otherwise indicated. Comply with solid-surface-material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
   1. Fabricate with loose backsplashes for field assembly.

2.2 COUNTERTOP MATERIALS

A. Adhesives: Adhesives shall not contain urea formaldehyde.

B. Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ANSI.
   1. Manufacturers: Subject to compliance with requirements, provide Dupont Corian Deep Bedrock or:
      a. Approved equal.
   2. Type: Provide Standard Type unless Special Purpose Type is indicated.
      a. Edge Profiles: 1/8” Roundover (Top and Bottom)
      b. Thickness: 1”
      c. Flame Spread: 20 maximum
      d. Grommets: Per drawings

**PART 3 – EXECUTION**

3.1 INSTALLATION

A. Grade: Premium.

B. Install countertops level to a tolerance of 1/8 inch in 8 feet.

C. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Pre-drill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

**END OF SECTION**

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# SECTION 13 34 19 - METAL BUILDING SYSTEMS

## PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Section 033000 Cast-In-Place Concrete

C. Section 071326 Self-adhering Sheet waterproofing

D. Section 072100 Thermal Insulation

E. Section 076200 Sheet Metal Flashing and Trim

F. Section 077233 Roof Hatches

G. Section 079200 Joint Sealants

H. Section 081113 Hollow Metal Doors and Frames

I. Section 084113 Aluminum-Framed Entrances and Storefront

J. Section 085113 Aluminum Windows

1.2 SUMMARY

A. Section Includes the complete design of a Deferred Approval Pre-Engineered Metal Building that includes but not limited to the following scope:
   1. Structural-steel framing (including but not necessarily limited to, primary framing, secondary framing, end wall framing, canopy framing and bracing) and anchor rod design.
   2. Metal roof panels and soffit panels.
   3. Metal wall panels and Translucent Polycarbonate Panels.
   4. Gutters and rain water leader downspouts.
   5. Insulated wall panels.
   6. Pre-Engineered metal steel stairs (including but not necessarily limited to, handrails, guardrails, columns, stringers, steps, landings, bracings and connections) and anchor rod design.

7. The General Contactor shall be responsible for hiring licensed professionals as required to design and build the systems as well as provide services to include the preparation of drawings as required for permit and plan review by Solano County Resource Management for building permit approval and the California State Fire Marshall having jurisdiction over the project. The contractor shall also be responsible for submitting the drawings to all authorities having jurisdiction over the project for review and approval. The deferred submittal items shall not be installed until the design and submittal documents have been approved by the building official and Architect and/or structural engineer.
8. Foundation design shown in the drawings is based on preliminary evaluation of metal building and stair reactions. Final building and stair reactions are to be submitted to the structural engineer for validation of foundations prior to construction.
9. Increased footing sizes and/or reinforcing steel sizes, as a result of the final foundation design and as required for permit by the agency having jurisdiction (beyond those shown on the drawings), shall be at no additional cost to the County.
10. The Contractor shall schedule and give prompt attention to the preparation and submittal of the Deferred Approval Pre-Engineered Metal Building. Extension of Contract Time will not be granted if the project is delayed due to not making the submittal in a timely manner.

1.3 DEFINITIONS

A. Terminology Standard: See MBMA's "Metal Building Systems Manual" for definitions of terms for metal building system construction not otherwise defined in this Section or in standards referenced by this Section.

1.4 COORDINATION

A. Coordinate sizes and locations of concrete foundations and casting of anchor-rod inserts or anchor rods into foundation walls and footings. Anchor rod installation, concrete, reinforcement, and formwork requirements are specified in Section 033000 "Cast-in-Place Concrete."

B. Coordinate metal panel assemblies with rain drainage work, flashing, trim, and construction of supports and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of metal building system component.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
      a. Structural-steel framing (including but are not necessarily limited to, primary framing, secondary framing, end wall framing, canopy framing and bracing) and anchor rod design.
      b. Metal roof panels and soffit panels.
      c. Metal wall panels and Translucent Polycarbonate Panels.
      d. Gutters and rain water leader downspouts.
      e. Insulated wall panels.

f. Pre-Engineered metal steel stairs (including but are not necessarily limited to, handrails, guardrails, columns, stringers, steps, landings, bracing and connections) and anchor rod design.

B. LEED Submittals:
1. Product Test Reports for Credit SS 7.2: For roofing materials, documentation indicating that roofing materials comply with Solar Reflectance Index requirement.
2. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings to be provided as Deferred Approval: Indicate components by others. Include full building plan, elevations, sections, details and the following:
1. Building system components including but not limited to vertical and lateral system design, roof and exterior metal panels, insulated exterior metal panels, attached canopy, supports and pre-fabricated fixed access stairs.
2. Anchor-Rod Plans: Submit anchor-rod plans and templates before foundation work begins. Include location, diameter, and minimum required projection of anchor rods required to attach metal building to foundation. Indicate column reactions at each location.
3. Structural-Framing Drawings: Show complete fabrication of primary and secondary framing; include provisions for openings. Indicate welds and bolted connections, distinguishing between shop and field applications. Include transverse cross-sections.
   a. Show provisions for attaching members.
4. Metal Roof, soffit and Wall Panel Layout Drawings: Show layouts of panels including methods of support. Include details of edge conditions, joints, panel profiles, corners, anchorages, clip spacing, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work; show locations of exposed fasteners.
   a. Show roof-mounted items including roof hatches, gutter, downspouts, equipment supports, pipe supports and penetrations, lighting fixtures, and items mounted on roof curbs.
   b. Show wall-mounted items including personnel doors, vehicular doors, windows, louvers, and lighting fixtures.
   c. Show wall and translucent panels.

1.6 INFORMATIONAL SUBMITTALS

A. Letter of Design Certification: Signed and sealed by a California Registered Civil Engineer or Structural Engineer. Include the following:

RFI 0001 *Stamp Approval Metal Building* *Acceptable for a Civil Engineer to stamp drawings.*

1. Name and location of Project.
2. Order number.
3. Name of manufacturer.
4. Name of Contractor.
5. Building dimensions including width, length, height, and roof slope.
6. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
7. Governing building code and year of edition.
8. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic design category or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads (cranes).

9. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
10. Building-Use Category: Indicate category of building use and its effect on load importance factors.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panel finishes and door hardware to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer.
1. Accreditation: Manufacturer's facility accredited according to the International Accreditation Service's AC472, "Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems."
2. Engineering Responsibility: Preparation of comprehensive engineering analysis and Shop Drawings by a California Registered Civil Engineer or Structural Engineer

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Protect foam-plastic insulation as follows:
1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic insulation materials to Project site before installation time.
3. Complete installation and concealment of foam-plastic materials as rapidly as possible in each area of construction.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with panel installation only when weather conditions permit metal panels to be installed according to manufacturers' written instructions and warranty requirements.

1.11 WARRANTY

A. Special Warranty on Metal Panel Finishes: Manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 20 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide Star Building Systems; or comparable by one of the following:
   1. Star Building Systems; a division of NCI Building Systems, Inc.
   2. MBCI, a division of NCI Building Systems, Inc.
   3. FCP Structures
   4. ACI Building Systems, Inc.
   5. Butler Manufacturing Company; a division of BlueScope Buildings North America, Inc.
   6. Schulte Building Systems, LLP.
   7. Varco Pruden Buildings; a division of BlueScope Buildings North America, Inc.
   8. Or Approved Equal.

C. Source Limitations: Obtain metal building system components, including primary and secondary framing and metal panel assemblies, from single source from single manufacturer.

### 2.2 SYSTEM DESCRIPTION

A. Provide a complete, integrated set of mutually dependent components and assemblies that form a metal building system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water into building interior.

B. Primary-Frame Type:
   1. Rigid Clear Span: Solid-member, structural-framing system without interior columns.

C. End-Wall Framing: Manufacturer's standard, for buildings not required to be expandable, consisting of load-bearing end-wall and corner columns and rafters.

D. Secondary-Frame Type: Manufacturer's standard purlins and joists and exterior-framed (bypass) girts.

E. Eave Height: Manufacturer's standard height, as indicated by nominal height on Drawings.

F. Bay Spacing: 20 feet unless noted otherwise on the drawings.

G. Roof Slope: As indicated on Drawings.

## 2.3 METAL ROOF PANELS

A. Basis of Design Product: Star Building Systems Metal Roof Panels Double-Lok: Formed with vertical ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels.
   1. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.024-inch nominal 24 GA uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
      a. For low slope (2:12 or less) roofing provide a Solar Reflectivity (SR) value of 0.65 or higher when tested according to Cool Roof Rating Council (CRRC-1).
   2. Clips: One-piece fixed to accommodate thermal movement.
   3. Joint Type: mechanically field seamed together.
   4. Panel Coverage: 12 inches. — 24" Metal Roof Panel Acceptable
   5. Panel Height: 3 inches.
   6. Color: Almond or as shown on drawings.

RFI 0061

B. Finishes: Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions

C. Accessories:
   1. Box Gutters 26 gauge 4”x4” deep with integral apron extension, leaf gutter guards and gutter hangers strap at 2’-0” on center. Finish color to match building roof panels. Provide color sample for Architects review.
   2. Rainwater downspout, elbow, kickout, commercial grade, 26 gauge with straps at 6’-0” on center. Finish to match building wall panels. Provide color sample for Architects review.

## 2.4 METAL WALL PANELS

A. Basis of Design Product: Subject to compliance with requirements provide; Metal Sales Manufacturing Corporation: Flush Face Series TLC-9 and integral Translucent Polycarbonate Panels.

B. Product Options:
   1. Panel Coverage: 12 inches (304.8 mm).
   2. Panel Depth: 1 ½” (38.1 mm).
   3. Material: Aluminum-zinc alloy-coated steel sheet, ASTM A 792, AZ50 coating designation, structural quality, Grade 50 0.0236 inch (0.60mm) 24 GA minimum thickness.
   4. Material: Aluminum sheet, ASTM B 209, 0.032 inch (0.813 mm) minimum thickness.
   5. Finish: PVDF (Kynar 500).
   6. Panel Fasteners: Concealed, direct fastened.
   7. Color: Khaki or as shown on drawings.

## 2.5 METAL SOFFIT PANELS

A. Basis of Design Product: Subject to compliance with requirements provide Metal Sales Manufacturing Corporation: Soffit Panel.

B. Substitution Limitations: All other manufacturers: Submit substitution request.

C. Product Options:
1. Panel Coverage: 12 inches (304.8).
2. Panel Depth: 1” (25.4mm).
3. Material: Aluminum-zinc alloy-coated steel sheet, ASTM A 792, AZ50 coating designation, structural quality, Grade 50 0.0236 inch (0.60mm) 24 GA minimum thickness.
4. Material: Aluminum sheet, ASTM B 209, 0.032 inch (0.813 mm) minimum thickness.
5. Finish: PVDF (Kynar 500).
6. Panel Fasteners: Concealed, direct fastened.
7. Surface Configuration: V-Groove
8. Color: As selected by Architect from manufacturer’s standard colors.
9. Air Infiltration: 0.25 cfm/sq.ft. at 6.24 psf when tested according to ASTM E 283.
10. Water Penetration: No penetration at 12 psf when tested according to ASTM E 331.
11. Uniform Static Air Pressure Difference: Tested according to ASTM E 330.

## 2.6 INSULATED WALL PANELS

A. Basis of Design Product: Metl-Span HPCI Barrier Panel: Roll-former exterior and interior steel sheet faces chemically bonded to continuously foamed-in-place polyurethane core; laminated panels are not acceptable.

B. Product Options:
1. Exterior and interior face: HPCI Galvanized stucco embossed painted steel, minimum Grade 33 stucco embossed painted steel, thickness of 0.016”.
2. Longitudinal Joint Sealants: Field applied.
3. Foam Core: Continuous foamed-in-place 92% min. closed cell, Non-CFC, Class I, Non-VOC polyurethane.
4. Exterior and Interior Finish: One coat factory applied Polyester coil coating nominal 0.7 mil (0.02 mm) in White, over 0.2 mil (0.005 mm) primer.
5. Metl-Span HPCI Barrier Panel: Concealed fastener wall panels with offset double tongue and grooves joinery, providing a high performance barrier joint to maximize thermal efficiency of the continuous insulated assembly. An extended metal shelf allowing fasteners to penetrate both metal faces with clips concealed in the side joint.
    a. Exterior Face Profile: Non profiled stucco embossed.
    b. Interior face Profile: Light Mesa, stucco embossed.
    c. Module Width: 42”.
    d. Thickness: 2”.
    e. Maximum length 24’.

C. The HPCI Barrier Panel must be separated from the interior of the building by an approved thermal barrier of 0.5-inch (.127 mm) gypsum wallboard to meet IBC requirements.

D. Flashing and trim shall be brake-formed sheet metal in the same thickness and finish to match the panels.

2.7 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Division 01 "Quality Requirements," to design metal building system.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

C. Fire-Resistance Ratings: Where assemblies are indicated to have a fire-resistance rating, provide metal panel assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 or ASTM E 108 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Indicate design designations from UL's "Fire Resistance Directory," FM Global's "Approval Guide," or from the listings of another qualified testing agency.

D. Fire Propagation Characteristics: Exterior wall assemblies containing foam plastics pass NFPA 285 fire test.

E. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.

F. Structural Performance for Metal Roof and Wall Panels: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
1. Wind Loads: As indicated on Drawings.

G. Air Infiltration for Metal Roof Panels: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E 1680 or ASTM E 283 at the following test-pressure difference:
1. Test-Pressure Difference: 1.57 lbf/sq. ft..

H. Air Infiltration for Metal Wall Panels: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E 283 at the following test-pressure difference:
1. Test-Pressure Difference: 1.57 lbf/sq. ft..

I. Water Penetration for Metal Roof Panels: No water penetration when tested according to ASTM E 1646 or ASTM E 331 at the following test-pressure difference:
1. Test-Pressure Difference: 2.86 lbf/sq. ft..

J. Water Penetration for Metal Wall Panels: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 2.86 lbf/sq. ft..

K. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
1. Uplift Rating: UL 90.

L. FM Global Listing: Provide metal roof panels and component materials that comply with requirements in FM Global 4471 as part of a panel roofing system and that are listed in FM Global's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.
1. Fire/Windstorm Classification: Class 1A-60.
2. Hail Resistance: MH.

M. Solar Reflectance Index: Not less than 78 according to ASTM E 1980.

N. Energy Star Listing: Roof panels that are listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low -slope roof products.

O. Energy Performance: Provide roof panels according to one of the following when tested according to CRRC-1:
1. Three-year, aged, solar reflectance of not less than 0.55 and emissivity of not less than 0.75.
2. Three-year, aged, Solar Reflectance Index of not less than 64 when calculated according to ASTM E 1980.

P. Thermal Performance for Opaque Elements: Provide the following maximum U-factors and minimum R-values when tested according to ASTM C 1363 or ASTM C 518:

1. Roof:

| | Building A | Building B |
|---|---|---|
| U Factor | 0.047 | 0.051 |
| R Value | R30 | R30 |

2. Walls:

| | | |
|---|---|---|
| U Factor | 0.033 | 0.048 |
| R Value | R44 | R32 |

2.8 STRUCTURAL-STEEL FRAMING

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Structural Steel: Comply with AISC 360, "Specification for Structural Steel Buildings."

C. Bolted Connections: Comply with RCSC's "Specification for Structural Joints Using High-Strength Bolts."

D. Cold-Formed Steel: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for design requirements and allowable stresses.

E. Primary Framing: Manufacturer's standard primary-framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafters, rake, and canopy beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing.
   1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly. Provide frame span and spacing indicated.
      a. Slight variations in span and spacing may be acceptable if necessary to comply with manufacturer's standard, as approved by Architect.
   2. Rigid Clear-Span Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Interior columns are not permitted.
   3. Frame Configuration: Gable .
   4. Exterior Column: Tapered.

F. End-Wall Framing: Manufacturer's standard primary end-wall framing fabricated for field-bolted assembly to comply with the following:
   1. End-Wall and Corner Columns: I-shaped sections fabricated from structural-steel shapes; shop-welded, built-up steel plates; or C-shaped, cold-formed, structural-steel sheet.
   2. End-Wall Rafters: C-shaped, cold-formed, structural-steel sheet; or I-shaped sections fabricated from shop-welded, built-up steel plates or structural-steel shapes.

G. Secondary Framing: Manufacturer's standard secondary framing, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Unless otherwise indicated, fabricate framing from either cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet, prepainted with coil coating, to comply with the following:
   1. Purlins: C- or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes; minimum 2-1/2-inch- wide flanges.
      a. Depth: As needed to comply with system performance requirements.
   2. Girts: C- or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes. Form ends of Z-sections with stiffening lips angled 40 to 50 degrees from flange, with minimum 2-1/2-inch- wide flanges.
      a. Depth: As required to comply with system performance requirements.
   3. Eave Struts: Unequal-flange, C-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes; to provide adequate backup for metal panels.
   4. Flange Bracing: Minimum 2-by-2-by-1/8-inch structural-steel angles or 1-inch-diameter, cold-formed structural tubing to stiffen primary-frame flanges.
   5. Sag Bracing: Minimum 1-by-1-by-1/8-inch structural-steel angles.
   6. Base or Sill Angles: Manufacturer's standard base angle, minimum 3-by-2-inch, fabricated from zinc-coated (galvanized) steel sheet.
   7. Purlin and Girt Clips: Manufacturer's standard clips fabricated from steel sheet. Provide galvanized clips where clips are connected to galvanized framing members.
   8. Framing for Openings: Channel shapes; fabricated from cold-formed, structural-steel sheet or structural-steel shapes. Frame head and jamb of door openings and head, jamb, and sill of other openings.
   9. Miscellaneous Structural Members: Manufacturer's standard sections fabricated from cold-formed, structural-steel sheet; built-up steel plates; or zinc-coated (galvanized) steel sheet; designed to withstand required loads.

H. Canopy Framing: Manufacturer's standard structural-framing system, designed to withstand required loads; fabricated from shop-welded, built-up steel plates or structural-steel shapes. Provide frames with attachment plates and splice members, factory drilled for field-bolted assembly.
   1. Type: Straight-beam, eave type Purlin-extension type .

I. Bracing: Provide adjustable wind bracing using any method as follows:
   1. Rods: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50; or ASTM A 529/A 529M, Grade 50; minimum 1/2-inch- diameter steel; threaded full length or threaded a minimum of 6 inches at each end.
   2. Diaphragm Action of Metal Panels: Design metal building to resist wind forces through diaphragm action of metal panels.

J. Anchor Rods: Headed anchor rods as indicated in Anchor Rod Plan for attachment of metal building to foundation.

K. Materials:
   1. W-Shapes: ASTM A 992/A 992M; ASTM A 572/A 572M, Grade 50 or 55; or ASTM A 529/A 529M, Grade 50 or 55.
   2. Channels, Angles, M-Shapes, and S-Shapes: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55; or ASTM A 529/A 529M, Grade 50 or 55.
   3. Plate and Bar: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55; or ASTM A 529/A 529M, Grade 50 or 55.
   4. Structural-Steel Sheet: Hot-rolled, ASTM A 1011/A 1011M, Structural Steel (SS), Grades 30 through 55, or High-Strength Low-Alloy Steel (HSLAS) or High-Strength Low-Alloy Steel with Improved Formability (HSLAS-F), Grades 45 through 70; or cold-rolled, ASTM A 1008/A 1008M, Structural Steel (SS), Grades 25 through 80, or HSLAS, Grades 45 through 70.
   5. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, SS, Grades 33 through 80, or HSLAS or HSLAS-F, Grades 50 through 80; with G60 coating designation; mill phosphatized.
   6. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
      a. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, SS, Grades 33 through 80, or HSLAS or HSLAS-F, Grades 50 through 80; with G90 coating designation.
      b. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, SS, Grade 50 or 80; with Class AZ50 coating.
   7. Non-High-Strength Bolts, Nuts, and Washers: ASTM A 307, Grade A, carbon-steel, hex-head bolts; ASTM A 563 carbon-steel hex nuts; and ASTM F 844 plain (flat) steel washers.
      a. Finish: Hot-dip zinc coating, ASTM F 2329, Class C.
   8. Structural Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563 heavy-hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
      a. Finish: Hot-dip zinc coating, ASTM F 2329, Class C.

9. High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy-hex steel structural bolts or tension-control, bolt-nut-washer assemblies with spline ends; ASTM A 563 heavy-hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers, plain.
10. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex-head steel structural bolts with spline ends.
    a. Finish: Mechanically deposited zinc coating, ASTM B 695, Class 50.
11. Unheaded Anchor Rods: ASTM F 1554, Grade 36.
    a. Configuration: Straight.
    b. Nuts: ASTM A 563 heavy-hex carbon steel.
    c. Plate Washers: ASTM A 36/A 36M carbon steel.
    d. Washers: ASTM F 436 hardened carbon steel.
    e. Finish: Hot-dip zinc coating, ASTM F 2329, Class C.
12. Headed Anchor Rods: ASTM F 1554, Grade 36.
    a. Configuration: Straight.
    b. Nuts: ASTM A 563 heavy-hex carbon steel.
    c. Plate Washers: ASTM A 36/A 36M carbon steel.
    d. Washers: ASTM F 436 hardened carbon steel.
    e. Finish: Hot-dip zinc coating, ASTM F 2329, Class C.
13. Threaded Rods: ASTM A 193/A 193M .
    a. Nuts: ASTM A 563 heavy-hex carbon steel.
    b. Washers: ASTM F 436 hardened carbon steel.
    c. Finish: Hot-dip zinc coating, ASTM F 2329, Class C.

L. Finish: Factory primed. Apply specified primer immediately after cleaning and pretreating.
1. Clean and prepare in accordance with SSPC-SP2.
2. Coat with manufacturer's standard primer. Apply primer to primary and secondary framing to a minimum dry film thickness of 1 mil.
    a. Prime secondary framing formed from uncoated steel sheet to a minimum dry film thickness of 0.5 mil on each side.

## 2.9 FABRICATION

A. General: Design components and field connections required for erection to permit easy assembly.
1. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.
2. Fabricate structural framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Members shall be free of cracks, tears, and ruptures.

B. Tolerances: Comply with MBMA's "Metal Building Systems Manual" for fabrication and erection tolerances.

C. Primary Framing: Shop fabricate framing components to indicated size and section, with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.
1. Make shop connections by welding or by using high-strength bolts.
2. Join flanges to webs of built-up members by a continuous, submerged arc-welding process.

3. Brace compression flange of primary framing with steel angles or cold-formed structural tubing between frame web and purlin web or girt web, so flange compressive strength is within allowable limits for any combination of loadings.
4. Weld clips to frames for attaching secondary framing if applicable, or punch for bolts.
5. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime primary framing with specified primer after fabrication.

D. Secondary Framing: Shop fabricate framing components to indicated size and section by roll forming or break forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.
1. Make shop connections by welding or by using non-high-strength bolts.
2. Shop Priming: Prepare uncoated surfaces for shop priming according to SSPC-SP 2. Shop prime uncoated secondary framing with specified primer after fabrication.

E. Metal Panels: Fabricate and finish metal panels at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.
1. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of metal panel.

## PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Before erection proceeds, survey elevations and locations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments to receive structural framing, with erector present, for compliance with requirements and metal building system manufacturer's tolerances.
1. Engage land surveyor to perform surveying.

C. Proceed with erection only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition.

B. Provide temporary shores, guys, braces, and other supports during erection to keep structural framing secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural framing, connections, and bracing are in place unless otherwise indicated.

3.3 ERECTION OF STRUCTURAL FRAMING

A. Erect metal building system according to manufacturer's written instructions and drawings.

B. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.

C. Set structural framing accurately in locations and to elevations indicated, according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.

D. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
   1. Set plates for structural members on wedges, shims, or setting nuts as required.
   2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
   3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

E. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
   1. Level and plumb individual members of structure.
   2. Make allowances for difference between temperature at time of erection and mean temperature when structure will be completed and in service.

F. Primary Framing and End Walls: Erect framing level, plumb, rigid, secure, and true to line. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist-cure grout for not less than seven days after placement.
   1. Make field connections using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt type and joint type specified.
      a. Joint Type: Snug tightened or pretensioned as required by manufacturer.

G. Secondary Framing: Erect framing level, plumb, rigid, secure, and true to line. Field bolt secondary framing to clips attached to primary framing.
   1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
   2. Locate and space wall girts to suit openings such as doors and windows.
   3. Provide supplemental framing at entire perimeter of openings, including doors, windows, louvers, ventilators, and other penetrations of roof and walls.

H. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.
   1. Tighten rod and cable bracing to avoid sag.
   2. Locate interior end-bay bracing only where indicated.

I. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to structural framing.

J. Erection Tolerances: Maintain erection tolerances of structural framing within AISC 303.

3.4 METAL PANEL INSTALLATION, GENERAL

A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. Examination: Examine primary and secondary framing to verify that structural-panel support members and anchorages have been installed within alignment tolerances required by manufacturer.
1. Examine roughing-in for components and systems penetrating metal panels, to verify actual locations of penetrations relative to seams before metal panel installation.

D. General: Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
1. Field cut metal panels as required for doors, windows, and other openings. Cut openings as small as possible, neatly to size required, and without damage to adjacent metal panel finishes.
   a. Field cutting of metal panels by torch is not permitted unless approved in writing by manufacturer.
2. Install metal panels perpendicular to structural supports unless otherwise indicated.
3. Flash and seal metal panels with weather closures at perimeter of openings and similar elements. Fasten with self-tapping screws.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Locate metal panel splices over structural supports with end laps in alignment.
6. Lap metal flashing over metal panels to allow moisture to run over and off the material.

E. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.

F. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal panel assemblies. Provide types of gaskets, fillers, and sealants indicated; or, if not indicated, provide types recommended by metal panel manufacturer.
1. Seal metal panel end laps with double beads of tape or sealant the full width of panel. Seal side joints where recommended by metal panel manufacturer.
2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

## 3.5 METAL ROOF PANEL INSTALLATION

A. General: Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.
   1. Flash and seal metal roof panels with weather closures at eaves and rakes. Fasten with self-tapping screws.

B. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint, at location and spacing and with fasteners recommended by manufacturer.
   1. Install clips to supports with self-drilling or self-tapping fasteners.
   2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
   3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
   4. Seamed Joint: Crimp standing seams with manufacturer-approved motorized seamer tool so that clip, metal roof panel, and factory-applied sealant are completely engaged.
   5. Rigidly fasten eave end of metal roof panels and allow ridge end free movement for thermal expansion and contraction. Predrill panels for fasteners.
   6. Provide metal closures at rake edges each side of ridge and hip caps.

C. Metal Fascia Panels: Align bottom of metal panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws. Flash and seal metal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

D. Metal Roof Panel Installation Tolerances: Shim and align metal roof panels within installed tolerance of 1/4 inch in 20 feet on slope and location lines and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

## 3.6 METAL WALL PANEL INSTALLATION

A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts, extending full height of building, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.
   1. Unless otherwise indicated, begin metal panel installation at corners with center of rib lined up with line of framing.
   2. Shim or otherwise plumb substrates receiving metal wall panels.
   3. When two rows of metal panels are required, lap panels 4 inches minimum.
   4. When building height requires two rows of metal panels at gable ends, align lap of gable panels over metal wall panels at eave height.
   5. Rigidly fasten base end of metal wall panels and allow eave end free movement for thermal expansion and contraction. Predrill panels.
   6. Flash and seal metal wall panels with weather closures at eaves and rakes, and at perimeter of all openings. Fasten with self-tapping screws.
   7. Install screw fasteners in predrilled holes.
   8. Install flashing and trim as metal wall panel work proceeds.
   9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated on Drawings; if not indicated, as necessary for waterproofing.

10. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws.
11. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

B. Metal Wall Panels: Install metal wall panels on exterior side of girts. Attach metal wall panels to supports with fasteners as recommended by manufacturer.

C. Installation Tolerances: Shim and align metal wall panels within installed tolerance of 1/4 inch in 20 feet, noncumulative; level, plumb, and on location lines; and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

## 3.7 ADJUSTING

A. Doors: After completing installation, test and adjust doors to operate easily, free of warp, twist, or distortion.

B. Door Hardware: Adjust and check each operating item of door hardware and each door to ensure proper operation and function of every unit. Replace units that cannot be adjusted to operate as intended.

C. Windows: Adjust operating sashes and ventilators, screens, hardware, and accessories for a tight fit at contact points and at weather stripping to ensure smooth operation and weathertight closure. Lubricate hardware and moving parts.

D. After completing installation, including work by other trades, lubricate, test, and adjust units to operate easily, free of warp, twist, or distortion as needed to provide fully functioning units.
1. Adjust louver blades to be weathertight when in closed position.

## 3.8 CLEANING AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

B. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

C. Touchup Painting: After erection, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted structural framing, bearing plates, and accessories.
1. Clean and prepare surfaces by SSPC-SP 2, "Hand Tool Cleaning," or by SSPC-SP 3, "Power Tool Cleaning."
2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

D. Touchup Painting: Cleaning and touchup painting are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

E. Metal Panels: Remove temporary protective coverings and strippable films, if any, as metal panels are installed. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

1. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

F. Doors and Frames: Immediately after installation, sand rusted or damaged areas of prime coat until smooth and apply touchup of compatible air-drying primer.
   1. Immediately before final inspection, remove protective wrappings from doors and frames.

**END OF SECTION 13 34 19**

# SECTION 21 10 00 WATER-BASED FIRE SUPPRESSION SYSTEMS

## PART 1 GENERAL

### 1.1 SUMMARY

A. Section Includes:
1. Settlement Joint
2. Pipe, Fittings, Valves and Connections for Sprinkler Systems.
3. Sprinkler Heads.
4. Fire Department Connections.
5. Alarm Devices.

B. Related Sections:
1. Section 22 07 19 - Meters and Gauges for Plumbing Piping.
2. Section 28 31 00 - Fire Detection and Alarm.

### 1.2 REFERENCES

A. National Fire Protection Association (NFPA)
1. NFPA 13 - Installation of Sprinkler Systems.
2. NFPA 15 - Water Spray Fixed Systems for Fire Protection.
3. NFPA 25 - Inspection, Testing and Maintenance of Water-Based Fire Protection Systems.
4. NFPA 72 - National Fire Alarm Code.
5. NFPA 230 - Fire Protection of Storage.
6. NFPA 291 - Recommended Practice for Fire Flow Testing and Marking of Hydrants.
7. NFPA 1961 - Fire Hose.
8. NFPA 1963 - Fire Hose Connections.

B. Factory Mutual Systems (FM) Publications
1. Approval Guide.

C. Underwriter’s Laboratories, Inc. (UL) Publications
1. Fire Protection Equipment Directory.

D. ASME
1. B1.20.1 - Pipe Threads, General Purpose.
2. B16.3 - Malleable Iron Threaded Fittings.
3. B16.4 - Gray Iron Threaded Fittings Class 125 and 250.
4. B16.5 - Pipe Flanges and Flanged Fittings.
5. B16.9 - Factory-Made Wrought Buttwelding Fittings.
6. B16.11 - Forged Steel Fittings, Socket-Welding and Threaded.
7. B16.25 - Buttwelding Ends.
8. B36.10 - Welded and Seamless Wrought Steel Pipe.

E. ASTM International
1. A47 - Ferritic Malleable Iron Castings.
2. A53 - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

3. A135 - Electric-Resistance-Welded Steel Pipe.
4. A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
5. A536-84 - Ductile Iron Castings.
6. C635 - Manufacture, Performance and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.
7. C636 - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.

F. Underwriter's Laboratories (UL)
1. UL 193 - Warm Valves for Fire-Protection Service.
2. UL 194 - Gasketed Joints for Ductile-Iron Pipe and Fittings for Fire Protection Service.
3. UL 213 - Rubber Gasketed Fittings for Fire Protection Service.
4. UL 262 - Gate Valves for Fire-Protection Service.
5. UL 312 - Check Valves for Fire-Protection Service.
6. UL 346 - Waterflow Indicators for Fire Protective Signaling Systems.
7. UL 393 - Indicating Pressure Gauges for Fire-Protection Service.
8. UL 405 - Fire Department Connections.
9. UL 464 - Audible Signal Appliances.
10. UL 753 - Alarm Accessories for Automatic Water-Supply Control Valves for Fire Protection Service.
11. UL 1091 - Butterfly Valves for Fire-Protection Service.
12. UL 1468 - Direct Acting Pressure Reducing and Pressure Restricting Valves.
13. UL 1474 - Adjustable Drop Nipples for Sprinkler Systems.
14. UL 1726 - Automatic Drain Valves for Standpipe Systems.

G. AWWA C105 - Polethylene Encasement for Ductile-Iron Pipe Systems.

H. AWWA C151/ ANSI A21.51 - Ductile-Iron Pipe, Centrifugally Cast, for Water.

I. AWWA C110/ ANSI A21.1D - Ductile-Iron and Gray-Iron Fittings for Water.

J. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

K. ANSI/ ASSE 1012 - Performance Requirements for Backflow Preventer with Intermediate Atmospheric Vent.

L. AWWA C510 - Double Check Valve Backflow-Prevention Assembly.

M. AWWA C511 - Reduced-Pressure Principle Backflow-Prevention Assembly.

1.3 DEFINITIONS
1. Working plans as used in this Section refer to Contract Documents (including Drawings and calculations) prepared pursuant to requirements in NFPA 13 for obtaining approval of authority having jurisdiction CA Office Of The State Fire Marshal – Fire and Life Safety Division..
2. Other definitions for fire protection systems are included in referenced NFPA standards.

1.4 SYSTEM DESCRIPTION

A. Design Requirements

1. Wet Pipe Sprinkler System Description: This system must be installed in conformance with NFPA 13 with California Amendments. All materials utilized must be UL listed and approved. All materials installed must adhere to the manufacturer's installation guidelines. System devices must include the following:
   a. Sprinkler Heads: As indicated in Part 2 of this Section.

B. Performance Requirements
   1. Work provided under this Section must include, but not be limited to, Deferred submittal of Engineered and stamped automatic fire sprinkler system design as outlined in this Section, including all labor, materials, complete engineered calculations and design shop drawings needed to provide an operating system, and all of the following:
      a. Connection to fire service mains.
      b. Automatic sprinklers and appropriate escutcheons.
      c. Flexible sprinkler hose fitting.
      d. Control and check valves.
      e. Drain and test valves.
      f. Pipe, fittings, and auxiliary drains.
      g. Hangers and supports including seismic restraints, and any required calculations.
      h. Sleeves including firestopping and watertight sealants.
      i. Ceiling and wall plates.
      j. Cutting and patching.
      k. Signs, pipe identification, and flow arrows.
      l. Fire department connection.
      m. Waterflow alarms (paddle type and pressure-type).
      n. Supervisory devices.
      o. Coordination with all other trades including the subcontractor providing the detection and actuation system.
      p. Shop drawings, hydraulic calculations, device manufacturer's literature, and samples.
      q. Air tests, hydrostatic tests, Contractor's Material and Test Certificates and as-built drawings.
      r. Training and operating instructions.
      s. Spare parts/sprinklers in cabinet with special wrenches.
      t. All permits and fees for this work.
   2. The design must conform to NFPA 13 and the requirements specified in this Section. Design of the automatic wet pipe sprinkler system must be for Light Hazard, Ordinary Hazard Group 1, Extra Hazard Group 1 and Ordinary Hazard Group 2.
   3. The fire protection system includes fire water service from a flange at 6" above finish floor inside each Building to all spaces as indicated on the Fire Protection Plans and as required by NFPA 13. The underground piping design must be in accordance with NFPA 24. The system must include all materials, accessories and equipment inside and outside the building to provide a system complete and ready for use. Design and provide each system giving full consideration to inmate access, blind spaces, HVAC and plumbing piping, electrical equipment, ductwork and other construction and equipment in accordance with detailed drawings to be submitted for approval. Equipment for fire protection service must be UL listed or FM approved for use in a wet pipe sprinkler system.
   4. Sprinkler System Protection Limits: All spaces within each building except as noted on the Fire Protection Plans. Include plumbing chases, closets, toilet and locker room areas cells, each stairway, warming kitchen, day room, and special applications areas.

a. Exception: Areas with other fire extinguishing systems and areas indicated to be without sprinkler protection.
b. Commercial sprinklers must be provided in areas as indicated on the Fire Protection Plans. Part 2 of this Section contains detailed sprinkler requirements.
c. The type of sprinkler head to be used in each room is indicated on the Fire Protection Plans. Contractor must submit in writing the type of sprinkler heads used in each room for each building.

5. Water Distribution: Distribution must be uniform throughout each Building, which it is assumed the sprinkler heads will open. Variation in discharge from individual heads in the hydraulically most remote area must be between 100 and 200 percent of the specified density.
6. Piping Restrictions: Piping is prohibited in the following areas, except when solely supplying sprinklers in such areas:
   a. Electrical Rooms and Electrical Closets.
   b. Telephone Rooms and Telephone Closets.
   c. Elevator Machine Rooms and elevator shafts.
   d. Computer Rooms, MDF Rooms, IDF Rooms, and Electronic Rooms
7. Clearance from Electrical Equipment: Piping and automatic sprinklers are prohibited directly over:
   a. Transformers.
   b. Substations.
   c. Switchboards.
   d. Motor Control Centers.
   e. Emergency Generators.
   f. Bus Ducts.
   g. Electrical Panels.
   h. If installing pipe over electrical equipment is unavoidable, provide a galvanized drip pan under piping to protect electrical equipment. Provide 1/2-inch drain pipe from pan and terminate 6-inches above floor.
8. Inmate Accessible Areas: Exposed sprinkler piping in inmate accessible areas is not allowed. In inmate accessible areas where sprinkler piping cannot be routed above ceilings or soffits or within walls due to the type of construction, provide 16 gauge metal enclosures per typical drawing details.
9. Location of Sprinkler Heads: Heads in relation to the ceiling and the spacing of sprinkler heads must not exceed their linked area coverage for Light Hazard and Ordinary Hazard Group 1 & 2, as indicated. Uniformly space sprinklers on the branch piping. Locate sprinkler heads in a consistent pattern with ceiling grid, lights and supply air diffusers. Locate sprinkler heads in center of 2’x2’ tiles or centered in half of 2’x4’ tiles in areas as shown on the Drawings. Part 2 of this Section contains detailed sprinkler requirements.
10. Sprinkler Discharge Area: The sprinkler discharge area must be the hydraulically most remote areas as defined in NFPA 13 and 230.
11. Hose Allowances: System design must include a combined inside and outside hose allowance based on sprinkler hazard classification:
    a. Light Hazard: 100 GPM.
    b. Ordinary Hazard 1: 250 GPM.
    c. Ordinary Hazard 2: 250 GPM.
    d. Extra Hazard: 500 GPM.
12. Hydraulic Calculations must be performed in accordance with NFPA 13 and 15. A minimum 10% psi cushion or safety factor/margin, between the available pressure and the calculated required pressure must be incorporated into all hydraulic calculations.

13. The Contractor must provide system demands at base of risers. Available water supply at risers must be coordinated with the Civil Engineer. As stated above, confirm pressure with Civil Engineer prior to performing calculations.
14. Hydraulic Calculations: Hydraulic calculations for each building must be in conformance with NFPA 13 and the following requirements:
    a. The Contractor, within one year of the submittal of final working drawings, must conduct an up-to date fire flow test indicating the static and residual pressure in the water mains used for fire service with certified flow volumes at time of test. Tests must be conducted at or near peak demand of day.
    b. The Contractor must coordinate with Civil Engineer fire service water pressures for the entire site, as specified in Number 13 above.
    c. Densities listed below are for the most hydraulically remove areas plus hose streams.

| Occupancy | Density GPM/Sq.Ft. | Remote Area Sq.Ft. |
|---|---|---|
| Light Hazard<br>Corridors and Vestibules<br>Offices<br>Toilets<br>Mechanical Chases | 0.10 | 1500 |
| Ordinary Hazard Group 1<br>Storage Rooms<br>Electrical Rooms<br>Mechanical Rooms / Water Heater Rooms<br>Janitor Closets<br>Equipment Rooms | 0.15<br><br><br><br>0.15 | 1500<br><br><br><br>1500 |
| Ordinary Hazard Group 2<br>Storage Areas<br>Machine Shop<br>Auto Repair Shop<br>Workshop | 0.20 | 1500 |
| Extra Hazard Group 1<br>Welding Shop and Storage Area | 0.30 | 2500 |

        1) Mechanical Rooms and Plumbing chases to be hydraulically designed to provide a design density of 0.20 gpm/sq.ft. over the most remote 2,000 sq.ft.
        2) Note: Maximum allowable velocity for inside piping should not exceed 28 FPS. Underground pipe velocities should not exceed 20 FPS.
    d. Components and Installation: Capable of producing piping systems with the following minimum working pressure rating except where indicated otherwise:
        1) Sprinkler Systems: 175 psig.

1.5 TOLERANCES

A. The Contractor must furnish on a design/build basis, all equipment, materials, tools, labor, engineering, drawings, and accessories, necessary for complete fire protection systems, with said systems being made ready for operation. The purpose of the Specifications and Drawings is to convey to the Contractor the scope of design/build work required, all of which the

Contractor must furnish, install, adjust, and make operable, and to meet the requirements of the California State Fire Marshal.

B. The omission of any necessary system component must not relieve the Contractor of the responsibility for providing such necessity, without additional cost to the Owner. Any case of error, omission, discrepancy or lack of clarity must be promptly identified for clarification prior to the bid due date.

C. The Contractor must provide all devices and equipment required by these Specifications and Drawings and the State of California Fire Marshal. Under no circumstances must the Contractor delete any equipment or devices without written directive of the State of California Fire Marshal.

D. Authority Having Jurisdiction: Any reference in the Specifications or applicable to the "authority having jurisdiction" (AHJ) must be interpreted to mean the State of California Fire Marshal.

1.6 SUBMITTALS

A. Before any work is commenced, submit system calculations, manufacturer's data sheets (with listings or approvals), water supply data and a complete set of working drawings stamped by a Fire Sprinkler Contractor licensed in the State of California, certifying compliance with specifications. Partial submittals will not be acceptable.

B. Manufacturer's Data: Annotate descriptive data to show the specific model, type and size of each item the Contractor proposes to furnish. Where any devices which are provided or furnished involve work by another trade, submit additional data copies directly to the subcontractor. Where manufacturer's data sheets show multiple equipment or model numbers, indicate with an arrow the equipment to be provided.
1. Pipe, fittings and seismic supports.
2. Alarm valves.
3. Gate and check valves.
4. Globe valves.
5. Sprinklers and escutcheons.
6. Pipe hangers and supports.
7. Pressure and waterflow switches.
8. Tamper switches.
9. Inspector's test station.
10. Retard chamber.
11. Ball drip.
12. Fire department connections.
13. Lubricating compound / Pipe Dope
14. Signs.
15. Caps, Chains.
16. Drip pans.
17. Dielectric unions.
18. Signs, pipe identification, and flow direction.
19. Flexible sprinkler hose fittings.

C. Shop Drawings:

1. Submit: Shop drawings, hydraulic calculations and manufacturer's data as required to obtain approval of all applicable local, state, federal and insurance authorities.
2. Submit to the State of California Fire Marshal one (1) set of shop drawings, hydraulic calculations and manufacturer's data as required to obtain approval.
3. Submit: One set of shop drawings and manufacturer's data bearing the review stamp of all applicable local, state, federal and insurance authorities.
4. Hydraulic calculations must include a water supply graph and hydraulic cover sheet. The cover sheet must include the name and location of the calculated area, ceiling height, occupancy, design criteria, sprinkler spacing, system type, sprinkler make, model, size, K factor and temperature rating, flow requirements, C factor used, water supply data and source of information, and commodity storage class, height and configuration.
5. Prepare shop drawings at minimum scale of 1/8-inch equals 1 foot for plans, and 1/4-inch equals 1 foot for details. Show all piping, sprinklers, hangers, type of pipe, tube connections, outlets, roof construction, and occupancy of each area, including ceiling and roof heights as required by NFPA 13. When welding is planned, shop drawings must indicate the sections to be shop welded and the type of welded fittings to be used.
6. Shop drawings must include details of earthquake sway bracing with any required calculations.
7. Installation of the fire suppression system must not be started until all plans and specifications have been approved by the Office of the State of California Fire Marshal.

D. Changes:
1. Make no changes in installation from layout as shown on the approved Drawings. This does not include minor revisions for the purpose of coordination.
2. Any pipe fabricated and/or installed before all approvals are obtained are at the Contractor's own expense and responsibility. Any changes made to the approved drawings other than as stated above are at the Contractor's own expense and responsibility.

E. As-Built and Project Record Drawings:
1. Maintain at the site an up-to-date set of as-built drawings.
2. The Contractor must utilize the marked up drawings to produce a set of Project Record Drawings. Upon completion furnish four (4) sets of prints and one set in electronic AutoCAD 2005 "DWG" format of each approved shop drawing, revised to show "as-built" conditions.

F. Final Inspection and Test:
1. Upon completion of final inspections and tests, as required by appropriate NFPA Standards and these Specifications, submit documentation of all test results and copies of the Standard Contractor's Material and Test Certificates .

## 1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firms whose equipment, specialties, and accessories are listed by product name and manufacturer in UL Fire Protection Equipment Directory and FM Approval Guide and that conform to other requirements indicated.

B. Listing/Approval Stamp, Label, or Other Marking: On equipment, specialties, and accessories made to specified standards.

C. Listing and Labeling: Equipment, specialties, and accessories that are listed and labeled.

1. The Terms “Listed” and “Labeled”: As defined in “California Electrical Code,” Article 100.
2. Listing and Labeling Agency Qualifications: A “Nationally Recognized Testing Laboratory” (NRTL) as defined in OSHA Regulation 1910.7.

D. Comply with requirements of authority having jurisdiction for submittals, approvals, materials, hose threads, installation, inspections, and testing.

E. Comply with requirements of Owner’s insurance underwriter for submittals, approvals, materials, installation, inspections, and testing.

F. Licensed Fire Sprinkler Contractor: Submit design drawings, Fire Protection design calculations, and installation inspection reports, sealed by a Fire Sprinkler Contractor licensed in the State of California, certifying compliance with specifications.

G. Installer’s Qualifications: Firms qualified to install and alter fire protection piping, equipment, specialties, and accessories, and repair and service equipment. A qualified firm is one that is experienced (minimum of 5 previous projects similar in size and scope to this Project) in such work, familiar with precautions required, and in compliance with the requirements of the authority having jurisdiction. Submit evidence of qualifications upon request. Refer to Division 1.

H. NFPA Standards: Equipment, specialties, accessories, installation, and testing complying with the following:
1. NFPA 13.
2. California Electrical Code (CEC) 2013 edition.
3. NFPA 230.

1.8 DELIVERY, STORAGE AND HANDLING

A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

B. Provide temporary protective coating on cast iron and steel valves.

C. Certificates: Submit mill certificates indicating steel pipe for use in above-ground sprinkler piping conforms to specified requirements.

1.9 SEQUENCING AND SCHEDULING

A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment and ductwork, all plumbing systems, and partition assemblies.

B. MAINTENANCE SERVICE - Initial Maintenance Service: Beginning at Project completion, provide one year emergency repair service by skilled employees of sprinkler/standpipe system Installer.
1. Include 24-hour-per-day, 7-day-per-week emergency callback service.
   a. Response Time: Four hours or less.

1.10 EXTRA MATERIALS

A. Provide spare sprinkler cabinets, complete with sprinklers of assorted temperature ratings of the type necessary and in use throughout the installation as required by NFPA 13. Each cabinet must be equipped with one special sprinkler wrench required for each type of sprinkler installed.

## PART 2 PRODUCTS

2.1 PIPE WRAP FOR BELOW GROUND FIRE WATER SERVICE

A. General: Provide pipe wrap for all pipe installed below ground.
   1. Cleaning: Remove loose scale, rust, dirt, oil and grease before wrapping. Wire brush as required; use solvent for removal of oil and grease.
   2. Encase in two (2) layers of an AWWA C105, 8-mil polyethylene jacket, all ductile iron pipe installed below ground. Install jacket per AWWA C105.

2.2 MATERIALS - GENERAL

A. All components must be UL listed or FM approved for the intended purpose. Components must be used in accordance with the manufacturer's recommendations and its UL listing and/or FM approval.

2.3 PIPES AND FITTINGS

A. Above Ground Piping:
   1. General: Provide fittings for changes in direction of piping and for all connections. Arrange piping so that it can be drained at the main riser. Make changes in piping sizes through standard tapered, reducing pipe fittings; the use of bushings will not be permitted. Perform welding in the shop; field welding will not be permitted. Lubricant used on gaskets for mechanical fittings must be non-petroleum based. Run piping concealed in areas with suspended ceilings, except as otherwise noted on the Drawings.
   2. Pipe must be new, designed for 175 psi, non-shock, cold water working pressure, conforming to ASTM specifications, and have the manufacturer's name and brand along with the applicable ASTM standard marked on each length of pipe.
      a. Steel: Steel piping must be black or galvanized.
         1) Standard Wall: Overhead pipe used must be black steel and must comply with ASTM A135. Galvanized pipe must be used where exposed to atmosphere and for dry systems. Dimensions for all overhead pipe must be in accordance with the American Standard for Wrought Steel and Wrought Iron Pipe ASME B36.10M for pressure up to 300 psi. Schedule 40 pipe is considered "standard wall" pipe. Schedule 30 pipe is, acceptable in sizes 8-inch and larger. Standard wall pipe ends must be welded, threaded, cut grooved or plain end.
         2) Thin Wall: Overhead pipe of the Welded and Seamless Type specified in ASTM A53 used in welded systems must have a minimum pipe wall thickness for pressures up to 300 psi as follows: Schedule 10 in sizes up to 5-inch; 0.134 inches for 6-inch; and 0.188 inches for 8-inch pipe. Pipe ends must be roll grooved or welded in accordance with NFPA 13.
         3) Threadable light wall piping must not be used.
         4) Pipe and preparation must conform to the fitting manufacturer's recommendations.

2.4 FITTINGS

A. Piping connections for steel pipe must be threaded, flanged or grooved, and rated for 175 psi working pressure. Piping connections for stainless steel must be stainless steel. Plain end fittings and couplings are not permitted. All fittings must be suitable for use in sprinkler and standpipe systems in accordance with NFPA 13 and 14.
   1. Steel Pipe:
      a. Threaded fittings must be cast iron, 125 pound class, black, and in accordance with ASME B16.4; or malleable iron, 150 pound class, black and in accordance with ASME B16.3. Bushings must not be used unless written approval is obtained from the Owner. Threaded fittings on deluge system located outside must be malleable.
      b. Welded fittings must be steel, standard weights, black, and in accordance with ASME B16.9, ASME B16.25, ASME B16.5, ASME B16.11 and ASTM A234.
      c. Grooved fittings must be malleable or ductile iron joined with rigid or flexible couplings with approved gaskets. Groove-type fittings must be UL listed or FM approved for fire protection: Fittings must be manufactured by Victaulic, Gustin-Bacon, or approved equal.
      d. Grooved couplings and reducers must be malleable or ductile iron conforming to ASTM A47. Grooved couplings to be malleable or ductile iron having clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; composition sealing gaskets recommended by the manufacturer, steel bolts, nuts, and washers. Use hot-dipped galvanized couplings for galvanized pipe. Coupling gasket must be molded Elastomer (EPDM) Victaulic grade “E” (TYPE A), Gustin-Bacon Type W or as otherwise recommended by the manufacturer for dry pipe systems, or equal. Grooved couplings and reducers must be of the same manufacturer as used for the grooved fittings. Grooved couplings may be of flexible or rigid type.
      e. Flanged fittings must be Class 150 steel, rated at 200 psi working pressure and provided to match adjacent equipment or fittings. Where using bolt connections, the length of the bolts must not protrude as to prevent the use of a socket wrench on associated nuts. Flanged bolts must be hexagon head machine bolts with heavy semi-finished hexagon head nuts, cadmium plated, having dimensions in accordance with ANSI B18.2.1 and ANSI B18.2.2. Bolted connections must be hot-dipped galvanized; or stainless steel bolts, nuts, and washers where exposed to outside air. Gaskets must be full-faced of 1/16-inch minimum thickness red sheet rubber.

B. Drain, trim, and test valves must be approved.
   1. Main drain, auxiliary drain and inspectors test valves must be globe valves, bronze body, rising stem, inside screw, renewable composition disc manufactured by Nibco, Stockham or equal. Globe valves up to 1-inch to be Nibco KT-65, Stockham or equal. Globe valves 1-1 /4-inches to 3-inches to be Nibco KT-211-W, Stockham or equal.
   2. Gate valves must not be used for dry pipe system inspectors test connections.

C. Check Valves:
   1. Check valves for water supply, fire department connections, and risers must have removable covers for maintenance without removing the valve from the system.
   2. Check valves in the trim must be approved.

2.5 SPRINKLERS

A. Fire Sprinkler Heads:
   1. Sprinklers must be quick response type and have a temperature classification per NFPA 13. Fire sprinklers must be of one manufacturer throughout the building. No mixing of sprinkler brands is permitted. Sprinklers must be of all brass body construction with a metal Belleville spring seal, coated on both sides with Teflon film. Sprinklers utilizing non-metal parts in the sealing portion of the sprinkler are strictly prohibited. Institutional sprinklers must have a quick response solder link. Commercial sprinklers must have a quick response frangible bulb type fusible element. Sprinklers to be installed in areas with no ceilings must be of a brass finish and must be of adequate temperature for the hazard. Sprinklers must have a standard or large orifice and a 5.6 or 8.0 nominal K Factor. Sprinklers must be UL Listed or FM Approved. Quick response sprinklers must be listed for installation in an Ordinary Hazard occupancy if installed in an Ordinary Hazard occupancy.
   2. Sprinkler head types are indicated on the Fire Protection Plans. Contractor must review types of heads prior to shop drawing submittal.

B. Institutional Style Sprinklers:
   1. Quick Response Institutional Style Flush Pendent Sprinkler: Quick response institutional pendent sprinklers must have a standard orifice with a nominal K Factor of 5.6. Sprinkler must have a quick response solder link. Quick response institutional pendent sprinklers must incorporate a lock ring and chrome finish escutcheon that mount to the threaded sprinkler body at the finished ceiling. Quick response institutional pendent sprinklers must have a maximum adjustment of 1/4-inch. Quick response institutional pendent sprinklers must be UL Listed. Quick response institutional flush pendent sprinklers must be listed for installation in an Ordinary Hazard occupancy, if installed in an Ordinary Hazard occupancy. Quick Response Institutional Flush Pendent Sprinklers must be Tyco Raven SIN: TY3281, or equal as approved by State Fire Marshal.
   2. Quick Response EC Institutional Style Flush Pendent Sprinkler: Quick response institutional extended coverage pendent sprinklers must have a standard orifice with a nominal K Factor of 5.6. Sprinkler must have a quick response solder link. Quick response institutional extended coverage pendent sprinklers must incorporate a lock ring and chrome finish escutcheon that mount to the threaded body at the finished ceiling. Quick response institutional extended coverage pendent sprinklers must have a maximum adjustment of 1/4-inch. Quick response institutional extended coverage pendent sprinklers must be UL Listed for coverage of 16-feet by 16-feet in Light Hazard occupancies. Quick Response Institutional Extended Coverage Flush Pendent Sprinklers must be Tyco Raven SIN: TY3282, or equal as approved by State Fire Marshal.
   3. Quick Response Institutional Style Flush Sidewall Sprinkler: Quick response institutional sidewall sprinklers must have a standard orifice with a nominal K Factor of 5.6. Sprinkler must have a quick response solder link. Quick response institutional sidewall sprinklers must incorporate a lock ring and chrome finish escutcheon that mount to the threaded sprinkler body at the finished wall. Sidewall institutional sprinklers must be equipped with a brass retaining flange that is to be installed on the sprinkler head supply pipe to prevent forward movement of sprinkler head. Quick response institutional sidewall sprinklers must be installed so that the body of the sprinkler does not protrude past the sprinkler escutcheon. Quick response institutional sidewall sprinklers must be UL Listed for use in Light Hazard occupancies. Quick Response Institutional Flush Sidewall Sprinklers must be Tyco Raven SIN: TY3381, or equal as approved by State Fire Marshal.

C. Commercial Quick Response Sprinklers:
   1. Quick Response Pendent Sprinkler: Sprinklers to be installed through a ceiling must be chrome finish pendent sprinklers (or finish as specified elsewhere) with an adjustable semi-recessed escutcheon of same specified finish. Sprinklers must have a quick response frangible bulb type fusible element. Sprinklers must have a standard or large orifice and a 5.6 or 8.0 nominal K Factor. Sprinklers must be UL Listed or FM Approved. Quick response sprinklers must be listed for installation in an Ordinary Hazard occupancy if installed in an Ordinary Hazard occupancy. Quick Response Sprinklers must be Viking SIN: VK302 (5.6K Standard Orifice Pendent) or SIN: VK352 (8.0K Large Orifice Pendent), or equal as approved by State Fire Marshal.
   2. Microfast Quick Response Upright Sprinkler: Sprinklers to be installed through a ceiling must be chrome finish pendent sprinklers (or finish as specified elsewhere) with a Viking model “E-1 or F-1” adjustable semi-recessed escutcheon of same specified finish. Sprinklers must have a quick response frangible bulb type fusible element. Sprinklers must have a standard or large orifice and a 5.6 or 8.0 nominal K Factor. Sprinklers must be UL Listed or FM Approved. Quick response sprinklers must be listed for installation in an Ordinary Hazard occupancy if installed in an Ordinary Hazard occupancy. Quick Response Sprinklers must be Viking SIN: VK300 (5.6K Standard Orifice Upright) or SIN: VK350 (8.0K Large Orifice Upright), or equal as approved by State Fire Marshal.
   3. Quick Response Concealed Horizontal Sidewall Sprinkler: Quick response concealed horizontal sidewall sprinklers must be listed for installation in an Ordinary Hazard occupancy if installed in an Ordinary Hazard occupancy. Sprinklers must have a quick response frangible bulb type fusible element. Concealed horizontal sidewall sprinklers must have a white finish (or painted to match enclosure finish) cover plate that is a push-on, pull-off assembly with a cover diameter no greater than 2-3/4-inch. Concealed sprinklers must have a 1/2-inch NPT, a standard orifice, and a nominal K Factor of 5.6. Quick response horizontal sidewall sprinklers must be UL Listed for Light Hazard and Ordinary Hazard occupancies. Concealed Horizontal Sidewall Sprinklers must be Viking SIN: VK408 (Base Part Number 11451), or equal as approved by State Fire Marshal.

D. Sprinkler Guards: Wire-cage type, including fastening device for attaching to sprinkler. Provide sprinkler guards for all sprinkler heads located in water heater room.

E. Sprinkler Cabinets: Finished steel cabinet and hinged cover, with space for minimum of six spare sprinklers plus sprinkler wrench, suitable for wall mounting. Include number of sprinklers required by NFPA 13 and one wrench for sprinklers. Include separate cabinet with sprinklers and wrench for each style sprinkler on Project.

## 2.6 FLEXIBLE SPRINKLER HOSE FITTINGS

A. The use of flexible sprinkler hose fittings is allowed as long is the assembly components are listed and installed in accordance with the requirements of the listing. Flexible fittings must be listed and approved by the State of California Fire Marshal. Compliance with NFPA 13 are required as follows:
   1. When installed and supported by suspended ceilings, the ceiling must meet ASTM C635 and must be installed in accordance with ASTM C636.
   2. Where flexible sprinkler hose fittings exceed 6-feet in length and are supported by a suspended ceiling, hangers attached to the structure must be required to ensure that the maximum unsupported length does not exceed 6-feet.

3. The suspended ceiling anchoring components must be attached to the ceiling support with tamper resistant self-tapping zip screws.

B. Flexible sprinkler hose fittings must be Flexhead Industries or an approved equal.

2.7 DIELECTRIC FITTINGS

A. Assembly must be copper alloy, ferrous, and insulating materials with ends matching piping system.

B. Dielectric Unions: Factory-fabricated assembly, designed for 250-psig minimum working pressure at 180-degree F. Include insulating material that isolates dissimilar materials and ends with inside threads according to ASME B1.20.1.
1. Available Manufacturers:
   a. Capitol Manufacturing Co.
   b. Central Plastics Company.
   c. Epco Sales, Inc.
   d. Hart Industries International, Inc.
   e. Watts Industries, Inc.; Water Products Div.
   f. Zurn Industries, Inc.; Wilkins Div.

C. Dielectric Flanges: Factory-fabricated companion-flange assembly, for 175-psig minimum working-pressure rating as required for piping system.
1. Available Manufacturers:
   a. Capitol Manufacturing Co.
   b. Central Plastics Company.
   c. Epco Sales, Inc.
   d. Watts Industries, Inc.; Water Products Div.

D. Dielectric Flange Insulation Kits: Components for field assembly must include CR or phenolic gasket, PE or phenolic bolt sleeves, phenolic washers, and steel backing washers.
1. Available Manufacturers:
   a. Advance Products and Systems, Inc.
   b. Calpico, Inc.
   c. Central Plastics Company.
   d. Pipeline Seal and Insulator, Inc.

E. Dielectric Couplings: Galvanized steel with inert and noncorrosive thermoplastic lining and threaded ends and 300-psig working-pressure rating at 225-degree F.
1. Available Manufacturers:
   a. Calpico, Inc.
   b. Lochinvar Corp.

F. Dielectric Nipples: Electroplated steel with inert and noncorrosive thermoplastic lining, with combination of plain, threaded, or grooved ends and 300-psig working-pressure rating at 225-degree F.
1. Available Manufacturers:
   a. Perfection Corporation.
   b. Precision Plumbing Products, Inc.
   c. Victaulic Co. of America.

2.8 SPRINKLER SPECIALTY FITTINGS

A. Sprinkler specialty fittings must be UL listed or FM approved, with 175-psig minimum working-pressure rating, and made of materials compatible with piping. Sprinkler specialty fittings must have 250-psig minimum working-pressure rating if fittings are components of high-pressure piping system.

B. Outlet Specialty Fittings:
   1. Available Manufacturers:
      a. Anvil International, Inc.
      b. Tyco Fire Protection Products.
      c. Ductilic, Inc.
      d. JDH Pacific, Inc.
      e. National Fittings, Inc.
      f. Shurjoint Piping Products, Inc.
      g. Southwestern Pipe, Inc.
      h. Star Pipe Products; Star Fittings Div.
      i. Ward Manufacturing.
   2. Mechanical-T and -Cross Fittings: UL 213, ductile-iron housing with gaskets, bolts and nuts, and threaded, locking-lug, or grooved outlets.
   3. Snap-On and Strapless Outlet Fittings: UL 213, ductile-iron housing or casting with gasket and threaded outlet.

C. Sprinkler Drain and Alarm Test Fittings: Cast- or ductile-iron body; with threaded or locking-lug inlet and outlet, test valve, and orifice and sight glass.
   1. Available Manufacturers:
      a. Tyco Fire Protection Products.
      b. Fire-End and Croker Corp.
      c. Viking Corp.

D. Sprinkler Branch-Line Test Fittings: Brass body with threaded inlet, capped drain outlet, and threaded outlet for sprinkler.
   1. Available Manufacturers:
      a. Elkhart Brass Mfg. Co., Inc.
      b. Fire-End and Croker Corp.
      c. Potter-Roemer; Fire-Protection Div.

E. Sprinkler Inspector’s Test Fitting: Cast- or ductile-iron housing with threaded inlet and drain outlet and sight glass.
   1. Available Manufacturers:
      a. AGF Manufacturing Co.
      b. Tyco Fire Protection Products.
      c. G/J Innovations, Inc.
      d. Triple R Specialty of Ajax, Inc.

F. Drop-Nipple Fittings: UL 1474, adjustable with threaded inlet and outlet, and seals.
   1. Available Manufacturers:
      a. CECA, LLC.
      b. Merit.

2.9 LISTED FIRE-PROTECTION VALVES

A. Valves must be UL listed or FMG approved, with 175-psig minimum pressure rating. Valves must have 250-psig minimum pressure rating if valves are components of high-pressure piping system.

B. Gate Valves with Wall Indicator Posts:
   1. Gate Valves: UL 262, cast-iron body, bronze mounted, with solid disc, nonrising stem, operating nut, and flanged ends.
   2. Available Manufacturers:
      a. Tyco Fire Protection Products.
      b. McWane, Inc.; Kennedy Valve Div.
      c. NIBCO.
      d. Stockham.

C. Ball Valves: Comply with UL 1091, except with ball instead of disc.
   1. NPS 1-1/2 and Smaller: Bronze body with threaded ends.
   2. NPS 2 and NPS 2-1/2: Bronze body with threaded ends or ductile-iron body with grooved ends.
   3. NPS 3: Ductile-iron body with grooved ends.
   4. Available Manufacturers:
      a. NIBCO.
      b. Tyco Fire Protection Products.

D. Globe or Angle Valves
   1. NPS 2 and smaller: Bronze body, bronze trim, rising stem and handwheel inside screw, renewable composition disc, solder or screwed ends, with backseating capacity repackable under pressure.
   2. Over NPS 2: Iron body, bronze trim, rising stem, handwheel, OS&Y, plug-type disc, flanged ends, renewable seat and disc.
   3. Available Manufacturers:
      a. NIBCO.
      b. Tyco Fire Protection Products.
      c. Stockham.

E. Butterfly Valves: UL 1091.
   1. NPS 2 and Smaller: Bronze body with threaded ends.
      a. Available Manufacturers:
         1) Global Safety Products, Inc.
         2) Milwaukee Valve Company.
   2. NPS 2-1/2 and Larger: Bronze, cast-iron, or ductile-iron body; wafer type or with flanged or grooved ends.
   3. Available Manufacturers:
      a. Tyco Fire Protection Products.
      b. Global Safety Products, Inc.
      c. McWane, Inc.; Kennedy Valve Div.
      d. Mueller Company.
      e. NIBCO.
      f. Pratt, Henry Company.

F. Check Valves NPS 2 and Larger: UL 312, swing type, cast-iron body with flanged or grooved ends.

1. Available Manufacturers:
   a. Tyco Fire Protection Products.
   b. Clow Valve Co.
   c. Crane Co.; Crane Valve Group; Crane Valves.
   d. Mueller Company.
   e. NIBCO.
   f. Potter-Roemer; Fire Protection Div.
   g. Reliable Automatic Sprinkler Co., Inc.
   h. Star Sprinkler Inc.
   i. Stockham.
   j. Watts Industries, Inc.; Water Products Div.

G. Gate Valves: UL 262, OS&Y type.
   1. NPS 2 and Smaller: Bronze body with threaded ends.
      a. Available Manufacturers:
         1) Crane Co.; Crane Valve Group; Crane Valves.
         2) Hammond Valve.
         3) NIBCO.
         4) United Brass Works, Inc.
   2. NPS 2-1/2 and Larger: Cast-iron body with flanged ends.
      a. Available Manufacturers:
         1) Clow Valve Co.
         2) Crane Co.; Crane Valve Group; Crane Valves.
         3) Crane Co.; Crane Valve Group; Jenkins Valves.
         4) Hammond Valve.
         5) Milwaukee Valve Company.
         6) Mueller Company.
         7) NIBCO.
         8) Red-White Valve Corp.
         9) United Brass Works, Inc.

H. Indicating Valves: UL 1091, with integral indicating device and ends matching connecting piping.
   1. Indicator: Electrical, 115-V ac, prewired, single-circuit, supervisory switch.
   2. NPS 2 and Smaller: Ball or butterfly valve with bronze body and threaded ends.
      a. Available Manufacturers:
         1) Milwaukee Valve Company.
         2) NIBCO.
   3. NPS 2-1/2 and Larger: Butterfly valve with cast- or ductile-iron body; wafer type or with flanged or grooved ends.
      a. Available Manufacturers:
         1) Tyco Fire Protection Products.
         2) McWane, Inc.; Kennedy Valve Div.
         3) Milwaukee Valve Company.
         4) NIBCO.

I. Double Check Valve Assemblies: ANSI/ASSE 1012, AWWA C510 and AWWA C511, bronze body with corrosion resistant internal parts and stainless steel springs, two independently operating check valves: Febco Model 805YD. Use iron body assembled for 2-inch and above.

2.10 SPECIALTY VALVES

A. Sprinkler System Control Valves: UL listed or FMG approved, cast- or ductile-iron body with flanged or grooved ends, and 175-psig minimum pressure rating. Control valves must have 250-psig minimum pressure rating if valves are components of high-pressure piping system.
   1. Available Manufacturers:
      a. Tyco Fire Protection Products.
      b. Globe Fire Sprinkler Corporation.
      c. Reliable Automatic Sprinkler Co., Inc.
      d. Star Sprinkler Inc.
      e. Viking Corp.
   2. Alarm Check Valves: UL 193, designed for horizontal or vertical installation, with bronze grooved seat with O-ring seals, single-hinge pin, and latch design. Include trim sets for bypass, drain, electrical sprinkler alarm switch, pressure gauges, retarding chamber, and fill-line attachment with strainer.
      a. Drip Cup Assembly: Pipe drain without valves and separate from main drain piping.
      b. Drip Cup Assembly: Pipe drain with check valve to main drain piping.

B. Pressure-Regulating Valves: UL 1468, brass or bronze, NPS 1-1/2 and NPS 2-1/2, 400-psig minimum rating. Include female NPS inlet and outlet, adjustable setting feature, and straight or 90-degree-angle pattern design as indicated.
   1. Finish: Rough metal.
   2. Available Manufacturers:
      a. AFAC Inc.
      b. Elkhart Brass Mfg. Co., Inc.
      c. Fire-End and Croker Corp.
      d. GMR International Equipment Corporation.
      e. Potter-Roemer; Fire Protection Div.
      f. Zurn Industries, Inc.; Wilkins Div.

C. Automatic Drain Valves: UL 1726, NPS 3/4, ball-check device with threaded ends.
   1. Available Manufacturers:
      a. AFAC Inc.
      b. Grinnell Fire Protection.

2.11 FIRE DEPARTMENT CONNECTIONS

A. Available Manufacturers:
   1. AFAC Inc.
   2. Tyco Fire Protection Products.
   3. Elkhart Brass Mfg. Co., Inc.
   4. Fire-End and Croker Corp.
   5. Fire Protection Products, Inc.
   6. GMR International Equipment Corporation.
   7. Guardian Fire Equipment Incorporated.
   8. Potter-Roemer; Fire-Protection Div.
   9. Reliable Automatic Sprinkler Co., Inc.
   10. United Brass Works, Inc.

B. FreeStanding-Type Fire Department Connection: UL 405 175-psig minimum pressure rating with corrosion-resistant metal body with sleeves, escutcheons, plugs, caps, and chains. Include inlets with threads according to NFPA 1963 and matching local fire department sizes and threads, outlet with pipe threads, extension pipe nipples, check devices or clappers for inlets, and escutcheon plate with marking similar to "AUTO SPKR & STANDPIPE."

2.12 ALARM DEVICES

A. Alarm-device types must match piping and equipment connections.

B. Electrically Operated Alarm: UL 464, with 6-inch- minimum- 8-inch- minimum- 10-inch-diameter, vibrating-type, metal alarm bell with red-enamel factory finish and suitable for outdoor use.
   1. Available Manufacturers:
      a. Potter Electric Signal Company.
      b. System Sensor.

C. Water-Flow Indicator: UL 346, electrical-supervision, paddle-operated-type, water-flow detector with 250-psig pressure rating and designed for horizontal or vertical installation. Include two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
   1. Available Manufacturers:
      a. ADT Security Services, Inc.
      b. Tyco Fire Protection Products.
      c. ITT McDonnell & Miller.
      d. Potter Electric Signal Company.
      e. System Sensor.
      f. Viking Corp.
      g. Watts Industries, Inc.; Water Products Div.

D. Pressure Switch: UL 753, electrical-supervision-type, water-flow switch with retard feature. Include single-pole, double-throw, normally closed contacts and design that operates on rising pressure and signals water flow.
   1. Available Manufacturers:
      a. Tyco Fire Protection Products.
      b. Potter Electric Signal Company.
      c. System Sensor.
      d. Viking Corp.

E. Valve Supervisory Switch: UL 753, electrical, single-pole, double-throw switch with normally closed contacts. Include design that signals controlled valve is in other than fully open position.
   1. Available Manufacturers:
      a. McWane, Inc.; Kennedy Valve Div.
      b. Potter Electric Signal Company.
      c. System Sensor.

2.13 FIRE HOSES

A. Hose Rack Cabinets, Hose Racks and Fire Hose Valves for interior of building is not required for this project.

2.14 PRESSURE GAUGES

A. Available Manufacturers:
   1. AGF Manufacturing Co.
   2. AMETEK, Inc.; U.S. Gauge.
   3. Brecco Corporation.
   4. Dresser Equipment Group; Instrument Div.
   5. Marsh Bellofram.
   6. WIKA Instrument Corporation.

B. Description: UL 393, 3-1/2 to 4-1/2 inch diameter, dial pressure gauge with range of 0 to 300-psig.
   1. Water System Piping: Include caption “WATER” on dial face.

2.15 HANGERS AND SUPPORTS

A. Swivel rings and building attachments must be UL listed/approved.
   1. Trapeze/hanger component station module must meet or exceed values listed in NFPA 13.
   2. Earthquake sway bracing components must meet or exceed values listed in NFPA 13.

2.16 SLEEVES FOR WALL/FLOOR PENETRATIONS

A. Sleeves through walls and floors, where provided, must be of a type that can be made watertight and fire stopped. Sleeve sizes must be as required by NFPA 13 and 14 for Earthquake Protection.

2.17 SIGNS

A. Valve signs must indicate purpose and system of each control, test, trim, and drain valve. Hydraulic information sign must meet requirements of NFPA 13 and 14.

2.18 PIPE ESCUTCHEONS

A. General: Provide solid, (not hinged or split type) pipe escutcheons as specified with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extension, if any. Furnish pipe escutcheons with nickel or chrome finish for occupied areas, prime paint finish for unoccupied areas. Escutcheons must be vandal proof.

B. Pipe Escutcheons for Moist Areas: For waterproof floors, and areas where water and condensation can be expected to accumulate, provide solid cast brass or sheet brass escutcheons, solid pipe escutcheons.

C. Pipe Escutcheons for Dry Areas: Provide solid sheet metal escutcheons.

D. Manufacturer: Chicago Specialty, Producers Specialty, Sanitary-Dash.

2.19 FIRE BARRIER PENETRATION SEALS

A. Provide seals for opening through fire-rated walls, floors, or ceiling used as passage for mechanical components such as piping or ductwork in accordance with the Contract Documents.
   1. Piping: Provide fire stopping and sealing material in accordance with Section 07 84 13 and 07 92 00.

**PART 3 EXECUTION**

3.1 PREPARATION

A. Perform fire-hydrant flow test in accordance with NFPA 13, NFPA 14, and NFPA 291. Use results for system design calculations required in Part 1 “Quality Assurance” Article.

B. Report test results promptly and in writing to Owner.

3.2 EARTHWORK

A. Refer to Section 31 20 00, “Earthmoving” for excavating, trenching, and backfilling.

3.3 EXAMINATION

A. Examine roughing-in for hose connections and stations to verify actual locations of piping connections before installation.

B. Examine walls and partitions for suitable thicknesses, fire- and smoke-rated construction, framing for hose-station cabinets, and other conditions where hose connections and stations are to be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.4 FIRE DEPARTMENT CONNECTION INSTALLATIONS

A. Install fire department connections of types and features indicated in locations indicated.

B. Install ball drip valves at each check valve for fire department connection to mains and where indicated. Drain to floor drain.

3.5 CONNECTIONS

A. Connect to specialty valves, specialties, fire department connections, and accessories.

B. Connect water supplies to sprinkler systems.

C. Electrical Connections: Power wiring is specified in Division 26.

D. Connect alarm devices to fire alarm system.

3.6 FIELD QUALITY CONTROL

A. Perform field acceptance tests of each fire protection system.

1. Flush, test, and inspect sprinkler piping systems according to NFPA 13.

B. Replace piping system components that do not pass test procedures specified, and then retest to demonstrate compliance. Repeat procedure until satisfactory results are obtained.
   1. Report test results promptly and in writing.
   2. Report test results promptly and in writing and authority having jurisdiction CA Office Of The State Fire Marshal – Fire and Life Safety Division.

3.7 CLEANING

A. Clean dirt and debris from sprinklers. Replace sprinklers having paint other than factory finish with new sprinklers. Cleaning and reuse of painted sprinklers is prohibited.

3.8 LABELING AND IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13 and NFPA 14.

3.9 STARTUP SERVICES

A. Starting Procedures: Follow manufacturer's written procedures. If no procedures are prescribed by manufacturer, proceed as follows:
   1. Verify that specialty valves, trim, fittings, controls, and accessories have been installed correctly and operate correctly.
   2. Verify that excess pressure pumps and accessories have been installed correctly and operate correctly.
   3. Verify that specified tests of piping are complete.
   4. Check that damaged sprinklers and sprinklers with paint or coating not specified have been replaced with new, correct type of sprinklers.
   5. Check that sprinklers are correct type, have correct finish and temperature ratings, and have guards where required for applications.
   6. Check that potable water supplies have correct type of backflow preventer.
   7. Check that fire department connections have threads compatible with local fire department equipment and have correct pressure rating.
   8. Fill wet-pipe sprinkler systems with water.
   9. Energize circuits to electrical equipment and devices.
   10. Adjust operating controls and pressure settings.

3.10 DEMONSTRATION AND TRAINING

A. In accordance with Section 01 79 00, the Contractor must conduct two training sessions of four hours each to familiarize the facility personnel with the features, operation, and maintenance of the fire protection systems. Training sessions must be scheduled with the Owners Representative at a mutually agreeable time.

B. Operating Instructions:
   1. Furnish three (3) copies of printed operating and maintenance instructions and a copy of NFPA 25 California Edition that adequately instruct the maintenance personnel in proper operation and test procedures of all fire protection components provided, furnished, or installed.

C. Demonstrate equipment, specialties, and accessories. Review operating and maintenance information.

D. Schedule demonstration with at least 7 days' advance notice.

E. Upon completion of the system it must be tested in the presence of the State of California Fire Marshal.

**END OF SECTION 21 10 00**

# SECTION 22 05 00 COMMON WORK RESULTS FOR PLUMBING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Types of piping specialties specified in this section include the following:
1. Pipe escutcheons.
2. Pipeline strainers.
3. Sleeves.
4. Sleeve seals.
5. Drip pans.
6. Unions and flanges.
7. Cathodic protection.
8. Pipe identification.
9. Gauges.
10. Strainers.

B. Coordination with other Elements:
1. 08-Interior Construction, for fire stopping through architectural enclosures.
2. Part 3-Chapter G, for sound isolation and acoustical treatment criteria.

### 1.2 SUBMITTALS

A. Submittals for review with system confirmation phase: Not required.

B. Submittals for review during construction document phase: Not required.

C. Submittals for review during construction phase:
1. Shop drawings indicating locations of heat traced piping systems.

RFI 0544 — GEN - Plumbing Shop Drawings Clarification — Shop Drawings not required

D. Submittals for closeout: Maintenance, calibrating requirements and turn over all gauges and special tools.
1. Submit all warranties signed by the manufacturer.
2. Provide all special tools, loose gauges and test kits and maintenance and calibration instructions.

### 1.3 QUALITY ASSURANCE

A. All fire stopping materials shall be U.L. listed.

B. Manufacturer's qualifications: Firms regularly engaged in manufacture of piping specialties, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

C. Identification: Provide piping specialties with manufacturer's name (or trademark) and pressure rating clearly marked on valve body.

**PART 2 – PRODUCTS**

2.1 GENERAL

A. Provide chrome plated brass pipe escutcheons with inside diameter closely fitting pipe outside diameter or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, ceilings, or pipe sleeve extension, if any. Furnish pipe escutcheons with nickel or chrome finish and screw or spring clamping device with concealed hinge.

1. Pipe escutcheons for moist areas: For water resistant floors, and areas where water and condensation can be expected to accumulate, provide cast brass or sheet brass escutcheons, solid or split hinged. Split hinged type shall not be used in areas with security requirements.

2. Pipe escutcheons for dry areas: Provide sheet steel escutcheons, solid or split hinged. Split hinged type shall not be used in areas with security requirements.

B. Where pipes pass through concrete floors or walls, install galvanized metal or plastic sleeves having not less than 1/2-inch or more than 1-inch clearance around sides of the pipe or pipe covering for the full thickness of the concrete.

C. Extend sleeves through floors one inch above floor and seal watertight. After piping has been installed, fill annular space with UL listed fire stopping system, 3M, Fire Barrier, Dow Firestop or Nelson Firestop. All through-wall firestop penetrations shall comply with the requirements of Division 08, Section 078413.

D. The annular space between the pipe sleeves and the pipe and between duct openings and ducts through all floors and walls shall be fire resistant. Seal duct penetrations with an incombustible material.

E. Provide sleeve seals for sleeves located in foundation walls below grade or in exterior walls.

F. Provide unions at each threaded or soldered connection to all equipment, tanks and valves.

G. Provide insulating couplings or flanges at connections of piping with dissimilar materials. Construct couplings so that the two pipes being connected are completely insulated from each other with no metal to metal contact. Heavily line the couplings with a hard, insulating, phenolic threaded coupling in standard pipe sizes.

H. Flanges:

| Type of Pipe | Flanges |
|---|---|
| Screwed black or galvanized steel pipeline, 2-1/2 inches and larger. | 125 lb. cast iron screwed steel flange flat faced, black or galvanized. |
| Welded steel pipe, 2-1/2 inches and larger for all services | 150 lb. forged steel welding flanges, 1/16 inch raised faced. |

I. Provide full faced or ring type gasket material to suit facing on flanges and material carried in pipe.

J. Gauges shall be in compliance with Marsh Quality, with an accuracy to be within 1 percent in the middle third of the dial range and equipped with front calibration. Gauge movements shall be phosphor bronze, bushed, rotary type. Gauges mounted on panel boards shall be the flush mounting type in cast iron or aluminum cases. Stem or pipe mounted gauges shall have non flanged cases of drawn or stamped steel, phenolic, or aluminum. Gauges shall have a minimum dial size of 3-1/2 inches.

K. Pipeline strainers:

RFI 0390 *Plumbing - Wye Strainer Confirmation*

*Apolloxpress Model YB-PRLF Lead Free Bronze Wye-Strainer to be used in lieu of cast iron*

1. Provide Y type strainers, full line size of connecting piping, with ends matching piping system materials and cast iron body. Select strainers for 125 psi working pressure, with type 304 stainless steel screens and gasket seal on plug. Provide 3/64 inch perforations at 233 per square inch.
2. Strainer screens shall have an open area equal to at least twice the cross sectional area of the pipe in which they are installed.
3. End styles:
   a. Threaded ends, 2 inches and smaller: Cast iron body, screwed screen retainer with centered blowdown fitted with pipe plug.
   b. Threaded ends, 2-1/2 inches and larger: Cast iron body, bolted screen retainer with off center blowdown fitted with pipe plug.
   c. Flanged ends, 2-1/2 inches and larger: Cast iron body, bolted screen retainer with off center blowdown fitted with pipe plug.
   d. Buttwelded ends, 2-1/2 inches and larger: Schedule 40 cast carbon steel body, bolted screen retainer with off center blowdown fitted with pipe plug.

2.2 FABRICATION

A. Drip pans: Provide drip pans fabricated from corrosion resistant sheet metal with watertight joints and with edges turned up 2-1/2 inches. Extend drain pans 4 inches beyond pipes or equipment on all sides. Reinforce top, either by structural angles or by rolling top over 1/4 inch steel rod. Provide hole, gasket, and flange at low point for watertight joint and 1 inch drain line connection.

## PART 3 - EXECUTION

3.1 GENERAL

A. Provide unions at each threaded or soldered connection to all equipment, tanks and valves.

B. Provide flanges at each flanged connection to equipment, tanks, and valves.

C. Provide dielectric unions at all locations described herein.

D. Installation of piping specialties:
1. Pipe escutcheons: Install pipe escutcheons on each pipe penetration through floors, walls, partitions, and ceilings where penetration is exposed to view and on exterior of building. Secure escutcheon to pipe or insulation so escutcheon covers penetration hole and is flush with adjoining surface.

2. Sleeves: Secure sleeves to metal or wood forms in such a manner that they will not become displaced during pouring of concrete. Fill sleeves on deck with sand. After forms have been removed from concrete, the sleeves shall be removed from the openings.
3. Core drill properly sized holes in the concrete to replace metal sleeves that are crushed or knocked out of position during pouring of concrete. Coordinate core drilling with structural engineer.
4. Sleeve seals: Install in accordance with the following:
   a. Mastic and oakum: Fill and pack annular space between sleeve opening and pipe with oakum; caulk with mastic on both sides.
   b. Mechanical sleeve seals: Loosely assemble rubber links around pipe with bolts and pressure plates located under each bolt head and nut. Push into sleeve opening and center. Tighten bolts until links have expanded to form watertight seal.

E. Installation of Y-type strainers:
1. Install Y-type strainers full size of pipeline in accordance with manufacturer's installation instructions. Install pipe nipple and shutoff valve in strainer blow down connection, full size of connection, except for strainers 2 inches and smaller installed ahead of control valves feeding individual terminals. Provide drain line from shutoff valve to plumbing drain, full size of blowdown connection.
2. Locate Y-type strainers in supply line ahead of the following equipment, if integral strainer is not included in equipment:
   a. Pumps.
   b. Temperature control valves.
   c. Pressure reducing valves.
   d. Temperature or pressure regulating valves.

F. Installation of unions and flanges: Install unions and flanges so that piping can be easily disconnected for removal of tanks, equipment, and valves. Provide three unions at each three way valve.

G. Installation of electric heat tape: Installation shall conform to manufacturers printed instructions.

H. Installation of fabricated piping specialties:
1. Drip pans: Hang from structure with rods and building attachments, weld rods to sides of drip pan. Brace to prevent sagging or swaying. Connect 1 inch drain line to drain connection, and run to nearest plumbing drain.
   a. Locate drip pans under piping passing over or within 3 feet horizontally of electrical equipment.
   b. Provide drip pans under storm, waste and vent piping in space above food preparation areas.

**END OF SECTION 22 05 00**

# SECTION 22 05 13 - COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

### 1.3 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
   1. Motor controllers.
   2. Torque, speed, and horsepower requirements of the load.
   3. Ratings and characteristics of supply circuit and required control sequence.
   4. Ambient and environmental conditions of installation location.

## PART 2 - PRODUCTS

### 2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with NEMA MG 1 unless otherwise indicated.

### 2.2 MOTOR CHARACTERISTICS

A. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

### 2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Rotor: Random-wound, squirrel cage.

E. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

F. Temperature Rise: Match insulation rating.

G. Insulation: Class F.

H. Code Letter Designation:
1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

I. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 SINGLE-PHASE MOTORS

A. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

B. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

C. Motors 1/20 HP and Smaller: Shaded-pole type.

D. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION 22 05 13**

# SECTION 22 05 16 - EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING

## PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Flexible-hose packless expansion joints.
2. Alignment guides and anchors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

## PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Compatibility: Products shall be suitable for piping service fluids, materials, working pressures, and temperatures.

B. Capability: Products to absorb 200 percent of maximum axial movement between anchors.

2.2 PACKLESS EXPANSION JOINTS

A. Flexible-Hose Packless Expansion Joints FHEJ-01:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Flex-Hose Co., Inc.
b. Flexicraft Industries.
c. Mason Industries, Inc.
d. Metraflex, Inc.
e. Unisource Manufacturing, Inc.
2. Description: Manufactured assembly with inlet and outlet elbow fittings and two flexible-metal-hose legs joined by long-radius, 180-degree return bend or center section of flexible hose.
3. Flexible Hose: Corrugated-metal inner hoses and braided outer sheaths.

2.3 ALIGNMENT GUIDES AND ANCHORS

A. Alignment Guides:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Flex-Hose Co., Inc.
   b. Flexicraft Industries.
   c. Mason Industries, Inc.
2. Description: Steel, factory-fabricated alignment guide, with bolted two-section outer cylinder and base for attaching to structure; with two-section guiding slider for bolting to pipe.

## PART 3 - EXECUTION

3.1 EXPANSION JOINT INSTALLATION

A. Install expansion joints of sizes matching sizes of piping in which they are installed.

3.2 ALIGNMENT-GUIDE AND ANCHOR INSTALLATION

A. Install alignment guides to guide expansion and to avoid end-loading and torsional stress.

B. Attach guides to pipe, and secure guides to building structure.

**END OF SECTION 22 05 16**

# SECTION 22 05 17 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
1. Sleeves.
2. Stack-sleeve fittings.
3. Sleeve-seal systems.
4. Sleeve-seal fittings.
5. Grout.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

## PART 2 - PRODUCTS

### 2.1 STACK-SLEEVE FITTINGS

A. Description: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.
1. Underdeck Clamp: Clamping ring with setscrews.

### 2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

### 2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

2.4 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

**PART 3 - EXECUTION**

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
1. Sleeves are not required for core-drilled holes.

C. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.2 STACK-SLEEVE-FITTING INSTALLATION

A. Install stack-sleeve fittings in new slabs as slabs are constructed.
1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Section 076200 "Sheet Metal Flashing and Trim."
3. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
5. Using grout, seal the space around outside of stack-sleeve fittings.

B. Fire-Barrier Penetrations: Maintain indicated fire rating of floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

**END OF SECTION 22 05 17**

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# SECTION 22 05 19 - METERS AND GAUGES FOR PLUMBING PIPING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:
1. Thermometers (Water Service and Domestic Water Heating Systems).
2. Pressure Gauges (Water Service and Gas Service).
3. Pressure Gauge Toppings (Water Service and Gas Service).
4. Stem Type Thermometers and Supports.
5. Test Plugs and Kits.

B. Related Sections:
1. Section 22 11 16 - Domestic Water Piping (for domestic thermometers and gauges inside the building).
2. Section 23 11 23 - Facility Natural-Gas Piping (for gauges inside and outside the building).

### 1.2 DEFINITIONS

A. CR: Chlorosulfonated polyethylene synthetic rubber.

B. EPDM: Ethylene-propylene-diene terpolymer rubber.

### 1.3 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data: For each type of gauge and fitting specified. Provide manufacturers data which indicates use, construction, operating range, total range, accuracy, and dimensions. Submit a gauge schedule showing manufacturer’s figure number, scale range, location and accessories for each gauge.
1. Provide a Gauge Application Table indicating each different use of gauges and the gauge range to be utilized, including minimum and maximum measurement valves.

C. Product Certificates: For each type of thermometer and gauge, signed by product manufacturer.

D. Maintenance Data to be included in the Operating and Maintenance Manuals specified in Division 1, Operating and Maintenance Data. Include data for the following:
1. Test plugs.
2. Pressure gauges.
3. Thermometers.

1.4 QUALITY ASSURANCE

A. Comply with applicable portions of American Society of Mechanical Engineers (ASME) and Instrument Society of America (ISA) standards pertaining to construction and installation of meters and gauges.

B. Design Criteria: The Drawings, Piping Diagrams and Details indicate the location of thermometers, gauges and test ports. Thermometers and gauges and are based on the specific manufacturer types and models indicated. Thermometers and gauges having equal performance characteristics by other manufacturers may be considered, provided that deviations do not change the design concept or intended performance as judged by the Architect and Engineer. The burden of proof for equality of meters and gauges is on the proposer.

1.5 EXTRA MATERIALS

A. Test plugs and kits.

**PART 2 - PRODUCTS**

2.1 DIGITAL THERMOMETERS (DOMESTIC WATER)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. H.O. Trerice Co.
2. Weiss Instruments, Inc.
3. Weksler Instruments Corp.

B. Basis of Design: Weiss Vari-angle Digital Thermometer Model #DVU35 with the following:
1. Accuracy 1 percent of reading or 1 degree, whichever is greater.
2. Range: -40 to +300 degree F.
3. Case Hi-Impace ABS.
4. Display 3/8 inch LCD digits, wide ambient formula.
5. Resolution 1/10 degree between -19.9 to +199.9 degrees Fahrenheit.
6. Recalibration internal potentiometer.
7. Lux rating 10 lux (one-foot candles).
8. Update every 10 seconds.
9. Ambient temperature error Zero.
10. Humidity 100 percent.
11. Sensor glass passivated thermister.

C. Thermometer wells for above: Weiss Instruments, Inc.- Industrial Thermometer Wells (separable socket) as follows:
1. Brass Construction for copper pipe; stainless steel for steel pipe.
2. 3/4-inch NPT size.
3. 3-1/2-inch stem size or 6-inch stem size.
4. Standard or extension neck to suit installation.

5. Schedule:

| Model | Stem Size |
|---|---|
| E-35-75BS | 3-1/2 inches |
| ER6-75BS | 6 inches |
| EN6-75BS | 6 inches insertion and 2-1/2 inches extension for insulation. |

2.2 PRESSURE GAUGES (DOMESTIC WATER)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. H.O. Trerice Co.
2. Weiss Instruments, Inc.
3. Weksler Instruments, Inc.

B. Basis of Design: Weiss Model Solar Powered pressure gauge with the following:
1. Case: 4-1/2-inches black steel glass reinforced thermo plastic (PBTP), solid front construction, blow out back safety design, weatherproof IP65.
2. Sensor: Lux Capacitor.
3. Wetted Materials: Phosphor Brass/Bronze.
4. Connection: 1/4-inch NPT.
5. Range: 0 to 400 psi.
6. Accuracy: 0.5 percent full scale ASME B40.100
7. Ambient Operating: -15 to +150 degrees F.
8. Display: LCD.
9. Lux Rating: <10 (one foot candle).
10. Digits: (4) 5/8-inch high.
11. Update: One Second.

C. Pressure Gauge Accessories:
1. Pressure Snubbers: Weiss Mode PSN-B pressure snubber with the following:
   a. 1/4-inch FNPT gauge connection and 1/4-inch MNPT process connection.
   b. Corrosion resistant porous metal dampening element/disc.
   c. Pressure rating @ 70 degree F is 15,000 psi.
   d. Brass construction.

2.3 PRESSURE GAUGES (NATURAL GAS)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. H.O. Trerice Co.
2. Weiss Instruments, Inc.
3. Weksler Instruments, Inc.

B. Basis of Design: Weiss Model Solar Powered pressure gauge with the following:
1. Case: 4-1/2-inch black steel glass reinforced thermo plastic (PBTP), solid front construction, blow out back safety design, weatherproof IP65.
2. Sensor: Lux Capacitor.
3. Wetted Materials: Phosphor Brass/Bronze.
4. Connection: 1/4-inch NPT.
5. Range: 0 to 15-psi.

6. Accuracy: 0.5 percent full scale ASME B40.100
7. Ambient Operating: -15 to +150 degrees F.
8. Display: LCD.
9. Lux Rating: <10 (one foot candle).
10. Digits: (4) 5/8-inch high.
11. Update: One Second.

2.4 TEST PLUGS AND KITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. H.O. Trerice Co.
   2. Texas Fairfax Company
   3. Sisco Co., Spedco, Inc.

B. Test Plug Basis of Design: Texas Fairfax Company with the following:
   1. 1/4-inch or 1/2-inch NPT brass fitting and cap for receiving 1/8-inch outside diameter pressure or temperature probe with neoprene core for temperatures up to 200 degrees F (natural gas); neoprene core for temperatures up to 350 degrees F (domestic hot and cold); lag extension for pipe insulation.

C. Test Kit Basis of Design: Texas Fairfax Company with the following:
   1. Internally padded and fitted carrying case; two (2) 3-1/2-inch diameter pressure gauges-scale range: 0 to 100-psi; two gauge adapters with 1/8-inch type 316 stainless steel probes; two (2) 1-inch dial thermometers with 5-inch stem and external calibration-scale range: 25 to 125 degrees F; two (2) 1-inch dial thermometers with 5-inch stem and external calibration- scale range: 0 to 220 degrees F.

## PART 3 EXECUTION

3.1 GENERAL

A. Install in complete conformance with the manufacturer’s instruction.

B. Provide instruments with scale ranges selected according to service with largest appropriate scale.

C. Install pressure gauges and thermometers in locations where they are easily read from normal operating level without crawling or climbing. Install vertical to 45 degrees off vertical.

D. Adjust gauges and thermostats to final angle, clean windows and lenses and calibrate to zero.

3.2 THERMOMETERS

A. Provide thermometers where indicated on the plumbing plans, piping diagrams, and details. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inches for installation of thermometer sockets 24 inches on each side of the thermometer. Ensure sockets allow clearance from insulation.

3.3 GAUGES

A. Provide pressure gauges where indicated on the plumbing plans, piping diagrams, and details.

B. Install pressure gauges with snubbers. Provide ball valve to isolate each gauge. Extend nipples to allow clearance from insulation.

3.4 TEST PLUGS AND KITS

A. Provide temperature and pressure test plugs where indicated on the plumbing plans, piping diagrams, and details.

B. Turn over test kit to Owner at project closeout.

3.5 ADJUSTING AND CLEANING

A. Adjusting: Adjust faces of gauges to proper angle for best visibility.

B. Cleaning: Clean windows of meters and gauges and factory-finished surfaces. Replace cracked and broken windows and repair scratched and marred surfaces with manufacturer's touchup paint.

**END OF SECTION 22 05 19**

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# SECTION 22 05 23.12 - BALL VALVES FOR PLUMBING PIPING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
1. Brass ball valves.
2. Bronze ball valves.

### 1.3 DEFINITIONS

A. CWP: Cold working pressure.

### 1.4 ACTION SUBMITTALS

A. Product Data: For each type of valve.
1. Certification that products comply with NSF 61 Annex G and NSF 372.

### 1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, and soldered ends.
3. Set ball valves open to minimize exposure of functional surfaces.

B. Use the following precautions during storage:
1. Maintain valve end protection.
2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles or stems as lifting or rigging points.

## PART 2 - PRODUCTS

### 2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:
1. ASME B1.20.1 for threads for threaded end valves.

2. ASME B16.1 for flanges on iron valves.
3. ASME B16.5 for flanges on steel valves.
4. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
5. ASME B16.18 for solder-joint connections.
6. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 Annex G and NSF 372 for valve materials for potable-water service.

D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

F. Valve Sizes: Same as upstream piping unless otherwise indicated.

G. Valve Actuator Types:
1. Gear Actuator: For quarter-turn valves NPS 4 and larger.
2. Handlever: For quarter-turn valves smaller than NPS 4.

H. Valves in Insulated Piping:
1. Include 2-inch stem extensions.
2. Extended operating handles of nonthermal-conductive material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
3. Memory stops that are fully adjustable after insulation is applied.

## 2.2 BRASS BALL VALVES

A. One-Piece, Brass Ball Valves:
1. Description:
   a. Standard: MSS SP-110.
   b. CWP Rating: 400 psig.
   c. Body Design: One piece.
   d. Body Material: Forged brass or bronze.
   e. Ends: Threaded and soldered.
   f. Seats: PTFE.
   g. Stem: Brass or stainless steel.
   h. Ball: Chrome-plated brass or stainless steel.
   i. Port: Reduced.

B. Two-Piece, Brass Ball Valves with Full Port and Brass Trim:
1. Description:
   a. Standard: MSS SP-110.
   b. CWP Rating: 600 psig.
   c. Body Design: Two piece.
   d. Body Material: Forged brass.
   e. Ends: Threaded and soldered.
   f. Seats: PTFE.
   g. Stem: Brass.
   h. Ball: Chrome-plated brass.

i. Port: Full.

C. Two-Piece, Brass Ball Valves with Full Port and Stainless-Steel Trim:
1. Description:
a. Standard: MSS SP-110.
b. CWP Rating: 600 psig.
c. Body Design: Two piece.
d. Body Material: Forged brass.
e. Ends: Threaded and soldered.
f. Seats: PTFE.
g. Stem: Stainless steel.
h. Ball: Stainless steel, vented.
i. Port: Full.

D. Two-Piece, Brass Ball Valves with Regular Port and Brass Trim:
1. Description:
a. Standard: MSS SP-110.
b. CWP Rating: 600 psig.
c. Body Design: Two piece.
d. Body Material: Forged brass.
e. Ends: Threaded and soldered.
f. Seats: PTFE.
g. Stem: Brass.
h. Ball: Chrome-plated brass.
i. Port: Regular.

E. Two-Piece, Brass Ball Valves with Regular Port and Stainless-Steel Trim:
1. Description:
a. Standard: MSS SP-110.
b. CWP Rating: 600 psig.
c. Body Design: Two piece.
d. Body Material: Brass or bronze.
e. Ends: Threaded and soldered.
f. Seats: PTFE.
g. Stem: Stainless steel.
h. Ball: Stainless steel, vented.
i. Port: Regular.

F. Three-Piece, Brass Ball Valves with Full Port and Brass Trim:
1. Description:
a. Standard: MSS SP-110.
b. CWP Rating: 600 psig.
c. Body Design: Three piece.
d. Body Material: Forged brass.
e. Ends: Threaded and soldered.
f. Seats: PTFE.
g. Stem: Brass.
h. Ball: Chrome-plated brass.
i. Port: Full.

G. Three-Piece, Brass Ball Valves with Full Port and Stainless-Steel Trim:

1. Description:
   a. Standard: MSS SP-110.
   b. CWP Rating: 600 psig.
   c. Body Design: Three piece.
   d. Body Material: Forged brass.
   e. Ends: Threaded and soldered.
   f. Seats: PTFE.
   g. Stem: Stainless steel.
   h. Ball: Stainless steel, vented.
   i. Port: Full.

## 2.3 BRONZE BALL VALVES

A. One-Piece, Bronze Ball Valves with Bronze Trim:
   1. Description:
      a. Standard: MSS SP-110.
      b. CWP Rating: 400 psig.
      c. Body Design: One piece.
      d. Body Material: Bronze.
      e. Ends: Threaded.
      f. Seats: PTFE.
      g. Stem: Bronze.
      h. Ball: Chrome-plated brass.
      i. Port: Reduced.

B. One-Piece, Bronze Ball Valves with Stainless-Steel Trim:
   1. Description:
      a. Standard: MSS SP-110.
      b. CWP Rating: 600 psig.
      c. Body Design: One piece.
      d. Body Material: Bronze.
      e. Ends: Threaded.
      f. Seats: PTFE.
      g. Stem: Stainless steel.
      h. Ball: Stainless steel, vented.
      i. Port: Reduced.

C. Two-Piece, Bronze Ball Valves with Full Port, and Bronze or Brass Trim:
   1. Description:
      a. Standard: MSS SP-110.
      b. CWP Rating: 600 psig.
      c. Body Design: Two piece.
      d. Body Material: Bronze.
      e. Ends: Threaded and soldered.
      f. Seats: PTFE.
      g. Stem: Bronze or brass.
      h. Ball: Chrome-plated brass.
      i. Port: Full.

D. Two-Piece, Bronze Ball Valves with Full Port and Stainless-Steel Trim:

1. Description:
   a. Standard: MSS SP-110.
   b. CWP Rating: 600 psig.
   c. Body Design: Two piece.
   d. Body Material: Bronze.
   e. Ends: Threaded or soldered.
   f. Seats: PTFE.
   g. Stem: Stainless steel.
   h. Ball: Stainless steel, vented.
   i. Port: Full.

E. Two-Piece, Bronze Ball Valves with Regular Port and Bronze or Brass Trim:
   1. Description:
      a. Standard: MSS SP-110.
      b. CWP Rating: 600 psig.
      c. Body Design: Two piece.
      d. Body Material: Bronze.
      e. Ends: Threaded.
      f. Seats: PTFE.
      g. Stem: Bronze or brass.
      h. Ball: Chrome-plated brass.
      i. Port: Regular.

F. Two-Piece, Bronze Ball Valves with Regular Port and Stainless-Steel Trim:
   1. Description:
      a. Standard: MSS SP-110.
      b. CWP Rating: 600 psig.
      c. Body Design: Two piece.
      d. Body Material: Bronze.
      e. Ends: Threaded.
      f. Seats: PTFE.
      g. Stem: Stainless steel.
      h. Ball: Stainless steel, vented.
      i. Port: Regular.

G. Three-Piece, Bronze Ball Valves with Full Port and Bronze or Brass Trim:
   1. Description:
      a. Standard: MSS SP-110.
      b. CWP Rating: 600 psig.
      c. Body Design: Three piece.
      d. Body Material: Bronze.
      e. Ends: Threaded.
      f. Seats: PTFE.
      g. Stem: Bronze or brass.
      h. Ball: Chrome-plated brass.
      i. Port: Full.

H. Three-Piece, Bronze Ball Valves with Full Port and Stainless-Steel Trim:
   1. Description:
      a. Standard: MSS SP-110.
      b. CWP Rating: 600 psig.

c. Body Design: Three piece.
d. Body Material: Bronze.
e. Ends: Threaded.
f. Seats: PTFE.
g. Stem: Stainless steel.
h. Ball: Stainless steel, vented.
i. Port: Full.

I. Three-Piece, Bronze Ball Valves with Regular Port and Bronze Trim:
1. Description:
a. Standard: MSS SP-110.
b. CWP Rating: 600 psig.
c. Body Design: Three piece
d. Body Material: Bronze
e. Ends: Threaded or soldered.
f. Seats: PTFE.
g. Stem: Bronze.
h. Ball: Chrome-plated brass.
i. Port: Regular.

J. Three-Piece, Bronze Ball Valves with Regular Port and Stainless-Steel Trim:
1. Description:
a. Standard: MSS SP-110.
b. CWP Rating: 600 psig.
c. Body Design: Three piece.
d. Body Material: Bronze.
e. Ends: Threaded or soldered.
f. Seats: PTFE.
g. Stem: Stainless steel.
h. Ball: Stainless steel, vented.
i. Port: Regular.

K. Two-Piece, Safety-Exhaust, Bronze Ball Valves:
1. Description:
a. Standard: MSS SP-110.
b. CWP Rating: 600 psig.
c. Body Design: Two piece.
d. Body Material: Bronze, ASTM B 584, Alloy C844.
e. Ends: Threaded.
f. Seats: PTFE.
g. Stem: Stainless steel.
h. Ball: Chrome-plated brass, with exhaust vent opening for pneumatic applications.
i. Port: Full.

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install valve tags. Comply with requirements in Section 22 05 53 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

B. Select valves with the following end connections:
1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
3. For Copper Tubing, NPS 5 and Larger: Flanged ends.

3.4 LOW-PRESSURE, COMPRESSED-AIR VALVE SCHEDULE (150 PSIG OR LESS)

A. Pipe NPS 2 and Smaller:
1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. One piece, brass ball valve.

3. One piece, bronze ball valve with bronze trim.
4. Two-piece, brass ball valves with full port and brass trim.
5. Two-piece, bronze ball valves with full port and bronze or brass trim.
6. Three-piece, brass ball valves with full port and brass trim.
7. Three-piece, bronze ball valves with full port and bronze or brass trim.
8. Two-piece, bronze ball valves with regular port and bronze trim.

3.5 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:
1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. One piece, brass ball valve.
3. One piece, bronze ball valve with bronze trim.
4. Two-piece, brass ball valves with full port and brass trim.
5. Two-piece, bronze ball valves with full port and bronze or brass trim.
6. Three-piece, brass ball valves with full port and brass trim.
7. Three-piece, bronze ball valves with full port and bronze or brass trim.
8. Two-piece, bronze ball valves with regular port and bronze trim.

**END OF SECTION 22 05 23.12**

# SECTION 22 05 23.14 - CHECK VALVES FOR PLUMBING PIPING

## PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Bronze lift check valves.
2. Bronze swing check valves.
3. Iron swing check valves.
4. Iron swing check valves with closure control.
5. Iron, grooved-end swing check valves.
6. Iron, center-guided check valves.
7. Iron, plate-type check valves.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene-diene terpolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of valve.
1. Certification that products comply with NSF 61 Annex G and NSF 372.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set check valves in either closed or open position.

B. Use the following precautions during storage:
1. Maintain valve end protection.
2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

## PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:
1. ASME B1.20.1 for threads for threaded end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
4. ASME B16.18 for solder joint.
5. ASME B31.9 for building services piping valves.

C. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.

D. NSF Compliance: NSF 61 Annex G and NSF 372 for valve materials for potable-water service.

E. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

F. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

G. Valve Sizes: Same as upstream piping unless otherwise indicated.

H. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE LIFT CHECK VALVES

A. Class 125, Lift Check Valves with Bronze Disc:
1. Description:
   a. Standard: MSS SP-80, Type 1.
   b. CWP Rating: 200 psig.
   c. Body Design: Vertical flow.
   d. Body Material: ASTM B 61 or ASTM B 62, bronze.
   e. Ends: Threaded or soldered. See valve schedule articles.
   f. Disc: Bronze.

B. Class 125, Lift Check Valves with Nonmetallic Disc:
1. Description:
   a. Standard: MSS SP-80, Type 2.
   b. CWP Rating: 200 psig.
   c. Body Design: Vertical flow.
   d. Body Material: ASTM B 61 or ASTM B 62, bronze.
   e. Ends: Threaded or soldered. See valve schedule articles.
   f. Disc: NBR, PTFE.

2.3 BRONZE SWING CHECK VALVES

A. Class 125, Bronze, Swing Check Valves with Bronze Disc:
   1. Description:
      a. Standard: MSS SP-80, Type 3.
      b. CWP Rating: 200 psig.
      c. Body Design: Horizontal flow.
      d. Body Material: ASTM B 62, bronze.
      e. Ends: Threaded or soldered. See valve schedule articles.
      f. Disc: Bronze.

B. Class 125, Bronze Swing Check Valves with Nonmetallic Disc:
   1. Description:
      a. Standard: MSS SP-80, Type 4.
      b. CWP Rating: 200 psig.
      c. Body Design: Horizontal flow.
      d. Body Material: ASTM B 62, bronze.
      e. Ends: Threaded or soldered. See valve schedule articles.
      f. Disc: PTFE.

C. Class 150, Bronze Swing Check Valves with Bronze Disc:
   1. Description:
      a. Standard: MSS SP-80, Type 3.
      b. CWP Rating: 300 psig.
      c. Body Design: Horizontal flow.
      d. Body Material: ASTM B 62, bronze.
      e. Ends: Threaded or soldered. See valve schedule articles.
      f. Disc: Bronze.

D. Class 150, Bronze Swing Check Valves with Nonmetallic Disc:
   1. Description:
      a. Standard: MSS SP-80, Type 4.
      b. CWP Rating: 300 psig.
      c. Body Design: Horizontal flow.
      d. Body Material: ASTM B 62, bronze.
      e. Ends: Threaded or soldered. See valve schedule articles.
      f. Disc: PTFE.

2.4 IRON SWING CHECK VALVES

A. Class 125, Iron Swing Check Valves with Metal Seats:
   1. Description:
      a. Standard: MSS SP-71, Type I.
      b. CWP Rating: 200 psig.
      c. Body Design: Clear or full waterway.
      d. Body Material: ASTM A 126, gray iron with bolted bonnet.
      e. Ends: Flanged or threaded. See valve schedule articles.
      f. Trim: Bronze.
      g. Gasket: Asbestos free.

B. Class 125, Iron Swing Check Valves with Nonmetallic-to-Metal Seats:
1. Description:
a. Standard: MSS SP-71, Type I.
b. CWP Rating: 200 psig.
c. Body Design: Clear or full waterway.
d. Body Material: ASTM A 126, gray iron with bolted bonnet.
e. Ends: Flanged or threaded. See valve schedule articles.
f. Trim: Composition.
g. Seat Ring: Bronze.
h. Disc Holder: Bronze.
i. Disc: PTFE.
j. Gasket: Asbestos free.

C. Class 250, Iron Swing Check Valves with Metal Seats:
1. Description:
a. Standard: MSS SP-71, Type I.
b. CWP Rating: 500 psig.
c. Body Design: Clear or full waterway.
d. Body Material: ASTM A 126, gray iron with bolted bonnet.
e. Ends: Flanged or threaded. See valve schedule articles.
f. Trim: Bronze.
g. Gasket: Asbestos free.

2.5 IRON SWING CHECK VALVES WITH CLOSURE CONTROL

A. Class 125, Iron Swing Check Valves with Lever- and Spring-Closure Control:
1. Description:
a. Standard: MSS SP-71, Type I.
b. CWP Rating: 200 psig.
c. Body Design: Clear or full waterway.
d. Body Material: ASTM A 126, gray iron with bolted bonnet.
e. Ends: Flanged or threaded. See valve schedule articles.
f. Trim: Bronze.
g. Gasket: Asbestos free.
h. Closure Control: Factory-installed exterior lever and weight.

2.6 IRON, GROOVED-END SWING CHECK VALVES

A. 300 CWP, Iron, Grooved-End Swing Check Valves:
1. Description:
a. CWP Rating: 300 psig.
b. Body Material: ASTM A 536, ductile iron.
c. Seal: EPDM.
d. Disc: Spring operated, ductile iron or stainless steel.

2.7 IRON, CENTER-GUIDED, SPRING-LOADED CHECK VALVES

A. Class 125, Iron, Compact-Wafer, Center-Guided Check Valves with Metal Seat:
1. Description:
a. Standard: MSS SP-125.

b. CWP Rating: 200 psig.
c. Body Material: ASTM A 126, gray iron.
d. Style: Compact wafer, spring loaded.
e. Seat: Bronze.

B. Class 125, Iron, Globe, Center-Guided Check Valves with Metal Seat:
1. Description:
a. Standard: MSS SP-125.
b. CWP Rating: 200 psig.
c. Body Material: ASTM A 126, gray iron.
d. Style: Globe, spring loaded.
e. Ends: Flanged.
f. Seat: Bronze.

C. Class 150, Iron, Compact-Wafer, Center-Guided Check Valves with Metal Seat:
1. Description:
a. Standard: MSS SP-125.
b. CWP Rating: 300 psig.
c. Body Material: ASTM A 395/A 395M or ASTM A 536, ductile iron.
d. Style: Compact wafer, spring loaded.
e. Seat: Bronze.

D. Class 150, Iron, Globe, Center-Guided Check Valves with Metal Seat:
1. Description:
a. Standard: MSS SP-125.
b. CWP Rating: 300 psig.
c. Body Material: ASTM A 395/A 395M or ASTM A 536, ductile iron.
d. Style: Globe, spring loaded.
e. Ends: Flanged.
f. Seat: Bronze.

E. Class 250, Iron, Compact-Wafer, Center-Guided Check Valves with Metal Seat:
1. Description:
a. Standard: MSS SP-125.
b. CWP Rating: 400 psig.
c. Body Material: ASTM A 126, gray iron.
d. Style: Compact wafer, spring loaded.
e. Seat: Bronze.

F. Class 250, Iron, Globe, Center-Guided Check Valves with Metal Seat:
1. Description:
a. Standard: MSS SP-125.
b. CWP Rating: 400 psig.
c. Body Material: ASTM A 126, gray iron.
d. Style: Globe, spring loaded.
e. Ends: Flanged.
f. Seat: Bronze.

G. Class 300, Iron, Compact-Wafer, Center-Guided Check Valves with Metal Seat:
1. Description:

a. Standard: MSS SP-125.
b. CWP Rating: 500 psig.
c. Body Material: ASTM A 395/A 395M or ASTM A 536, ductile iron.
d. Style: Compact wafer, spring loaded.
e. Seat: Bronze.

H. Class 300, Iron, Globe, Center-Guided Check Valves with Metal Seat:
1. Description:
a. Standard: MSS SP-125.
b. CWP Rating: 500 psig.
c. Body Material: ASTM A 395/A 395M or ASTM A 536, ductile iron.
d. Style: Globe, spring loaded.
e. Ends: Flanged.
f. Seat: Bronze.

I. Class 125, Iron, Compact-Wafer, Center-Guided Check Valves with Resilient Seat:
1. Description:
a. Standard: MSS SP-125.
b. CWP Rating: 200 psig.
c. Body Material: ASTM A 126, gray iron.
d. Style: Compact wafer, spring loaded.
e. Seat: EPDM Stainless Steel.

J. Class 125, Iron, Globe, Center-Guided Check Valves with Resilient Seat:
1. Description:
a. Standard: MSS SP-125.
b. CWP Rating: 200 psig.
c. Body Material: ASTM A 126, gray iron.
d. Style: Globe, spring loaded.
e. Ends: Flanged.
f. Seat: EPDM Stainless Steel.

K. Class 150, Iron, Compact-Wafer, Center-Guided Check Valves with Resilient Seat:
1. Description:
a. Standard: MSS SP-125.
b. CWP Rating: 300 psig.
c. Body Material: ASTM A 395/A 395M or ASTM A 536, ductile iron.
d. Style: Compact wafer, spring loaded.
e. Seat: EPDM Stainless Steel.

L. Class 150, Iron, Globe, Center-Guided Check Valves with Resilient Seat:
1. Description:
a. Standard: MSS SP-125.
b. CWP Rating: 300 psig.
c. Body Material: ASTM A 395/A 395M or ASTM A 536, ductile iron.
d. Style: Globe, spring loaded.
e. Ends: Flanged.
f. Seat: EPDM Stainless Steel.

M. Class 250, Iron, Compact-Wafer, Center-Guided Check Valves with Resilient Seat:

1. Description:
    a. Standard: MSS SP-125.
    b. CWP Rating: 400 psig.
    c. Body Material: ASTM A 126, gray iron.
    d. Style: Compact wafer, spring loaded.
    e. Seat: EPDM Stainless Steel.

N. Class 250, Iron, Globe, Center-Guided Check Valves with Resilient Seat:
1. Description:
    a. Standard: MSS SP-125.
    b. CWP Rating: 400 psig.
    c. Body Material: ASTM A 126, gray iron.
    d. Style: Globe, spring loaded.
    e. Ends: Flanged.
    f. Seat: EPDM Stainless Steel.

O. Class 300, Iron, Compact-Wafer, Center-Guided Check Valves with Resilient Seat:
1. Description:
    a. Standard: MSS SP-125.
    b. CWP Rating: 500 psig.
    c. Body Material: ASTM A 395/A 395M or ASTM A 536, ductile iron.
    d. Style: Compact wafer, spring loaded.
    e. Seat: EPDM Stainless Steel.

P. Class 300, Iron, Globe, Center-Guided Check Valves with Resilient Seat:
1. Description:
    a. Standard: MSS SP-125.
    b. CWP Rating: 500 psig.
    c. Body Material: ASTM A 395/A 395M or ASTM A 536, ductile iron.
    d. Style: Globe, spring loaded.
    e. Ends: Flanged.
    f. Seat: EPDM Stainless Steel.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install check valves for proper direction of flow and as follows:
1. Swing Check Valves: In horizontal position with hinge pin level.
2. Plate-Type Check Valves: In horizontal or vertical position, between flanges.
3. Lift Check Valves: With stem upright and plumb.

F. Install valve tags. Comply with requirements in Section 22 05 53 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:
1. Pump-Discharge Check Valves:
   a. NPS 2 and Smaller: Bronze swing check valves with bronze or nonmetallic disc.
   b. NPS 2-1/2 and Larger for Domestic Water: Iron swing check valves with lever and weight or spring; or iron, center-guided, metal-seat or resilient-seat check valves.
   c. NPS 2-1/2 and Larger for Sanitary Waste and Storm Drainage: Iron swing check valves with lever and weight or spring.

B. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

C. End Connections:
1. For Copper Tubing, NPS 2 and Smaller: Threaded or soldered.
2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged or threaded.
3. For Copper Tubing, NPS 5 and Larger: Flanged.
4. For Steel Piping, NPS 2 and Smaller: Threaded.
5. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged or threaded.
6. For Steel Piping, NPS 5 and Larger: Flanged.
7. For Grooved-End Copper Tubing and Steel Piping: Grooved.

3.5 LOW-PRESSURE, COMPRESSED-AIR VALVE SCHEDULE (150 PSIG OR LESS)

A. Pipe NPS 2 and Smaller:
   1. Vertical, Upflow Applications Only: Bronze lift check valves, Class 125, bronze disc with soldered end connections.
   2. Horizontal and Vertical Applications: Bronze swing check valves, Class 125, bronze disc with soldered end connections.

3.6 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller: Bronze swing check valves, Class 125 bronze disc with soldered end connections.

**END OF SECTION 22 05 23.14**

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# SECTION 22 05 23.15 - GATE VALVES FOR PLUMBING PIPING

## PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Bronze gate valves.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. NRS: Nonrising stem.

C. OS&Y: Outside screw and yoke.

D. RS: Rising stem.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of valve.
   1. Certification that products comply with NSF 61 Annex G and NSF 372.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Protect internal parts against rust and corrosion.
   2. Protect threads, flange faces, grooves, and weld ends.
   3. Set gate valves closed to prevent rattling.

B. Use the following precautions during storage:
   1. Maintain valve end protection.
   2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

## PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:
1. ASME B1.20.1 for threads for threaded end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
4. ASME B16.18 for solder joint.
5. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 Annex G and NSF 372 for valve materials for potable-water service.

D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

F. Valve Sizes: Same as upstream piping unless otherwise indicated.

G. RS Valves in Insulated Piping: With 2-inch stem extensions.

H. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE GATE VALVES

A. Class 125, NRS, Bronze Gate Valves:
1. Description:
a. Standard: MSS SP-80, Type 1.
b. CWP Rating: 200 psig.
c. Body Material: Bronze with integral seat and screw-in bonnet.
d. Ends: Threaded or solder joint.
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron, bronze, or aluminum.

B. Class 125, RS, Bronze Gate Valves:
1. Description:
a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 200 psig.
c. Body Material: Bronze with integral seat and screw-in bonnet.
d. Ends: Threaded or solder joint.
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron, bronze, or aluminum.

C. Class 150, NRS, Bronze Gate Valves:
   1. Description:
      a. Standard: MSS SP-80, Type 1.
      b. CWP Rating: 300 psig.
      c. Body Material: Bronze with integral seat and union-ring bonnet.
      d. Ends: Threaded.
      e. Stem: Bronze.
      f. Disc: Solid wedge; bronze.
      g. Packing: Asbestos free.
      h. Handwheel: Malleable iron, bronze, or aluminum.

D. Class 150, RS, Bronze Gate Valves:
   1. Description:
      a. Standard: MSS SP-80, Type 2.
      b. CWP Rating: 300 psig.
      c. Body Material: Bronze with integral seat and union-ring bonnet.
      d. Ends: Threaded.
      e. Stem: Bronze.
      f. Disc: Solid wedge; bronze.
      g. Packing: Asbestos free.
      h. Handwheel: Malleable iron, bronze, or aluminum.

## PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install valve tags. Comply with requirements in Section 22 05 53 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. Use gate valves for shutoff service only.

B. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

C. For Grooved-End Copper Tubing and Steel Piping: Valve ends may be grooved.

3.5 LOW-PRESSURE, COMPRESSED-AIR VALVE SCHEDULE (150 PSIG OR LESS)

A. Pipe NPS 2 and Smaller: Bronze gate valves, Class 150, NRS with soldered ends.

3.6 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller: Bronze gate valves, Class 150, NRS with soldered ends.

**END OF SECTION 22 05 23.15**

# SECTION 22 05 29 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

### 1.3 SUBMITTALS

A. Submit in accordance with Division 1.

B. Product Data
   1. Product data for products and materials indicated.
   2. Manufacturer's technical bulletins and installation/application instructions.
   3. Material Safety Data Sheets (MSDS).
   4. Manufacturer's data (catalog cuts and data sheets), for each manufactured component including hangers, attachments, inserts, thermal shields anchors and guides, auxiliary framing and wall seals. Provide a project specific hanger and support schedule indicating all devices, manufacture and model, where used. Cross reference to product data and specification paragraph. Data must demonstrate that components comply with Specifications.

C. Maintenance Data: Submit maintenance data and parts list for each type of support and anchor. Include this data, product data, and shop drawings in maintenance manual in accordance with requirements of Division 1.

D. Certificates
   1. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

E. Qualification Data
   1. For manufacturer as specified in the "Quality Assurance" Article.

## PART 2 - PRODUCTS

### 2.1 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
   1. Properties: Nonstaining, noncorrosive, and nongaseous.
   2. Design Mix: 5000-psi, 28-day compressive strength.

**PART 3 - EXECUTION**

3.1 HANGER AND SUPPORT INSTALLATION

A. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

B. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

C. Install lateral bracing with pipe hangers and supports to prevent swaying.

D. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

E. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

3.2 METAL FABRICATIONS

A. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

B. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.3 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.4 PAINTING

A. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.5 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use copper-plated pipe hangers and attachments for copper piping and tubing.

F. Use instead of building attachments where required in concrete construction.

**END OF SECTION 22 05 29**

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# SECTION 22 05 53 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
1. Equipment labels.
2. Pipe labels.
3. Valve tags.
4. Warning tags.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

## PART 2 - PRODUCTS

### 2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Brady Corporation.
   b. emedco.
   c. Seton Identification Products.
2. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
3. Letter Color: White.
4. Background Color: Black.
5. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
6. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
7. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
8. Fasteners: Stainless-steel self-tapping screws.
9. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 PIPE LABELS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Brady Corporation.
2. emedco.
3. Seton Identification Products.

B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

C. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.

D. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

E. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.
1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: Size letters according to ASME A13.1 for piping.

2.3 VALVE TAGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Brady Corporation.
2. emedco.
3. Seton Identification Products.

B. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.
1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link chain.

C. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
   1. Valve-tag schedule shall be included in operation and maintenance data.

2.4 WARNING TAGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Brady Corporation.
   2. emedco.
   3. Seton Identification Products.

B. Description: Preprinted or partially preprinted accident-prevention tags of plasticized card stock with matte finish suitable for writing.
   1. Size: 3 by 5-1/4 inches minimum.
   2. Fasteners: Brass grommet and wire.
   3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
   4. Color: Safety yellow background with black lettering.

**PART 3 - EXECUTION**

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

## 3.4 PIPE LABEL INSTALLATION

A. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
   1. Near each valve and control device.
   2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
   3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
   4. At access doors, manholes, and similar access points that permit view of concealed piping.
   5. Near major equipment items and other points of origination and termination.
   6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
   7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

C. Pipe Label Color Schedule:
   1. Low-Pressure Compressed Air Piping:
      a. Background: Safety blue.
      b. Letter Colors: White.
   2. High-Pressure Compressed Air Piping:
      a. Background: Safety blue.
      b. Letter Colors: White.
   3. Domestic Water Piping
      a. Background: Safety green.
      b. Letter Colors: White.
   4. Sanitary Waste Piping:
      a. Background Color: Safety black .
      b. Letter Color: White.

## 3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, faucets, convenience and lawn-watering hose connections, and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:
   1. Valve-Tag Size and Shape:
      a. Cold Water: 1-1/2 inches, round.
      b. Hot Water: 1-1/2 inches, round.
      c. Low-Pressure Compressed Air: 1-1/2 inches, round.
      d. High-Pressure Compressed Air: 1-1/2 inches, round.
   2. Valve-Tag Colors:
      a. Cold Water: Natural.
      b. Hot Water: Natural.

c. Low-Pressure Compressed Air: Natural.
d. High-Pressure Compressed Air: Natural.

3. Letter Colors:
   a. Cold Water: White.
   b. Hot Water: White.
   c. Low-Pressure Compressed Air: White.
   d. High-Pressure Compressed Air: White.

3.6 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

**END OF SECTION 22 05 53**

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# SECTION 22 07 16 - PLUMBING EQUIPMENT INSULATION

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section includes insulating the following plumbing equipment:
   1. Domestic water, pumps.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied, if any).

### 1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
   1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
   2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

### 1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

### 1.6 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with equipment Installer for equipment insulation application.

C. Coordinate installation and testing of heat tracing.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

**PART 2 - PRODUCTS**

2.1 INSULATION MATERIALS

A. Products shall not contain asbestos, lead, mercury, or mercury compounds.

B. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

C. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

D. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

2.2 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
1. Verify that systems and equipment to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
   1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
   2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

## 3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
   1. Install insulation continuously through hangers and around anchor attachments.
   2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
   3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

L. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

M. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

N. For above ambient services, do not install insulation to the following:
1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.4 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:
1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

3.5 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

C. Do not field paint aluminum or stainless-steel jackets.

**END OF SECTION 22 07 16**

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# SECTION 22 07 19 - PLUMBING PIPING INSULATION

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section includes insulating the following plumbing piping services:
   1. Supplies and drains for handicap-accessible lavatories and sinks.

### 1.3 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
   1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
   2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

C. Comply with the following applicable standards and other requirements specified for miscellaneous components:
   1. Supply and Drain Protective Shielding Guards: ICC A117.1.

### 1.4 SUBMITTALS

A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.

B. Shop Drawings: Show fabrication and installation details for the following:
   1. Application of protective shields, saddles, and inserts at pipe hangers for each type of insulation and hanger.
   2. Insulation application at pipe expansion joints for each type of insulation.
   3. Insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
   4. Removable insulation at piping specialties and equipment connections.
   5. Application of field-applied jackets.

RFI 0544 GEN - Plumbing Shop Drawings Clarification
Shop Drawings not required

C. Manufacturer's Color Charts: Show the full range of colors available for each type of field-applied finish material indicated.

D. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets with requirements indicated. Include dates of tests.

E. Installer Certificates: Signed by the Contractor certifying that installers comply with requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.5 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.6 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

## PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Products shall not contain asbestos, lead, mercury, or mercury compounds.

B. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

C. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

D. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
   1. Verify that systems to be insulated have been tested and are free of defects.
   2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
   1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
   2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

### 3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
   1. Install insulation continuously through hangers and around anchor attachments.
   2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
   3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
   4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:
   1. Draw jacket tight and smooth.
   2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
   3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at [2 inches] [4 inches] o.c.
      a. For below-ambient services, apply vapor-barrier mastic over staples.
   4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
   5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:
1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Cleanouts.

3.4 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
   1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
   2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
   3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
   4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
   5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

## 3.5 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
   1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
      a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

C. Do not field paint aluminum or stainless-steel jackets.

## 3.6 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
   1. Drainage piping located in crawl spaces.
   2. Underground piping.

3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

**END OF SECTION 22 07 19**

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# SECTION 22 11 16 - DOMESTIC WATER PIPING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes
1. Settlement Joints.
2. Copper pipe and fittings for above and below ground installation.
3. Pipe wrap for all domestic water piping installed below ground and inside grout-filled block walls.
4. Insulation for copper pipe through concrete, grade beams and footings.
5. Electric heat tracing for domestic water temperature maintenance.
6. Dielectric unions and fittings.

B. This Contractor shall furnish all labor, materials, pipe supports, sleeves, hangers, tools, equipment and perform all work and services necessary for furnishing and installation of a complete domestic water piping system. Although all work is not specifically shown or specified, all valves, appurtenances and devices incidental to or necessary for a sound, secure, complete and compatible installation shall be furnished and installed as part of this work.

C. Domestic water piping installed below ground and under slab in all buildings (i.e. trap primer lines, etc) shall be supported either from the structural slab or direct burial. Scope and direction is indicated on the Plumbing Plans.

### 1.2 DEFINITIONS

A. Water Service Piping: Water piping outside the building that conveys water to the building.

B. Service Entrance Piping: Water piping approximately 5-feet outside the building, between water service piping and water distribution piping.

C. Water Distribution Piping: Water piping from a point approximately 5-feet outside the building that conveys water to fixtures and equipment throughout the building.

### 1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing domestic water piping systems with the following minimum working pressure ratings, unless otherwise indicated:
1. Domestic Water Service Piping, Below Ground: 160 psig.
2. Domestic Water Distribution Piping, Above Ground: 125 psig.

### 1.4 SUBMITTALS

A. Submit in accordance with Division 1.

B. Product Data for settlement joints, below and above ground pipe, fittings, couplings, hangers, pipe coating and pipe wrap for pipe installed below ground and installed in grout-filled block

walls, seismic bracing and thrust and/or restraint or blocking at base of domestic water riser. Provide manufacturer's catalog information.

C. Shop Drawings
   1. For underground and above ground systems, and all mechanical and plumbing chases. Include plans, elevations, sections, and details.
   2. In accordance with Sections 22 05 29.

D. Calculations: In accordance with Sections 22 05 29.

E. Water Samples: Specified in Disinfection of Domestic Water Piping System Article in Part 3.

F. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.5 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Settle joints shall be FM approved.

1.6 RECORDS

A. Provide record of all pipe tests and provide as part of O & M Manual.

B. Include certificate of Tests in O&M Manual.

C. Include certificate of Health Department approval of domestic water quality in O&M Manual.

D. Provide certificate of Domestic water piping system disinfecting and include in O & M Manual.

1.7 DRAWING SCHEDULE

A. Refer to sheet notes and schedule on Drawings for model numbers, symbols, etc. for additional information concerning products specified in this section.

**PART 2 - PRODUCTS**

2.1 SETTLEMENT JOINT

A. General: Provide settlement joint on all domestic water service entrance pipe to each building, as indicated on the Underground Plumbing Plans.

B. Settlement joint shall be manufactured of 65-45-12 ductile iron conforming to the material requirements of ASTM A536.84 and ANSI/AWWA C153/A21.53. Provide foundry certification of material with submittal.

C. Each settlement joint shall be pressure tested prior to shipment against it own restraint to a minimum of 350 psi (250 psi for flexible expansion joints 30 inches diameter and larger.) A minimum 2:1 safety factor, determined from the published pressure rating, shall apply. Factory Mutual Approval for the 12-inch and smaller sizes is required.

D. Each settlement joint shall consist of an expansion joint designed and cast as an integral part of a ball and socket type flexible joint, having a minimum per ball deflection of 20 degrees, 3-inch to 12-inch; and 4-inches minimum expansion.

E. All internal surfaces (wetted parts) shall be lined with a minimum of 15-mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C213 and shall be holiday tested with a 1500-volt spark test conforming to said specification. Sealing gaskets shall be constructed of EPDM. The coating and gaskets shall meet ANSI/NSF-61.

F. All external surfaces shall be coated with a catalyzed coal tar epoxy conforming to the material requirements of AWWA C210. Appropriately sized polyethylene sleeves, meeting ANSI/AWWA C105/A21.5, shall be included for direct buried applications.

G. Manufacturer's certification of compliance to the above standards and requirements shall be provided with submittal.

2.2 PIPING MATERIALS

A. General: The application of the following pipe, tube, and fitting materials and joining methods required for plumbing piping systems are indicated in Part 3 Article "Pipe Fittings and Applications."

B. Hard Copper Tube: ASTM B88, Type L, water tube, drawn temper for above ground and in wall installation.

C. Set Copper Tube: ASTM B88, Type K, water tube, annealed temper for below ground installation.

1. COPPER PIPE AND FITTINGS
    a. Soft Copper Tube: ASTM B88, Types K (ASTM B88M, Types A and B), water tube, annealed temper.
        1) Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
        2) Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.
        3) Copper Unions: MSS SP-123/ASME B16.18, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.
            i. Threaded Ends: Threads conforming to ASME B1.20.1.
    b. Hard Copper Tube: ASTM B88, Types L (ASTM B88M, Types B and C), water tube, drawn temper.
        1) Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought- copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.

2) Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.
3) Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.
Threaded Ends: Threads conforming to ASME B1.20.1.
4) Copper, Grooved-End Fittings: ASTM B75 (ASTM B75M) copper tube or ASTM B584 bronze castings.
5) Copper-Tubing, Keyed Couplings: Copper-tube dimensions and design similar to ANSI/AWWA C606. Include ferrous housing sections, gasket suitable for hot water, and bolts and nuts.
6) Alternate Fitting Option: For piping 4-inches and smaller, copper press fittings conforming to the material and sizing requirements of ASME B16.18 or ASME B16.22. O-rings for copper press fittings shall be EPDM. Fittings shall be IAPMO and UPC listed.

2.3 JOINING MATERIALS

A. Solder, brazing, and welding filler metals are specified in Section 22 05 00, Common Work Results for Plumbing.

2.4 PIPE WRAP BELOW GROUND AND WITHIN GROUT-FILLED BLOCK WALLS

A. General: Provide pipe wrap for all copper pipe installed below ground and for all horizontal and vertical copper pipe installed inside grout-filled block walls.
1. Cleaning: Remove loose scale, rust, dirt, oil and grease before wrapping. Wire brush as required; use solvent for removal of oil and grease.
2. Provide Calpico Inc. pipe wrapping polyvinyl tape, 20-mil thickness, with identification as per IAPMO-CPC Code for all horizontal and vertical copper piping installed inside grout-filled block walls.
3. Encase in one layer of an ANSI/AWWA C105, 8-mil polyethylene jacket all ground copper pipe installed below ground. Install jacket per ANSI/AWWA C105/A21.5.
4. Encase in two layers of an ANSI/AWWA C105, 8-mil polyethylene jacket, all ductile iron pipe installed below ground. Install jacket per ANSI/AWWA C105/A21.5.

2.5 DIELECTRIC PIPE FITTINGS

A. General: Provide dielectric pipe fittings, unions and waterways to protect domestic water copper pipe from deterioration caused by galvanic and stray current corrosion. Provide dielectric fitting, union or waterway where dissimilar metals are used in piping systems.
1. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld neck end types and matching piping system materials.
2. Insulating Material: Suitable for system fluid, pressure, and temperature.
3. Dielectric Unions: Factory-fabricated, union assembly for 250 psig minimum working pressure at a 180 degrees F temperature.
a. Manufacturers: Epco Sales, Inc.; Watts Industries, Inc. - Water Products Division or Zurn Industries, Inc. - Wilkins Division.
4. Dielectric Flanges: Factory-fabricated, companion-flange assembly for 150 or 300 psig minimum pressure to suit system pressures.
a. Manufacturers: Epco Sales, Inc. or Watts Industries, Inc. - Water Products Division.

5. Dielectric-Flange Insulation Kits: Field-assembled, companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
   a. Provide separate companion flanges and steel bolts and nuts for 150 or 300 psig minimum working pressure to suit system pressures.
   b. Manufacturers: Advance Products & Systems, Inc. ; Calipco, Inc. or Pipeline Seal and Insulator, Inc.
6. Dielectric Couplings: Galvanized-steel coupling, having inert and noncorrosive, thermoplastic lining, with threaded ends and 300 psig minimum working pressure at 225 degrees F temperature.
   a. Manufacturers: Calpico, Inc. or Lochinvar Corp.
7. Dielectric Nipples: Electroplated steel nipple, having inert and noncorrosive thermoplastic lining, with combination of plain, threaded, or grooved end types and 300 psig working pressure at 225 degrees F temperature. Nipples shall be listed by IAPMO/UPC and SBCCI PST and ESI.
   a. Manufacturers: Precision Plumbing Products, Inc.; Sioux Chief manufacturing Co.,Inc, Perfection Corp. or Victaulic Co. of America.

2.6 PIPE ESCUTCHEONS

A. General: Provide solid (not split-hinged) pipe escutcheons as specified herein with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extension, if any. Furnish pipe escutcheons with nickel or chrome finish for occupied areas, prime paint finish for unoccupied areas. All areas with escutcheons shall be vandal proof.

B. Pipe Escutcheons for Moist Areas: For waterproof floors, and areas where water and condensation can be expected to accumulate, provide solid cast brass or sheet brass escutcheons, solid pipe escutcheons.

C. Pipe Escutcheons for Dry Areas: Provide solid sheet metal escutcheons.

D. Manufacturer: Chicago Specialty, Producers Specialty, Sanitary-Dash.

2.7 FIRE BARRIER PENETRATION SEALS

A. Provide seals for opening through fire-rated walls, floors, or ceiling used as passage for mechanical components such as piping or ductwork. Refer to details on Drawings.
   1. Piping: Provide fire stopping material.

**PART 3 - EXECUTION**

3.1 SERVICE ENTRANCE PIPING

A. Extend building domestic water piping 5 feet outside building and connect to water service piping. Coordinate invert elevations, pipe sizes and points of connection with the existing site conditions.

3.2 PREPARATION OF FOUNDATION FOR BURIED PIPING

A. Grade trench bottom to provide smooth, firm, stable, and rock-free foundation throughout length of piping.

B. Remove unstable, soft and unsuitable materials at surface on which piping is to be laid and backfill with clean sand or pea gravel to indicated level.

C. Shape bottom of trench to fit bottom of piping. Fill unevenness with tamped-sand backfill. Dig holes at each end of pipe joint to relieve loads and to ensure continuous bearing of pipe barrel on foundation.

3.3 PIPING AND FITTINGS APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.

B. Flanges may be used on aboveground piping, unless otherwise indicated.

C. Grooved joints may be used on aboveground grooved-end piping.

D. Underground Domestic Water Service Entrance Piping: Use the following piping materials:
1. 6 inches and Smaller: Soft copper tube, Type K, cast-copper-alloy, soldered-joint pressure fittings; and soldered joints with Alloy Sn95 solder.
2. All copper pipe installed below finished grade and slab shall be encased in one layer of an ANSI/AWWA C105, 8-mil polyethylene jacket installed per ANSI/AWWA C105/A21.5.

E. Aboveground Domestic Water Distribution Piping: Use the following piping materials:
1. 6 inches and Smaller: Hard copper tube, Type L wrought-copper or cast-copper-alloy pressure fittings; copper unions; bronze flanges and soldered joints with Alloy Sn95 solder.
2. Provide transition fitting (C900 PVC-to-Copper) at location indicated outside the building.

3.4 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
1. Shutoff Duty: Use full port ball or butterfly valves.
2. Throttling Duty: Use full port ball or butterfly valves.
3. Hot Water, Balancing Duty: Calibrated balancing valves, comply with the requirements of Section 22 05 23.
4. Drain Duty: Hose-end drain valves.
5. Isolation Duty: Use full port ball valves.
6. Back Flow: Swing check valves.

B. All iron body valves installed below finished grade shall be encased in two layers on an ANSI/AWWA C105, 8-mil polyethylene jacket installed per ANSI/AWWA C105/A21.5.

3.5 PIPING INSTALLATION

A. Contamination Prevention:

1. Pipe interiors shall be kept free of debris.
2. Interior surfaces of domestic water pipes, valves and fittings shall be protected against contamination, as well as debris. All openings in pipelines shall be closed with watertight plugs when worked is halted on the system. Sealing and packing materials shall not support growth of bacteria. Trenches that become wet shall be treated with calcium hypochlorite granules to prevent bacterial growth.

B. General:
1. The installation of the domestic water systems shall conform to the latest edition of California Plumbing Code (CPC) and this specification.
2. Piping installation shall be coordinated with respect to space available for HVAC, fire protection and electrical installation. In case of conflict in the routing of the piping and ducting, the routing of the ducting shall govern. Installed piping shall not interfere with the operation or accessibility of doors or windows; shall not encroach on aisles, passageways and equipment and shall not interfere with the servicing or maintenance of equipment. Pipe shall be cut accurately to measurements established at the construction site and shall be worked into place without springing or forcing, properly clearing all openings and equipment. Pipe shall not be bent. Cutting or weakening of structural members to facilitate piping installation is not permitted.
3. Pipes shall have burrs removed by reaming and shall be so installed as to permit free expansion and contraction without damage to joints or hangers. Piping above ground shall run parallel with the lines of the building unless otherwise noted on the drawings. Service pipe, valves and fittings shall be kept a sufficient distance from other work to permit finished covering not less than 1-inch from such other work and not less than 1-inch between finished covering on the different services.

C. Extend domestic water distribution piping to a point 5 feet outside each building and in sizes and locations indicated. Connect to water service entrance piping, coordinate point of connection with the existing site conditions. Provide transition fitting, C900 PVC-to-copper.

D. Install underground copper tubing according to CDA's "Copper Tube Handbook."

E. Install wall penetration system at service pipe penetration through foundation wall. Make installation watertight.

F. Install butterfly valve, hose-end drain valve, strainer, pressure gauge, temperature gauge, and test tee with valve, at water service entrance.

G. Install aboveground domestic water piping level without pitch and plumb.

H. Provide and install electric heat trace temperature maintenance on all non-recirculating domestic hot water systems to maintain temperatures indicated on Drawings. Heat trace shall extend from water heater to within 15 feet minimum of each fixture. Install per manufacturer's instructions.

## 3.6 JOINT CONSTRUCTION

A. Soldered Joints: Use ASTM B813, water-flushable, lead-free flux; ASTM B32, lead-free-alloy solder; and ASTM B828 procedure, unless otherwise indicated.

B. Grooved Joints: Assemble joints with keyed-coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

C. Option for fittings: Copper press connections. Copper press fittings shall be made in accordance with the manufacturer's installation instructions. The tubing shall be fully inserted into the fitting and tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool approved by the manufacturer.

## 3.7 VALVE INSTALLATION

A. General: Valves shall be installed at the locations shown on the drawings, as required by code and for isolation of equipment, plumbing fixtures, etc. All valves shall be installed with the stems between the horizontal the 90 degrees vertical. Provide access to all concealed valves by means of access doors furnished and installed by the Contractor.

B. Sectional Valve: Install sectional valves close to water main on each branch and riser serving 2 or more plumbing fixtures or equipment connections and where indicated. Use ball valves for piping 4 inches and smaller. Use butterfly valves for piping 5 inches and larger.

C. Install shutoff valve on each water supply to equipment and on each water supply to plumbing fixtures without supply stops. Use ball valves for piping 4-inches and smaller. Use butterfly valves for piping 5 inches and larger.

D. Drain Valves: Install drain valves on each plumbing equipment item located to drain equipment for service and repair. Install drain valves at base of each water riser, at low points in horizontal piping, and where required to drain water distribution piping system.
   1. Install hose-end drain valves at low points in water mains, risers, and branches.
   2. Install stop-and-waste drain valves where indicated.

E. Balancing Valve: Install balancing valve on the hot water and hot water return loops as indicated on the Drawings and Riser Diagrams.

F. Check Valves: Install swing check valve on discharge side of each pump and elsewhere as indicated. Use MSS SP-80, Class 125, cast-bronze body for 2-inch and smaller piping.

G. Mechanical and Plumbing Chases: Install ball valve on each branch serving each plumbing chase.

## 3.8 HANGER AND SUPPORT INSTALLATION

A. Comply with the requirements for seismic-restraint devices and pipe hanger and supports.

B. Install hangers for horizontal and vertical piping with the following maximum spacing and minimum rod sizes:
   1. Support vertical copper tube at each floor.
   2. Install supports for vertical copper tubing every 10 feet.

C. Conform to Table below for maximum spacing of supports:

| Pipe Material | Horizontal In Feet | Vertical In Feet | Rod Size In Inches |
|---|---|---|---|
| Copper Tubing 1-1/4 inches and smaller: | 6 | 10 | 3/8 inch |
| Copper Tubing 1-1/2 inches and larger: | 10 | 10 | 1/2 inch |

D. Support horizontal and vertical piping inside each mechanical chase using cold formed metal framing ("Superstrut").

3.9 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow service and maintenance.

C. Connect domestic water distribution piping to exterior water service entrance piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to the following:
1. Water Heaters: Install cold-water supply and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
2. Plumbing Fixtures: Install cold and hot water supply piping in sizes indicated, but not smaller than required by the latest edition of California Plumbing Code (CPC) and/or authorities having jurisdiction.
3. Equipment: Connect cold and hot water supply piping to equipment as indicated, but not smaller than equipment connections and as required by CPC. Provide ball valve and union for each connection; provide drain valve on drain connection. Use flanges instead of unions for 5-inches and larger.

3.10 FIELD QUALITY CONTROL

A. Inspect domestic water piping as follows:
1. Do not enclose, cover, or put piping into operation until all piping is inspected and approved by local plumbing official and/or authority having jurisdiction.
2. During progress of the installation, notify local plumbing official and/or authority having jurisdiction at least 24 hours prior to time inspection must be made. Perform tests specified below in presence of the local plumbing official and/or authority having jurisdiction:
   a. Roughing-in Inspection: Arrange for inspection of piping system before concealing or closing-in after roughing-in and prior to setting fixtures.
   b. Final Inspection: Arrange for final inspection by local plumbing official and/or authority having jurisdiction to observe tests and to ensure all systems are in compliance with requirements of the latest edition of California Plumbing Code.
3. Reinspection: When a plumbing official finds that a piping system will not pass test or inspection, Contractor shall make the required corrections and arrange for reinspection by the plumbing official.
4. Reports: Prepare inspection reports and have them signed by the local plumbing official and/or authority having jurisdiction. A copy of all inspection reports to be included in the O & M Manuals.

5. Provide written report to Architect and Engineer that all copper piping installed below ground and inside grout filled block walls have been coated and wrapped with approved pipe wrap. Written report shall be included in the O & M Manuals.

B. Test domestic water distribution piping as follows:
   1. Test for leaks and defects in new water distribution piping system and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
   2. Leave uncovered and unconcealed new, altered, extended, or replaced domestic water distribution piping until it has been tested and approved. Expose work that was covered or concealed before it has been tested and approved for testing.
   3. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
   4. Repair leaks and defects with new materials and retest system or portion thereof until satisfactory results are obtained.
   5. Prepare reports for tests and required corrective action.

3.11 ADJUSTING

A. Adjust balancing valves in hot-water system to provide adequate flow.
   1. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.
   2. Adjust calibrated balancing valves to flows indicated on the Plumbing Drawings or Domestic Water Piping Diagram.

3.12 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify system is complete and clean.

B. Ensure pH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

C. Disinfect potable domestic water distribution piping as follows:
   1. Purge new domestic water distribution piping systems before using.
   2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction or, if methods are not prescribed by that authority, the procedures described in either AWWA C651 or AWWA C652 or as described below:
      a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
      b. Fill and isolate system according to either of the following:
         1) Fill system or part thereof with water/chlorine solution with at least 50 ppm (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours.
         2) Fill system or part thereof with water/chlorine solution with at least 200 ppm (200 mg/L) of chlorine. Isolate and allow to stand for three hours.
      c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
      d. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 of outlets.

e. If final disinfectant residual test less than 25 mg/L, repeat treatment.
f. Flush disinfectant from system until residual equal to that of incoming water or 1.0mg/L.
g. Take samples no sooner than twenty-four (24) hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651. Provide laboratory results to Owner. Obtain approval from local health department.

D. Prepare and submit reports of purging and disinfecting activities.

E. Completely flush all domestic hot and cold water risers to eliminate all debris in the lines before using any flush valves.

F. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.13 STARTUP SERVICES

A. Verify incoming water pressure and temperature.

B. Replace all strainer screens with new at all mechanical and plumbing equipment.

C. Fill water systems. Check potable water expansion tanks to determine that they are not air bound and that system is completely full of water.

D. Before operating systems, perform these steps.
1. Close drain valves, hydrants, and hose bibbs.
2. Open all valves to full open position.
3. Open throttling valves to proper setting.
4. Remove plugs used during testing of piping systems and plugs used for temporary sealing of piping during installation.
5. Remove and clean strainer screens and aerators. Close drain valves and replace drain plugs.
6. Remove filter cartridges from housings and verify that cartridges are as specified for application where used, clean, and ready for use.

E. Check plumbing equipment and verify proper settings, adjustments, and operation. Do not operate water heaters before filling with water.

F. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.14 PROTECTION

A. Protect piping during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

B. Place plugs in ends of uncompleted piping at end of day or when work stops.

**END OF SECTION 22 11 16**

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# SECTION 22 11 19

# DOMESTIC WATER PIPING SPECIALTIES

## PART 1 GENERAL

### 1.1 SUMMARY

A. Section Includes:
1. Backflow preventers.
2. Hose bibbs/Wall hydrant.
3. Water hammer arrester.
4. Trap primer.
5. Balancing valve.
6. Thermostatic mixing valve (eye-wash).
7. Strainer.

### 1.2 SUBMITTALS

A. General: Submit the following in accordance with Conditions of the Contract and Division 1.

B. Product Data: Include rated capacities and shipping, installed, and operating weights. Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following:
1. Backflow Preventers.
2. Hose Bibbs.
3. Water Hammer Arresters.
4. Trap primer.
5. Balancing valve
6. Thermostatic mixing valve (eye-wash).
7. Strainer.

C. Field test reports.

D. Maintenance Data for inclusion in operating and maintenance manuals as specified in Division for the following:
1. Backflow Preventers.
2. Trap Primer.

### 1.3 QUALITY ASSURANCE

A. Design Concept: Drawings indicate capacities, size, profiles, and dimensional requirements of plumbing specialties and system components. Components having equal performance characteristics that deviate from the indicated size and dimensions may be considered, provided such deviations do not change the design concept or intended performance. Refer to Division 1.

B. Plumbing specialties must bear label, stamp, or other markings of specified testing agency.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for piping materials and installation.

E. NSF Compliance:
1. Comply with NSF 61, "Drinking Water System Components-Health Effects, Sections 1 through 9," for potable domestic water plumbing specialties.

1.4 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials matching products installed as described below. Package them with protective covering for storage and identify with labels clearly describing contents.

B. Operating Keys (Handles): Furnish 1 extra key for each key-operated hose bibb installed.

## PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Backflow Preventers:
   a. Conbraco Industries, Inc.
   b. Watts Industries, Inc.; Water Products Div.
   c. Zurn Industries, Inc.; Wilkins Div.
2. Hose Bibbs / Wall Hydrants:
   a. Jay R. Smith Mfg. Co., Div., Smith Industries, Inc.
   b. Woodford Manufacturing Co., Div. WCM Industries, Inc.
   c. Zurn by Hydromechanics Div., Zurn Industries, Inc.
3. Water Hammer Arresters:
   a. Jay R.Smith Mfg. Co., Div., Smith Industries, Inc.
   b. Precision Plumbing Products, Inc.
   c. Sioux Chief Manufacturing Co., Inc.
   d. Zurn by Hydromechanics Div., Zurn Industries, Inc.
4. Trap Primer
   a. Precision Plumbing Products, Inc.
   b. Approved Equal.
5. Balancing Valve
   a. Zurn.
   b. Approved Equal.
6. Thermostatic Mixing Valve
   a. Guardian.
   b. Approved Equal.
7. Strainer
   a. Zurn.

b. Approved Equal.

2.2 BACKFLOW PREVENTERS

A. Hose Connection Vacuum Breakers: ASSE 1011, nickel plated, with nonremovable and manual drain features, and ASME B1.20.7 garden-hose threads on outlet. Units attached to rough-bronze-finish hose connections may be rough bronze.

B. Reduced-Pressure-Principle Backflow Preventer. ASSE 1013, consisting of (OS&Y) gate valves on inlet and outlet and strainer on inlet. Include test cocks and pressure-differential relief valve having ASME A112.1.2 air-gap fitting located between 2 positive-seating check valves for continuous pressure application.
1. Pressure Loss: 12 psig maximum, through middle 1/3 of flow range.
2. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.

2.3 HOSE BIBB /WALL HYDRANT

A. Hose Bibb/Wall Hydrants: Anti-siphon, with integral backflow preventer, all bronze interior parts, with ½ turn ceramic disk cartridge and stainless steel face with operating key.

2.4 WATER HAMMER ARRESTERS

A. Water Hammer Arresters: ASSE 1010, or PDl WH-201, bellows or piston type with pressurized cushioning chamber. Sizes are based on water-supply fixture units, PDl WH-201 sizes “A” through “F.”

2.5 TRAP PRIMER

A. Automatic pressure drop activated trap primer valve. System operating range 20psi to 80psi maximum. Construction type: 300 brass, EPDM E70 O-rings, Dow#7 silicone, #60 stainless steel mesh screen.

2.6 BALANCING VALVES

A. Copper-Alloy calibrated balancing valves with two readout ports and memory-setting indicator, brass body, size same as connected piping. Provide with accessories as follows: meter hoses, fitting valves, differential pressure meter, and carrying case.

B. Cast-Iron Calibrated balancing valves adjustable with Y-pattern globe valve, two readout ports, and memory-setting indicator, size same as connected piping. Provide with accessories as follows: meter hoses, fitting valves, differential pressure meter, and carrying case.

C. Memory-Stop balancing valves. Standard MSS SP-110 for two piece, copper-alloy ball valves, copper alloy body, standard or full port, chrome-plated brass ball, replaceable seats and seals, solder joint or threaded end connections, vinyl-covered steel handles with memory-setting device.

2.7 THERMOSTATIC MIXING VALVE (EYE-WASH)

A. Certified to ASSE 107. Locking type temperature regulator, built-in cold water bypass, adjustable high temperature limit, lead free valves equipped with stainless steel unions, integral check valve and union connection, and mounting bracket.

2.8 STRAINER

A. Y-pattern strainers. Bronze body for NPS 2 and smaller; cast iron for NPS 21/2 and larger. Stainless steel screen with round preformation.

## PART 3 EXECUTION

3.1 INSTALLATION

A. Comply with Section 22 05 00 for piping joining materials, joint construction, and basic installation requirements.

3.2 PIPING SPECIALTY INSTALLATION

A. Install backflow preventers of type, size, and, and capacity indicated, at each water supply connection to mechanical equipment and systems, hot and cold water to washing machines and cold water to garbage disposal at dishwashing machine; and to other equipment and systems as indicated. Comply with plumbing code and authority having jurisdiction. Locate in same room as equipment being connected. Install air-gap fitting on units having atmospheric vent connection and pipe relief outlet drain to nearest floor drain. Do not install bypass around backflow preventer.

B. Install strainers on supply side of each control valve, pressure-regulating valve, and solenoid valve, and where indicated.

C. Install hose bibbs (wall hydrants) with integral or field-installed vacuum breaker.

D. Install water hammer arrestors on all fixture groups of 3 or more fixtures, Water hammer arrestors to be sized according to P.D.I. Standard, see Table below:

| P.D.I. Symbol | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| Fixture Unit Rating | 1-11 | 12-32 | 33-60 | 61-113 | 114-154 | 755-330 |

E. Placement of arrestors on fixture branch line up to 20 feet in length should be between the last two fixtures. On fixture branch line over 20 feet in length two arrestors should be used with the second arrestor placed at the approximate midpoint of the line. The total sum of the fixture unit ratings of the water hammer arrestor should be equal to or greater than the total fixture unit of the branch line.

3.3 CONNECTIONS

A. Supply Runouts to Fixtures: Install hot- and cold-water supply piping runouts to fixtures of sizes indicated but not smaller than required by plumbing code.

B. Electrical Connections: Power wiring and disconnect switches are specified in Division 26.
   1. Grounding: Connect unit components to ground according to the National Electrical Code and Division 26 Section 26 05 26.

## 3.4 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each backflow preventer.
   1. Text: Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.
   2. Requirements for nameplates and signs are specified in Section 22 05 00.

## 3.5 PROTECTION

A. Place plugs in ends of uncompleted piping at end of each day or when work stops.

## 3.6 STARTUP SERVICES

A. Preparation: Perform the following checks before start-up:
   1. Systems tests are complete.
   2. Damaged and defective specialties and accessories have been replaced or repaired.
   3. There is clear space for servicing of specialties.

B. Before operating systems, perform these steps:
   1. Close drain valves, hydrants, and hose bibbs.
   2. Open valves to full open position.
   3. Remove and clean strainers.

## 3.7 ADJUSTING

A. Adjust operation and correct deficiencies discovered during startup services.

## 3.8 DOMESTIC WATER PIPING SPECIALTIES SCHEDULES

A. Provide specialties as scheduled on the following “Data Sheets.” Each Data Sheet begins with a new page.

**END OF SECTION 22 11 19**

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# SECTION 22 13 16 SANITARY WASTE AND VENT PIPING

RFI 0085 — Plumbing - Sanitary Waste & Vent Piping — No-hub piping shall be used below ground

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes
1. Hub and Spigot pipe and Fittings (below ground).
2. No-Hub Pipe, fittings (above ground).
3. No-Hub Heavy Duty Couplings (above ground).
4. Settlement Joints.
5. Pipe Wrap for all sanitary waste and vent and grease waste and vent piping installed below ground and inside grout-filled block walls.
6. Settlement Joints.
7. Pipe Escutcheons.
8. Fire Barrier Penetration Seals.

B. This Contractor shall furnish all labor, materials, sleeves, hangers, supports, tools, equipment and perform all work and services necessary for furnishing and installation of a complete sanitary waste and vent piping system. Although all work is not specifically shown or specified, all appurtenances and devices incidental to or necessary for a sound, secure, complete and compatible installation shall be furnished and installed as part of this work.

C. This Contractor shall furnish to Owner a digital record of all underground sanitary waste and vent and grease waste and vent piping prior to issuing Certificate of Occupancy. Contractor shall review with the Owner entire underground waste and vent system for each building. All blockages and debris found shall be removed and piping systems replaced at no cost to the Owner.

### 1.2 DEFINITIONS

A. Sanitary Waste and Vent Piping: Piping inside the building that conveys waste water and vapors from fixtures and equipment throughout the building.

B. Service Entrance Piping: Sanitary sewerage piping to a point approximately 5 feet outside each building between outside building sewer piping and inside sewer piping.

C. Sewerage Piping: Building sewer piping outside building that conveys sanitary sewerage from building.

### 1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:
1. Soil, Waste, and Vent Piping: 10-foot head of water.
2. Indirect Waste and Vent Piping: 10-foot head of water.
3. Grease Waste and Vent Piping: 10-foot head of water.

### 1.4 SUBMITTALS

A. Product Data for settlement joints, hub and spigot pipe and fittings, No-hub pipe, fittings, and heavy duty couplings, hangers, supports, pipe wrap for pipe installed below ground and installed in grout filled block walls, thrust and/or restraints or blocking at base of each sanitary stack, and seismic bracing. Provide manufacturers catalog information.

B. Shop Drawings
   1. For underground and above ground systems, and all mechanical and plumbing chases. Include plans, elevations, sections, and details.
   2. Details for the installation of the sanitary waste and vent piping for to be supported from the structural slab.

C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.5 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of CISPI, IAMPO and the specified testing agency.

B. Comply with the provisions of ASME B31.9 “Building Services Piping,” for materials, products, and installation.

C. All cast iron pipe and fittings shall be manufactured in the United States. Pipe shall bear the label or stamp that the cast iron was manufactured in the United States, with collective trademark of the Cast Iron Soil Pipe Institute.

D. Submittal for No-Hub heavy duty couplings to include copy of compliance to the requirements of FM 1680 Class I.

1.6 TESTING

A. Sanitary and Grease Waste and Vent Piping:
   1. Test all building sanitary and grease sewer and venting to ensure system is water tight.
   2. All sanitary and grease drainage piping shall be tested to the point of connection to mains outside each building.
   3. Refer to Part 3, Article “Testing” of this section.

B. Records:
   1. Provide record of all pipe tests and include in O&M Manual.
   2. Include certificate of all Tests in O & M Manual.
   3. Include digital record of all underground sanitary waste; grease waste and vent piping systems in O&M Manual.

1.7 DRAWING SCHEDULE

A. Refer to schedules on drawings for model numbers, symbols, and additional information concerning products specified in this section.

## PART 2 - PRODUCTS

2.1 PIPING MATERIALS MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products in each category, by one of the following listed from that category:
   1. Hub and Spigot Cast Iron Pipe and Fittings:
      a. AB&I, Oakland, California.
      b. Charlotte Pipe & Foundry Company, Charlotte, North Carolina.
      c. Tyler Pipe Industries, Tyler, Texas.
   2. No-Hub Cast Iron Pipe and Fittings:
      a. AB&I, Oakland, California.
      b. Charlotte Pipe & Foundry Company, Charlotte, North Carolina.
      c. Tyler Pipe Industries, Tyler, Texas.
   3. No-Hub Heavyweight Couplings:
      a. Anaco, Inc., Oakland, California; Husky SD4000-Orange Shield.
      b. Clamp-All Corporation, Haverhill, MA; Clamp All Hi Torque 125.
      c. No other couplings are acceptable.

2.2 HUB AND SPIGOT SOIL, WASTE AND VENT PIPING

A. Hub and Spigot Pipe and Fittings:
   1. Service Cast Iron pipe and fittings shall be manufactured from gray cast iron with a tensile strength of not less than 21,000 psi.
   2. Pipe and fittings shall comply with ASTM A74. Compression gaskets shall be hydrostatically (water) tested by the manufacturer to verify compliance.
   3. Joints shall be made with an elastomeric compression gasket meeting requirements of ASTM C564.

2.3 CAST-IRON NO-HUB SOIL, WASTE AND VENT PIPING AND FITTINGS

A. No-Hub Pipe: Hubless cast iron pipe and fittings shall be manufactured from gray cast iron with a tensile strength of not less than 21,000 psi. Pipe and fittings shall comply with ASTM A888 and CISPI 301. Each length of pipe shall be hydrostatically (water) tested by the manufacturer to verify compliance. All systems shall utilize a separate waste and vent system.

B. Joints for Hubless Cast Iron Pipe and Fittings Above Grade: Couplings for joining hubless cast iron soil pipe and fittings conforming to ASTM A888, shall be 3 inches wide for nominal pipe sizes 1-1/2 to 4 inches in diameter, 4 inches wide for nominal pipe sizes 5 to 10 inches in diameter. Shields shall have a minimum thickness of 0.015 inches (28 gauge) type 304 stainless steel. Worm drive clamps shall be type 304 stainless steel with a minimum clamp torque of 80 in/lbs. Sealing Gasket shall be neoprene conforming to ASTM C564. Couplings shall conform to FM 1680, Class 1 or ASTM C1540.
   1. Alternate to above, cast iron split clamps secured by stainless steel bolts and nuts with neoprene gasket conforming to ASTM C564, as manufactured by MG Coupling Company.
   2. FM approved couplings may be hung with one hanger per length of pipe for 10-foot lengths and at every third fitting where they are contiguous in conformance with manufacturers installation instructions.

2.4 PIPE WRAP FOR BELOW GROUND PIPING

A. General: Provide pipe wrap for all cast iron pipe installed below ground and cast iron pipe installed inside grout-filled block walls.

B. All underground grease waste, waste and vent cast iron piping installed below finished grade shall be encased in two (2) layers of an ANSI/AWWA C105, 8-mil polyethylene jacket installed per ANSI/AWWA C105/A21.5.

2.5 SETTLEMENT JOINTS

A. General: Provide settlement joints on all service entrance sanitary waste and grease waste pipe from each building as indicated on the Plumbing Drawings.

B. Flexible settlement joints shall be manufactured of 65-45-12 ductile iron conforming to the material requirements of ASTM A536.84 and ANSI/AWWA C153/A21.53. Provide foundry certification of material with submittal.

C. Each settlement joint shall be pressure tested prior to shipment against its own restraint to a minimum of 350 psi (250 psi for flexible expansion joints 30 inches diameter and larger.) A minimum 2:1 safety factor, determined from the published pressure rating, shall apply. Factory Mutual Approval for the 12 inch and smaller sizes is required.

D. Each settlement joint shall consist of an expansion joint designed and cast as an integral part of a ball and socket type flexible joint, having a minimum per ball deflection of: 20 degrees for 3 inches to 12 inches, and 4 inches minimum expansion.

E. All internal surfaces (wetted parts) shall be lined with a minimum of 15 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C213 and shall be holiday tested with a 1500 volt spark test conforming to said specification. Sealing gaskets shall be constructed of EPDM. The coating and gaskets shall meet NSF/ANI 61.

F. All external surfaces shall be coated with a catalyzed coal tar epoxy conforming to the material requirements of AWWA C210. Appropriately sized polyethylene sleeves, meeting ANSI/AWWA C105/A21.5, shall be included for direct buried applications.

G. Manufacturer’s certification of compliance to the above standards and requirements shall be provided with submittal.

2.6 PIPE ESCUTCHEONS

A. General: Provide solid (not split-hinged) pipe escutcheons as specified herein with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extension, if any. Furnish pipe escutcheons with nickel or chrome finish for occupied areas, prime paint finish for unoccupied areas. All areas with escutcheons shall be vandal proof.

B. Pipe Escutcheons for Moist Areas: For waterproof floors, and areas where water and condensation can be expected to accumulate, provide solid cast brass or sheet brass escutcheons, solid pipe escutcheons.

C. Pipe Escutcheons for Dry Areas: Provide solid sheet metal escutcheons.

D. Manufacturer: Chicago Specialty, Producers Specialty, Sanitary-Dash.

2.7 FIRE BARRIER PENETRATION SEALS

A. Provide seals for opening through fire-rated walls, floors, or ceiling used as passage for mechanical components such as piping or ductwork. Refer to details on Drawings.
1. Piping: Provide fire stopping material.

**PART 3 - EXECUTION**

3.1 SERVICE ENTRANCE PIPING

A. Extend building sanitary and grease waste piping and connect to building sanitary and grease drainage piping of size and in location indicated on the underground plumbing drawings for service entrance to each building in. Coordinate invert elevations, pipe sizes and points of connection with the existing site conditions. Install cleanout and extension to grade at connection of building sanitary and grease drainage.

B. Provide settlement joint at each service entrance to each building as indicated on the Plumbing Drawings.

3.2 PREPARATION OF FOUNDATION FOR BURIED PIPING WHERE BUILDING IS SLAB-ON-GRADE

A. Grade trench bottom to provide smooth, firm, stable, and rock-free foundation throughout length of piping.

B. Remove unstable, soft and unsuitable materials at surface on which piping is to be laid and backfill with clean sand or pea gravel to indicated level.

C. Shape bottom of trench to fit bottom of piping. Fill unevenness with tamped-sand backfill. Dig holes at each end of pipe joint to relieve loads and to ensure continuous bearing of pipe barrel on foundation.

3.3 PIPE SUPPORT FOR BUILDING WITH SUPPORTED SLABS

A. Attach all sanitary and grease waste drainage piping to structural slab as indicated on the underground plumbing plans for each building.

B. Comply with the requirements of Article 1.5 D of this Section.

3.4 PIPING APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.

B. Underground, Sanitary and Grease Waste Drainage Piping: Use the following:
1. 2 to 8 inches: Use service weight hub and spigot cast-iron pipe and fittings.
2. Encase all underground piping in two (2) layers of ANSI/AWWA C105, 8-mil polyethylene jacket installed per ANSI/AWWA C105/A21.5 Standards.

C. Aboveground, Sanitary and Grease Waste Drainage Piping: Use the following:
   1. 2 to 8 inches: Use hubless cast-iron pipe; hubless cast-iron pipe fittings; and hubless cast-iron heavy duty stainless steel couplings.

## 3.5 SANITARY AND GREASE WASTE AND VENT PIPING INSTALLATION

A. General: Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

B. Make changes in direction for sanitary and grease waste drainage piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

C. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab or drag in piping and pull past each joint as completed.

D. Install sanitary and grease drainage piping at the following minimum slopes, except where another slope is indicated on the plumbing drawings:
   1. Building Sanitary and Grease Waste Drain: 1/4 inch per foot (2 percent) downward in direction of flow for piping 6 inches and smaller; unless otherwise indicated on the Drawings.
   2. Horizontal Storm Drainage Piping: 1/4 inch per foot (2 percent)downward in direction of flow, unless otherwise indicated on the Drawings.

E. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

F. Do not enclose, cover, or put piping into operation until it is inspected and approved by local plumbing inspector or authorities having jurisdiction.

G. Underground Horizontal Piping: Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

H. Trench shall be wide enough to assemble joints.

I. Trench Bottom shall be stable enough to support the complete barrel of the pipe. If possible, barrel to rest on even undisturbed soil. If it becomes necessary to excavate deeper than needed, place and tamp back fill material to provide an appropriate bed. Holes shall be provided at each joint for the couplings to allow for continuous support of the barrel along the trench bottom.

J. Maximum deflection (change in the direction of the line) shall not exceed ½-inch per foot of pipe.

K. Maintain proper alignment during backfilling, stabile the pipe in proper position by partial backfilling and cradling.

L. Piping laid on grade shall be adequately secured to prevent misalignment when slab is poured.

M. Closet bends installed under slabs shall be adequately secured.

N. Aboveground Horizontal Piping, Suspended: Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

O. Support horizontal pipe and fittings at sufficiently close intervals to maintain alignment and prevent sagging or grade reversal. Support each length of pipe at every coupling, located not more than 18-inches for the joint.

P. Support terminal ends of all horizontal runs or branches at each change of direction or alignment with approved hanger.

Q. Closet bends installed above ground shall be firmly secured.

R. Horizontal pipe and fittings 6 inches and larger shall be braced to prevent horizontal movement. Provide at every branch opening or change of direction by the use of braces, blocks, rodding or other suitable method to prevent movement or joint separation.

S. Vertical Piping: Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

T. Support vertical piping at sufficiently close intervals to maintain alignment and to support the weight of the pipe and its contents. Support stacks at their bases and at each floor level. Provide riser clamps not to exceed 15'-0".

U. If vertical piping is to stand free of any support or if no structure element is available for stability during construction, secure the piping in its proper position by means of adequate stakes or braces fastened to the pipe.

V. Closet bends installed above ground shall be firmly secured.

3.6 JOINT CONSTRUCTION

A. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
   1. Hubless Joints: Make with heavyweight rubber gasket.

3.7 HANGER AND SUPPORT INSTALLATION

A. Comply with Section 23 05 29 for pipe hanger and support devices and Section 23 05 48 for seismic-restraint devices.

B. Conform to Table below for maximum spacing of supports:

| Pipe Material | Horizontal In Feet | Vertical In Feet |
|---|---|---|
| Cast Iron Soil Pipe | 5 | 15 |

C. Pipe Attachments: Install the following:
1. Riser Clamps: MSS Type 8 or Type 42 for vertical runs.
2. Adjustable Steel Clevis Hangers: MSS Type 1 for individual straight runs to 100 feet and less.

D. Support cast-iron soil pipe and fittings not included in Table, at a maximum horizontal spacing of 5 feet, except 10-foot sections of pipe may be supported at 10-foot spacing and at a maximum vertical spacing of 15 feet.

3.8 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect sanitary and grease waste drain piping to exterior sanitary drainage piping. Use transition fitting to join dissimilar piping materials.

C. Connect sanitary and grease waste drainage piping to the following:
1. Plumbing Fixtures and Equipment: Connect drainage piping in sizes indicated on Plumbing Drawings.

3.9 FIELD QUALITY CONTROL

A. During installation, notify local plumbing official or authority having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by local plumbing official and/or authority having jurisdiction to observe tests and to ensure all systems are in compliance with requirements.

B. Reinspection: If local plumbing official and/or authority having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by local plumbing official and/or authority having jurisdiction. A copy of all inspection reports shall be included in the O&M Manuals.

3.10 TESTING

A. Test sanitary and grease drainage and vent piping according to procedures of local plumbing inspector and as follows:
1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed drainage and vent piping until it has been tested and approved. Expose for testing work that has been covered or concealed before it has been tested and approved.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in piping installation. Tightly close all openings in the piping system, torque all couplings to recommended 80 in/lbs and all bends, changes of direction and ends of runs should be properly restrained prior to testing. Contractor shall have the option of hydrostatic or air test the system(s) as followings:
   a. Hydrostatic or Water Test: Prior to the hydrostatic test expelled all air from the system. A hydrostatic test of 10 feet of hydrostatic pressure (4.3 pounds per square inch) shall be performed. Test system for a minimum of 15 minutes, water level must not drop. Inspect joints for leaks.
   b. Air Test: The system shall be pressurized to a maximum of 6 psi utilizing a gauge graduated to no more than 3 times the test pressure. The gauge shall be monitored during the 15 minute test. A reduction of more than 1 psi during the test period indicates failure of the test.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch water column. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.11 CLEANING

A. Clean interior and exterior of piping prior to installation. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.12 STARTUP SERVICES

A. Before operating systems, perform these steps:
   1. Remove all plugs used during testing of piping systems and plugs used for temporary sealing of piping during installation.

B. Check plumbing equipment and verify proper settings, adjustments, and operation.

C. Check plumbing specialties and verify proper settings, adjustments, and operation.

D. Refer to Part I, article 1.2/F.

3.13 PROTECTION

A. Protect all piping during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

B. Place plugs in ends of uncompleted piping at end of day or when work stops.

**END OF SECTION 22 13 16**

RFI 0436 GEN - Factory-Authorized Inspection Eliminations Factory Witness Test Field Removed

# SECTION 22 13 19 - SANITARY WASTE PIPING SPECIALTIES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes
1. Cleanouts.
2. Floor Drains.
3. Floor Sinks.
4. Flashing Materials.

B. Coordinate electrical requirements with electrical contractor prior to commencing Work.

### 1.2 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:
1. Sanitary Waste and Vent Piping: 10-foot head of water.

### 1.3 SUBMITTALS

A. Shop Drawings

1. Shop drawings and elevations of interceptor.
2. Waterproofing and tie-down details for fully immersed interceptor.

RFI 0544 GEN - Plumbing Shop Drawings Clarification Shop Drawings not required

B. Product Data: Include rated capacities and shipping, installed, and operating weights. Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following:
1. Flashing Materials.
2. Cleanouts.
3. Floor Drains.
4. Floor Sinks.
5. Vandal Proof Vent Caps.

C. Calculations
1. Calculations for fully immersed interceptor.

D. Field test reports.

### 1.4 QUALITY ASSURANCE

A. Design Concept: Drawings indicate capacities, size, profiles, and dimensional requirements of plumbing specialties and system components. Components having equal performance characteristics that deviate from the indicated size and dimensions may be considered, provided such deviations do not change the design concept or intended performance. Refer to Division 01.

B. Manufacturer's Qualifications: Firms regularly engaged in manufacture of interceptors of types and capacities required, whose products have been in satisfactory use in similar service for not less than 3 years.

C. Plumbing specialties shall bear label, stamp, or other markings of specified testing agency.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Codes and Standards:
1. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for piping materials and installation.
2. PDI Compliance: Test and rate grease interceptors in accordance with PDI Standard G101, Testing and Rating Procedure for Grease Interceptors.
3. Comply with State Health Department.

1.5 EXTRA MATERIALS

A. Deliver extra materials to OWNER. Furnish extra materials matching products installed as described below. Package them with protective covering for storage and identify with labels clearly describing contents.

B. Operating Keys (Handles): Furnish 1 extra key for each key-operated hose bibb and hydrant installed.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Handle interceptors carefully to prevent damage, and/or breaking. Do not install damaged or broken interceptors; replace with new.

B. Store interceptors in clean dry place. Protect from weather, dirt, water, construction debris, and physical damage.

## PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Floor Drains / Floor Sinks:
1. Jay R.Smith Mfg. Co., Smith Industries, Inc.
2. Zurn by Hydromechanics Div., Zurn Industries, Inc.
3. Wade Div., Tyler Pipe.

B. Cleanouts:
1. Jay R.Smith Mfg. Co., Smith Industries, Inc.
2. Zurn by Hydromechanics Div., Zurn Industries, Inc.
3. Wade Div., Tyler Pipe.

2.2 CLEANOUTS

A. General: Size cleanouts as indicated on Drawings, or where not indicated, same size as connected drainage piping. Cleanouts larger than 4 inches are not required except where indicated.

B. Cleanouts: ASME A112.36.2M, cast-iron body with straight threads and gasket seal or taper threads for plug, flashing flange and clamping ring, and a brass closure plug. Cleanouts for installation in floors not having membrane waterproofing may be furnished without clamping ring. The Product Data Sheets at end of Part 3 of this Section indicate deck plate shape, top-loading classification, access cover, finish, and other specific features.

C. Products: Subject to compliance with requirements, provide one of the products specified in each Sanitary Waste Piping Specialties Product Data Sheet at end of this Section.

2.3 FLOOR DRAINS

A. General: Size outlets as indicated on Product Data Sheet or drawings.

B. Floor Drains/Floor Sink: ASME A112.6.3, cast-iron body, with seepage flange and clamping device. Floor drains for installation in floors not having membrane waterproofing may have seepage flange without clamping device. Floor drains for use as area drains in exterior slab on grade may be furnished with anchor flange instead of seepage flange and clamping device. The Product Data Sheet at end of Part 3 of this Section indicates shape, dimensions, strainer and body top finish, top-loading classification, sump size, and specific features. Provide removable sediment baskets for building.

C. Products: Subject to compliance with requirements, provide one of the products specified in each Sanitary Waste Piping Specialties Product Data Sheet at end of this Section.

2.4 FLASHING MATERIALS

A. Lead: ASTM B 749, Type L51121, copper-bearing sheet, at least 4 psf (0.0625-inch thick) for general use, and at least 6 psf (0.0937-inch thick) for burning (welding), except as otherwise indicated.

B. Roof Flashing Assemblies: Manufactured assembly consisting of 4-psf lead flashing collar with boot and skirt extending at least 8 inches from pipe, with galvanized steel boot reinforcement and counter flashing fitting.
   1. Option 1: Open top.

## PART 3 EXECUTION

3.1 PIPING SPECIALTY INSTALLATION

A. Install trap seal primer valves with valve outlet piping pitched down toward drain trap a minimum of 1/8 inch per foot (1 percent) and connect to floor drain body, trap, or inlet fitting. Adjust valve for proper flow.

B. Install cleanouts in above-ground piping and building drain piping as indicated, and where not indicated, according to the following:

1. Size same as drainage piping up to 4-inch size. Use 4-inch size for larger drainage piping except where larger size cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping 4-inches and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil or waste stack.

C. Install cleanout deck plates (covers), of types indicated, with top flush with finished floor, for floor cleanouts for piping below floors.

D. Install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall, for cleanouts located in concealed piping.

E. Install flashing flange and clamping device with each stack and cleanout passing through floors having waterproof membrane.

F. Install vent flashing sleeves on stacks passing through roof. Secure over stack flashing according to the manufacturer's written instructions.

3.2 FLOOR DRAIN

A. Install drains according to manufacturer's written instruction , in locations indicated.

B. Trap drains connected to sanitary building drain.

C. Install drain flashing collar or flange so that no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes, where penetrated.

D. Position drains for easy accessibility and maintenance.

3.3 CONNECTIONS

A. Drainage Runouts to Fixtures: Provide drainage and vent piping runouts to plumbing fixtures and drains, with approved trap, of sizes indicated, but not smaller than required by plumbing code.

B. Locate drainage piping runouts as close as possible to bottom of floor slabs supporting fixtures or drains.

C. Electrical Connections: Power wiring and disconnect switches are specified in Division 26.
1. Grounding: Connect unit components to ground according to the National Electrical Code and Section 26 05 26.

3.4 FLASHING INSTALLATION

A. Provide flashing Manufactured in a single piece except where large pans, sumps; or other drainage shapes are required.

B. Install 4-psf lead flashing or 16-oz. per sq. ft. copper, except when another weight or material is specified.

C. Install 8-psf lead flashing or heavier where burning (welding) of lead sheets is required.

D. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with membrane waterproofing.
   1. Pipe Flashing: Sleeve type, matching pipe size, with minimum sleeve length of 10-inches, and skirt or flange extending at least 8-inches around pipe..
   2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8-inches around sleeve.
   3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 3-inches around specialty.

E. Set flashing on floors and roofs in solid coating of bituminous cement.

F. Secure flashing into sleeve and specialty clamping ring or device.

G. Install flashing for piping passing through roofs with counter flashing or commercially made flashing fittings.

H. Extend flashing up vent pipe passing through roofs and turn down into pipe or secure flashing into cast-iron sleeve having calking recess.

I. Fabricate and install lead sheet flashing and pans, sumps, and other drainage shapes as indicated. Install drain connection when indicated.

J. Fabricate and install copper sheet flashing and pans, sumps, and other drainage shapes as indicated. Install drain connection when indicated.

K. Fabricate and install galvanized-steel sheet flashing and pans, sumps, and other drainage shapes as indicated. Install drain connection when indicated.

L. Fabricate and install elastic-membrane sheet flashing and pans, sumps, and other drainage shapes as indicated. Install drain connection when indicated.

## 3.5 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each, trap seal primer system.
   1. Text: Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.

## 3.6 FIELD QUALITY CONTROL

A. Manufacturer’s Field Service: Engage a factory-authorized service representative to inspect field-assembled trap seal primer systems and grease recovery units and their installation, including piping and electrical connections. Report results in writing.
   1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
   2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.

3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.7 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

C. Protect interceptors during remainder of connection period, to avoid clogging with construction materials and debris, and to prevent damage from construction and traffic.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain trap seal primer systems. Comply with the requirements of Division 01.

3.9 ADJUSTING

A. Adjust operation and correct deficiencies discovered during startup services.

3.10 SANITARY WASTE PIPING SPECIALTIES SCHEDULES

A. Provide plumbing specialties as scheduled on the following "Data Sheets." Each Data Sheet begins with a new page.

**SANITARY WASTE PIPING SPECIALTIES DATA SHEET**

| | |
|---|---|
| Cleanout Type: | FCO. |
| Description: | Floor cleanout with round adjustable scorated nickel bronze top, lead seal and “Lekeromate” seal. |
| Appropriate Standard: | ASME A112.36.2M. |
| Material: | Cast-iron body. |
| Shape: | Round. |
| Top-Loading Classification: | Medium Duty. |
| Cover Finish: | Provide round top. |
| Closure Plug: | Brass. |
| Products: | J.R.Smith 4020.<br>Wade.<br>Zurn. |

Note: All floor cleanouts shall have vandal proof screws.

**SANITARY WASTE PIPING SPECIALTIES DATA SHEET**

| | | |
|---|---|---|
| Floor Drain Type: | 2” FD | |
| Description: | 2-inch floor drain for Guard Tower, 2” outlet size. | |
| Appropriate Standard: | ASME A112.6.3; ASSE; PDI; ASPE | |
| Material: | Cast-iron. | |
| Shape: | Round top. | |
| Dimensions of Top: | 5 inch Diameter | |
| Top-Loading Classification: | Medium Duty. | |
| Cover and Body Top Finish: | Nickel bronze. | |
| Manufacturer: | J.R.Smith<br>Wade<br>Zurn | 2005C-NB-U.<br>Series W-1100<br>Series Z-415 |

**END OF SECTION 22 13 19**

# SECTION 22 13 23 - SANITARY WASTE INTERCEPTORS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
   1. Grease interceptors.
   2. Oil interceptors.
   3. Sand interceptors.

### 1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:
   1. Sanitary Waste and Vent Piping: 10-foot head of water.

### 1.4 DEFINITIONS

A. FRP: Fiberglass-reinforced plastic.

B. PP: Polypropylene plastic.

### 1.5 ACTION SUBMITTALS

A. Product Data: For each type of interceptor indicated. Include materials of fabrication, dimensions, rated capacities, retention capacities, operating characteristics, size and location of each pipe connection, furnished specialties, and accessories.

B. Shop Drawings: For each type and size of precast-concrete interceptor indicated.
   1. Include materials of construction, dimensions, rated capacities, retention capacities, location and size of each pipe connection, furnished specialties, and accessories.Manufacturer’s Qualifications: Firms regularly engaged in manufacture of interceptors of types and capacities required, whose products have been in satisfactory use in similar service for not less than 3 years.

### 1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Interceptors, drawn to scale, on which the following items are shown and coordinated with each other, based on input from Installers of the items involved:
   1. Interceptors.
   2. Piping connections. Include size, location, and elevation of each.
   3. Interface with underground structures and utility services.

**PART 2 - PRODUCTS**

2.1 GREASE INTERCEPTORS

A. Grease Interceptors: Precast concrete comply with ASTM C 913.
1. Include rubber-gasketed joints, vent connections, manholes, compartments or baffles, and piping or openings to retain grease and to permit wastewater flow.
2. Structural Design Loads:
a) Light-Traffic Load: Comply with ASTM C 890, A-8 (ASSHTO HS10-44).
b) Medium-Traffic Load: Comply with ASTM C 890, A-12 (ASSHTO HS15-44).
c) Heavy-Traffic Load: Comply with ASTM C 890, A-16 (ASSHTO HS20-44).
d) Walkway Load: Comply with ASTM C 890, A-03.
3. Resilient Pipe Connectors: ASTM C 923, cast or fitted into interceptor walls, for each pipe connection.
4. Steps: FRP ladder, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of interceptor to finished grade is less than 60 inches
5. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover..

2.2 OIL INTERCEPTORS

A. Oil Interceptors: Precast concrete comply with ASTM C 913.
1. Include rubber-gasketed joints, vent connections, manholes, compartments or baffles, and piping or openings to retain grease and to permit wastewater flow.
2. Structural Design Loads:
a) Light-Traffic Load: Comply with ASTM C 890, A-8 (ASSHTO HS10-44).
b) Medium-Traffic Load: Comply with ASTM C 890, A-12 (ASSHTO HS15-44).
c) Heavy-Traffic Load: Comply with ASTM C 890, A-16 (ASSHTO HS20-44).
d) Walkway Load: Comply with ASTM C 890, A-03.
3. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
a) Josam Company.
b) MIFAB, Inc.
c) Parkson Corporation.
d) Rockford Sanitary Systems, Inc.
e) Schier Products Company.
f) Smith, Jay R. Mfg. Co.
g) Tyler Pipe, Inc.
h) Watts Water Technologies, Inc.
i) Zurn Plumbing Products Group; Zurn Specification Drainage Products.
4. Inlet, Outlet, Vent, and Waste-Oil Outlet Piping Connections: Hub, hubless, or threaded, unless otherwise indicated.

B. Oil Interceptors: Plastic body; with removable sediment bucket or strainer, baffles, vents, and flow-control fitting on inlet.
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
a) Green Turtle (USA).

b) Parkson Corporation.
c) Schier Products Company.
d) Town & Country Plastics, Inc.
e) Inlet, Outlet, Vent, and Waste-Oil Outlet Piping Connections: Hub, hubless, or threaded, unless otherwise indicated

2.3 SAND INTERCEPTORS

A. Description: Factory-fabricated, cast-iron or steel body and inlet grate; with settlement chamber and removable basket or strainer.

B. Basis-of-Design Product: Subject to compliance with requirements, provide [product indicated on Drawings] <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
1. MIFAB, Inc.
2. Rockford Sanitary Systems, Inc.
3. Smith, Jay R. Mfg. Co.
4. Tyler Pipe, Inc.

C. Outlet Piping Connection: Hub, hubless, or threaded, unless otherwise indicated.

D. Grate: Cast iron or steel with reinforcement to provide ASTM C 890 load.

2.4 PRECAST-CONCRETE MANHOLE RISERS

A. Precast-Concrete Manhole Risers: ASTM C 478, with rubber-gasket joints.
1. Structural Design Loads:
a) Light-Traffic Load: Comply with ASTM C 890, A-8 (ASSHTO HS10-44).
b) Medium-Traffic Load: Comply with ASTM C 890, A-12 (ASSHTO HS15-44).
c) Heavy-Traffic Load: Comply with ASTM C 890, A-16 (ASSHTO HS20-44).
d) Walkway Load: Comply with ASTM C 890, A-03.
2. Length: From top of underground concrete structure to grade.
3. Riser Sections: 3-inch minimum thickness and 36-inch diameter.
4. Top Section: Eccentric cone, unless otherwise indicated. Include top of cone to match grade ring size.
5. Gaskets: ASTM C 443, rubber.
6. Steps: FRP ladder, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals.

B. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, diameter matching manhole frame and cover, and height as required to adjust the manhole frame and cover to indicated elevation and slope.

**PART 3 EXECUTION**

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.2 INSTALLATION

A. Install precast-concrete interceptors according to ASTM C891. Set level and plumb.

B. Install manhole risers from top of underground concrete interceptors to manholes and gratings at finished grade.

C. Set tops of manhole frames and covers flush with finished surface in pavements. Set tops 3 inches above finish surface elsewhere, unless otherwise indicated.

D. Set tops of grating frames and grates flush with finished surface.

E. Set interceptors level and plumb.

F. Set tops of metal interceptor covers flush with finished surface in pavements. Set tops 3 inches above finish surface elsewhere, unless otherwise indicated.

3.3 CONNECTIONS

A. Piping installation requirements are specified in Section 221316 "Sanitary Waste and Vent Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Make piping connections between interceptors and piping systems.

3.4 IDENTIFICATION

A. Identification materials and installation are specified in Section 312000 "Earth Moving." Arrange for installation of green warning tapes directly over piping and at outside edges of underground interceptors.
   1. Use warning tapes or detectable warning tape over ferrous piping.
   2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

**END OF SECTION 22 13 23**

# SECTION 22 14 13 - FACILITY STORM DRAINAGE PIPING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:
1. Hub and Spigot Pipe and Fittings (below ground).
2. No-Hub Pipe, Fittings (above ground).
3. No-Hub Heavyweight Couplings (above ground).
4. Pipe Wrap for all storm and overflow drain piping installed below ground and inside grout-filled block walls.
5. Settlement Joints.
6. Pipe Escutcheons.
7. Fire Barrier Penetration Seals.

B. This Contractor must furnish all labor, materials, sleeves, hangers, supports, tools, equipment and perform all work and services necessary for furnishing and installation of a complete storm and overflow drainage piping system. Although all work is not specifically shown or specified, all appurtenances and devices incidental to or necessary for a sound, secure, complete and compatible installation must be furnished and installed as part of this work.

C. This Contractor must furnish to Owner a digital record of all underground storm drainage piping prior to issuing Certificate of Occupancy. Contractor must review with the Owner entire underground storm drainage system for each building. All blockages and debris found must be removed and piping systems replaced at no cost to the Owner.

### 1.2 DEFINITIONS

A. Drainage Piping: Building drainage piping outside the building that conveys storm drainage from roof drains from the building.

B. Service Entrance Piping: Drainage piping at a point approximately 15 feet outside each building between outside building storm drainage piping and building storm drainage piping.

C. Storm Drainage Piping: Piping inside the building that conveys storm water from roof drains.

D. Overflow Drainage Piping: Piping inside the building that conveys overflow storm drainage from overflow roof drains to the exterior of the building.

### 1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:
1. Storm and Overflow Drainage Piping: 10-foot head of water.

1.4 SUBMITTALS

A. Submit in accordance with Section 01.

B. Product Data for settlement joints, roof and overflow drain assembly, joint restraint, Hub and spigot pipe and fittings; No-hub pipe, fittings, and heavy duty couplings, hangers, supports, insulation and pipe wrap for pipe installed below ground and in grout filled block walls, thrust and/or restraints or blocking at base of each storm drain riser and seismic supports.

C. Shop Drawings
1. For underground and above ground storm and overflow drainage systems and all plumbing chases. Include plans, elevations, sections, and details.
2. Details for installation of the storm drain piping to be supported from the structural slab.
3. In accordance with Sections 22 05 29.

D. Calculations: In accordance with Sections 22 05 29.

E. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.5 QUALITY ASSURANCE

A. Piping materials must bear label, stamp, or other markings of CISPI, IAPMO and the specified testing agency.

B. Comply with the provisions of ASME B31.9 “Building Services Piping,” for materials, products, and installation.

C. All cast iron pipe and fittings must be manufactured in the United States. Pipe must bear the label or stamp that the cast iron was manufactured in the United States. With collective trademark of the Cast Iron Soil Pipe Institute.

D. Submittal for No-Hub heavy duty couplings to include copy of compliance to the requirements of FM 1680 Class I by certified independent third party testing laboratory.

E. Certificate of compliance for settlement joint.

F. Submittal for roof/overflow drain assembly.

1.6 TESTING

A. Storm and Overflow Drain Piping:
1. Test all building storm and overflow drain piping to ensure system water tight.
2. All storm drainage piping must be tested to the point of connection to mains outside each building.
3. Refer to Part 3, Article “Testing” of this section.

B. Records:
1. Provide record of pipe tests.
2. Include certificate of all Tests in O & M Manual.
3. Include digital record of all underground storm drain piping systems in O & M Manuals.

1.7 DRAWING SCHEDULE

A. Additional information concerning products specified in this section (model numbers, symbols, etc.) is indicated on schedules on Drawings.

**PART 2 - PRODUCTS**

2.1 PIPING MATERIALS MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products in each category, by one of the following listed from that category:
   1. Hub and Spigot Cast Iron Pipe and Fittings:
      a. AB&I, Oakland, California.
      b. Charlotte Pipe & Foundry Company, Charlotte, North Carolina.
      c. Tyler Pipe Industries, Tyler, Texas.
   2. No-Hub Cast Iron Pipe and Fittings:
      a. AB&I, Oakland, California.
      b. Charlotte Pipe & Foundry Company, Charlotte, North Carolina.
      c. Tyler Pipe Industries, Tyler, Texas.
   3. No-Hub Heavyweight Couplings:
      a. Anaco, Inc., Oakland, California; Husky SD4000-Orange Shield.
      b. Clamp-All Corporation, Haverhill, MA; Clamp All Hi Torque 125.
      c. No other couplings acceptable.
   4. Settlement Joints:
      a. EBAA Iron Sales, Eastland, Texas.
      b. Or approved equal.
   5. Combination Roof/Overflow Drains:
      a. J.R.Smith.
      b. Zurn.
      c. Wade.

2.2 HUB AND SPIGOT STORM DRAINAGE PIPING

A. General: Provide hub and spigot piping for all underground and below slab storm and drainage piping.

B. Hub and Spigot Pipe and Fittings:
   1. Service Cast Iron pipe and fittings must be manufactured from gray cast iron with a tensile strength of not less than 21,000 psi. Compression gaskets must be manufactured from an elastomer meeting the requirements of ASTM C567.
   2. Pipe and fittings must comply with ASTM A74. Compression gaskets must be hydrostatically (water) tested by the manufacturer to verify compliance.
   3. Joints must be made with an elastomeric compression gasket meeting requirements of ASTM C567.

2.3 NO-HUB STORM AND OVERFLOW DRAIN PIPING AND FITTINGS

A. No-Hub Pipe: Hubless cast iron pipe and fittings must be manufactured from gray cast iron with a tensile strength of not less than 21,000 psi. Pipe and fittings must comply with ASTM A888 and CISPI 301. Each length of pipe must be hydrostatically (water) tested by the

manufacturer to verify compliance. All systems must utilize a separate storm and overflow system.

B. Joints for Hubless Cast Iron Pipe and Fittings Above Grade: Couplings for joining hubless cast iron soil pipe and fittings conforming to ASTM A888, must be 3 inches wide for nominal pipe sizes 1-1/2 to 4 inches in diameter, 4 inches wide for nominal pipe sizes 5 to 10 inches in diameter. Shields must have a minimum thickness of 0.015 inches (28 gauge) type 304 stainless steel. Worm drive clamps must be type 304 stainless steel with a minimum clamp torque of 80 in/lbs. Sealing Gasket must be neoprene conforming to ASTM C567. Couplings must conform to FM Standard 1680, Class 1, or ASTM C1540, as manufactured by Clamp-All Products Models HI-TORQ 125.
   1. Alternate to above, cast iron split clamps secured by stainless steel bolts and nuts with neoprene gasket conforming to ASTM C567, as manufactured by MG Coupling Company.
   2. Factory Mutual Approved Couplings may be hung with one hanger per length of pipe for 10-foot lengths and at every third fitting where they are contiguous in conformance with manufacturer's installation instructions.

2.4 PIPE WRAP FOR BELOW GROUND PIPING AND INSIDE GROUT-FILLED BLOCK WALLS

A. General: Provide pipe wrap for all cast iron pipe installed below ground and cast iron pipe installed inside grout-filled block walls.

B. Provide Calpico Inc. pipe wrapping polyvinyl tape, 20 mil thickness with identification as per IAMPO-CPC Code for all vertical piping installed inside grout-filled block walls.

C. All underground storm drain piping installed below finished grade must be encased in two (2) layers of an AWWA C105/A21.5, 8-mil polyethylene jacket.

2.5 SETTLEMENT JOINTS

A. General: Provide settlement joints on all service entrance storm drainage pipe from each building on the plumbing plans.

B. Flexible settlement joints must be manufactured of 65-45-12 ductile iron conforming to the material requirements of ASTM A536 and AWWA C153/A21.53. Provide foundry certification of material with submittal.

C. Each settlement joint must be pressure tested prior to shipment against its own restraint to a minimum of 350 psi (250 psi for flexible expansion joints 30-inches diameter and larger.) A minimum 2:1 safety factor, determined from the published pressure rating, must apply. FM Approval for the 12-inch and smaller sizes is required.

D. Each settlement joint must consist of an expansion joint designed and cast as an integral part of a ball and socket type flexible joint, having a minimum per ball deflection of: 20 degrees for 3 inches to 12 inches, and 4 inches minimum expansion.

E. All internal surfaces (wetted parts) must be lined with a minimum of 15-mils of fusion bonded epoxy conforming to the applicable requirements of AWWA C213 and must be

holiday tested with a 1500 volt spark test conforming to said specification. Sealing gaskets must be constructed of EPDM. The coating and gaskets must meet NSF 61.

F. All external surfaces must be coated with a catalyzed coal tar epoxy conforming to the material requirements of AWWA C210. Appropriately sized polyethylene sleeves, meeting AWWA C105/A21.5, must be included for direct buried applications.

G. Manufacturer's certification of compliance to the above standards and requirements must be provided with submittal. All settlement joints must be FLEX-TEND as manufactured by EBAA Iron, INC. Eastland, TX., U.S.A.; or an approved equal.

2.6 PIPE ESCUTCHEONS

A. General: Provide solid (not split-hinged) pipe escutcheons as specified herein with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extension, if any. Furnish pipe escutcheons with nickel or chrome finish for occupied areas, prime paint finish for unoccupied areas. All areas with escutcheons must be vandal proof.

B. Pipe Escutcheons for Moist Areas: For waterproof floors, and areas where water and condensation can be expected to accumulate, provide solid cast brass or sheet brass escutcheons, solid pipe escutcheons.

C. Pipe Escutcheons for Dry Areas: Provide solid sheet metal escutcheons.

D. Manufacturer: Chicago Specialty, Producers Specialty, Sanitary-Dash.

2.7 FIRE BARRIER PENETRATION SEALS

A. Provide seals for opening through fire-rated walls, floors, or ceiling used as passage for mechanical components such as piping or ductwork. Refer to details on Drawings.
   1. Piping: Provide fire stopping material as specified in Section 07 84 13.

## PART 3 - EXECUTION

3.1 EXCAVATION

A. Comply with Division 2 Sections for sitework, excavating, trenching, and backfilling.

3.2 SERVICE ENTRANCE PIPING

A. Extend building storm drainage piping and connect to building storm drainage piping of size and in location indicated on the underground plumbing drawings for service entrance to each building in. Coordinate invert elevations, pipe sizes and points of connection with the Civil Drawings. Install cleanout and extension to grade at connection of building storm drainage and building storm drainage.

B. Provide settlement joint at each service entrance to each building as indicated on the Plumbing Drawings.

3.3 PREPARATION OF FOUNDATION FOR BURIED PIPING WHERE BUILDING IS SLAB-ON-GRADE

A. Grade trench bottom to provide smooth, firm, stable, and rock-free foundation throughout length of piping.

B. Remove unstable, soft and unsuitable materials at surface on which piping is to be laid and backfill with clean sand or pea gravel to indicated level.

C. Shape bottom of trench to fit bottom of piping. Fill unevenness with tamped-sand backfill. Dig holes at each end of pipe joint to relieve loads and to ensure continuous bearing of pipe barrel on foundation.

3.4 PIPE SUPPORT FOR BUILDING WITH SUPPORTED SLABS

A. Attach all storm drainage piping to structural slab as indicated on the underground plumbing plans for each building and approved shop drawings.

B. Comply with the requirements of Article 1.5 D of this Section.

3.5 PIPING APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.

B. Underground, Storm Drainage Piping: Use the following:
1. 2 to 8 inches: Use service weight hub and spigot cast-iron pipe and fittings.
2. Encase all underground piping in two (2) layers of AWWA C105/A21.5, 8-mil polyethylene jacket.

C. Aboveground, Storm Drainage Piping: Use the following:
1. 2 to 8 inches: Use hubless cast-iron pipe; hubless cast-iron pipe fittings; and hubless cast-iron heavy duty stainless steel couplings.

3.6 STORM DRAINAGE PIPING INSTALLATION

A. General: Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

B. Make changes in direction for storm drainage piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

C. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other

installation requirements. Maintain swab or drag in piping and pull past each joint as completed.

D. Install storm drainage piping at the following minimum slopes, except where another slope is indicated on the plumbing drawings:
   1. Building Storm Drain: As indicated on the Drawings.
   2. Horizontal Storm Drainage Piping: As indicated on the Drawings.

E. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

F. Do not enclose, cover, or put piping into operation until it is inspected and approved by local plumbing inspector or authorities having jurisdiction.

G. Underground Horizontal Piping: Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings." Provide joint restraint for each change of direction.

H. Trench must be wide enough to assemble joints.

I. Trench Bottom must be stable enough to support the complete barrel of the pipe. If possible, barrel to rest on even undisturbed soil. If it becomes necessary to excavate deeper than needed, place and tamp back fill material to provide an appropriate bed. Holes must be provided at each joint for the couplings to allow for continuous support of the barrel along the trench bottom.

J. Maximum deflection (change in the direction of the line) must not exceed ½-inch per foot of pipe.

K. Maintain proper alignment during backfilling, stabile the pipe in proper position by partial backfilling and cradling.

L. Piping laid on grade must be adequately secured to prevent misalignment when slab is poured.

M. Closet bends installed under slabs must be adequately secured.

N. Aboveground Horizontal Piping, Suspended: Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings." Provide joint restraint for each change of direction.

O. Support horizontal pipe and fittings at sufficiently close intervals to maintain alignment and prevent sagging or grade reversal. Support each length of pipe at every coupling, located not more than 18-inches for the joint.

P. Support terminal ends of all horizontal runs or branches at each change of direction or alignment with approved hanger.

Q. Closet bends installed above ground must be firmly secured.

R. Horizontal pipe and fittings 5-inches and larger must be braced to prevent horizontal movement. Provide at every branch opening or change of direction by the use of braces, blocks, rodding or other suitable method to prevent movement or joint separation.

S. Vertical Piping: Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

T. Support vertical piping at sufficiently close intervals to maintain alignment and to support the weight of the pipe and its contents. Support stacks at their bases and at each floor level. Provide riser clamps not to exceed 15 feet, 0 inches.

U. If vertical piping is to stand free of any support or if no structure element is available for stability during construction, secure the piping in its proper position by means of adequate stakes or braces fastened to the pipe.

V. Closet bends installed above ground must be firmly secured.

3.7 JOINT CONSTRUCTION

A. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
   1. Hubless Joints: Make with heavyweight rubber gasket.

3.8 HANGER AND SUPPORT INSTALLATION

A. Comply with Section 22 05 29 for pipe hanger, support devices and Section 22 05 48 for seismic-restraint devices.

B. Conform to Table below for maximum spacing of supports:

| Pipe Material | Horizontal In Feet | Vertical In Feet |
|---|---|---|
| Cast Iron Soil Pipe | 5 | 15 |

C. Pipe Attachments: Install the following:
   1. Riser Clamps: MSS Type 8 or Type 42 for vertical runs.
   2. Adjustable Steel Clevis Hangers: MSS Type 1 for individual straight runs to 100 feet and less.

D. Support cast-iron soil pipe and fittings not included in Table above, at a maximum horizontal spacing of 5 feet, except 10-foot sections of pipe may be supported at 10-foot spacing and at a maximum vertical spacing of 15 feet.

3.9 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect storm drain piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials. Coordinate with Civil Drawings.

C. Connect storm drainage piping to the following:

1. Roof and Overflow Drains: Connect drainage piping in sizes indicated, but not smaller than required by California Plumbing Code, Latest Edition.

3.10 FIELD QUALITY CONTROL

A. During installation, notify local plumbing official or authority having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
   1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
   2. Final Inspection: Arrange for final inspection by local plumbing official and/or authority having jurisdiction to observe tests and to ensure all systems are in compliance with requirements.

B. Reinspection: If local plumbing official and/or authority having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by local plumbing official and/or authority having jurisdiction. A copy of all inspection reports must be included in the O&M Manuals.

3.11 TESTING

A. Test storm and overflow piping according to procedures of local plumbing inspector and as follows:
   1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
   2. Leave uncovered and unconcealed storm and overflow drain piping until it has been tested and approved. Expose for testing work that has been covered or concealed before it has been tested and approved.
   3. Roughing-in Plumbing Test Procedure: Test storm and overflow drainage piping, except outside leaders, on completion of roughing-in piping installation. Tightly close all openings in the piping system, torque all couplings to recommended 80 in/lbs and all bends, changes of direction and ends of runs should be properly restrained prior to testing. Contractor must have the option of hydrostatic or air test the system(s) as followings:
      a. Hydrostatic or Water Test: Prior to the hydrostatic test expelled all air from the system. A hydrostatic test of 10 feet of hydrostatic pressure (4.3 pounds per square inch) must be performed. Test system for a minimum of 15 minutes, water level must not drop. Inspect joints for leaks.
      b. Air Test: The system must be pressurized to a maximum of 6 psi utilizing a gauge graduated to no more than 3 times the test pressure. The gauge must be monitored during the 15 minute test. A reduction of more than 1 psi during the test period indicates failure of the test.
   4. Finished Plumbing Test Procedure: After roof and overflow drains have been set, test connections and prove they are gastight and watertight. Plug building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch water column. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air

throughout period of inspection. Inspect roof and overflow drains connections for gas and water leaks.

5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.12 CLEANING

A. Clean interior and exterior of piping prior to installation. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.13 STARTUP SERVICES

A. Before operating systems, perform these steps:
1. Remove all plugs used during testing of piping systems and plugs used for temporary sealing of piping during installation.

B. Check plumbing equipment and verify proper settings, adjustments, and operation.

C. Check plumbing specialties and verify proper settings, adjustments, and operation.

D. Comply with the requirements of Part 1, Article 1.2/F for digital record of all underground storm drainage piping.

3.14 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

B. Place plugs in ends of uncompleted piping at end of day or when work stops.

**END OF SECTION 22 14 13**

# SECTION 22 15 00 - GENERAL SERVICE COMPRESSED-AIR SYSTEMS

## PART 1- GENERAL

### 1.1 SECTION INCLUDES

A. Pipe and pipe fittings.

B. Valve.

C. Utility air compressors.

D. Rotary screw compressors.

E. Air dryer.

F. Compressed air aftercooler.

G. Receivers.

H. Coalescing air filters.

I. Compressor motors.

J. Wiring.

K. Grounding and bonding.

L. Piping accessories.

### 1.2 RELATED SECTIONS

A. The compressed air systems, as indicated, show facilities diagrammatically and do not show offsets, fittings, and accessories that may be required. Investigate carefully the existing condition of air compressors, air dryers, air filters, pressure regulators, piping, and other accessories relative to compressed air system and report deficiencies to Engineer.

### 1.3 MEASUREMENT AND PAYMENT

A. Separate measurement or payment will not be made for the work required under this Section. All costs in connection with the Work specified herein will be considered to be included or incidental to the Work of this Contract.

### 1.4 REFERENCES

A. ASME B.16.22 Wrought Copper and Bronze Solder Joint Pressure Fittings.

B. ASMEB.16.3 Malleable Iron Threaded Fittings.

C. ASTMA53 Specification for pipe, steel, black and hot-dipped zinc-coated, welded and seamless.

D. ASTMA234/A34M Pipe fitting, flange fittings, and flanges, steel and malleable iron (threaded and butt welding), class 15

E. Specifications Section 01 42 19- Reference Standards.

F. MSS SP-80 Bronze Gate, Globe, Angle and Check Value.

G. MSS SP-110-Ball Values threaded, socket welded, solder joint, groove and flared ends.

H. Trade Standards: Compressed Air and Gas Institute (CAGI)

I. CGAG 7 = Compressed Air for Human Respiration

J. FSWW-V-54 Valve, Gate, Bronze

K. FSWW-V-35 Valve Ball

## 1.5 SUBMITTALS

A. General: Refer to Contract Specifications Section 01 33 00 - Submittal Procedures.

B. Product Data:

1. Air-to-Air Pressure Booster (Amplifier)

2. Receiver Tank

3. Combination Coalizer/Filter

C. Certificate of Compliance: Submit such certified test reports for materials and equipment as necessary to demonstrate compliance with specification requirements.

D. Operation and Maintenance Data: Submit operation and maintenance data for the equipment, include recommended spare parts list.

E. Submit manufacturer's product data for the equipment, defining size and arrangement, and for related materials, appurtenances, and installation accessories. Include manufacturer's certified performance data.

F. Submit shop drawings and details, installation instructions, wiring diagrams, assembly and other items required for a coordinated installation.

G. Submit certified copies of factory test reports.

RFI 0502 — GEN - Compressed Air System Sequence of Operations — Air Dryer Removed, FPT-NABCO, SOO for ACU-1/2

H. Submit Electrical and Communication equipment and materials

I. Prior to field-testing submit to the Engineer for approval the test procedure along with manufacturer's recommendations for startup and test. After testing, submit written records of tests.

RFI 0502.1 — GEN - Compressed Air Setpoint — Max pressure scheduled for the WF-1 is 125 PSI, however, setpoint should be 90 PSI per manufacturer's recommendation.

## PART 2 - PRODUCTS

### 2.1 PIPE AND PIPE FITTINGS

A. Class E, Type K copper pipe shall be nitrile gasket, Victaulic Type T (Orange Stripe), Gustin Bacon, or equal gasket having resistance to compressed air having synthetic oil. Unions for connecting steel pipe to copper tubing and tube shall be Dielectric union type

B. Provide expansive joints, in accordance with Fire Suppression, Plumbing and HVAC.

C. Only PTFE tape shall be used on threaded connection. Paste compound shall not be used.

### 2.2 VALVES

A. Gate, Globe angle, check, butterfly and ball valves. Refer to Contract Specifications Section 20 10 13 -Common Materials and Methods for Facility Services- Fire Suppression, Plumbing and HVAC, for requirements.

B. Air Dryer required.

C. Plug Valves: Plug valves shall have brass or bronze body and plug. Sealing 0-rings shall be TFE-coated viton. Snap ring shall be molybdenum stainless steel. End connections shall be as shown on the Contract Drawings.

### 2.3 QUALITY ASSURANCE

A. The Contractor shall ensure that manufacturer of air compressors and associated hardware is a fi1m that has been regularly engaged in the manufacture of compressors of similar type and size, and has a history of at least five successful similar installations in operation for at least three years.

B. The Contractor shall ensure that the air compressors electrical equipment and materials quality assurance shall be in accordance with the Contract Specifications.

C. All equipment shall be rated in accordance with CAGI standards.

### 2.4 SITE CONDITIONS

A. Inspect the conditions of the area where products are to be placed or installed before the work of this Section begins. Provide surfaces and structures capable of supporting the products. Electrical products that serve the equipment shall have been installed, tested, and accepted before equipment is started and operated.

## 2.5 UTILITY AIR COMPRESSORS

A. Single Stage: Provide heavy duty single stage reciprocating air cooled compressor with positive oil pump lubrication system, suction inlet screen, discharge service valves unit with either cast iron cylinders or aluminum cylinders with cast iron cylinder liners, steel valves, ductile iron crankshaft, splash lubrication, and drive pulleys. Mount compressor head, motor and drive belt on receiver-mounted base with vibration isolators. Rotating drive elements shall be covered by a guard plate or screen.

B. Two Stage: Same as single stage with interstage cooler.

C. Units shall be equipped with the following items:

1. Oil fill and drain plugs.
2. Air intake filter/silencer.
3. Automatic pressure switch.
4. Air receiver.
5. After cooler.
6. Air dryer and operating controls.
7. Control panel.
8. Starter and safety controls.

D. Motors shall be three phase, 460V, 60Hz and suitable for full voltage across the line starting. Motor enclosure shall be totally enclosed fan cooled or non-ventilated. Motors shall be provided and factory tested in accordance with Contract Specifications.

E. Motor starters shall be across the line magnetic starter operable on 480V, three phase, 60Hz supply. Motor starter enclosure shall be NEMA 4 type. Enclosure shall be manufactured to fit single or dual starters with the necessary auxiliary relays, terminal blocks, other associated electrical components. Compressor controls, indication lights, and local annunciator. Motor starters shall be provided and factory tested

RFI 0551

***BLDG B - Compressed Air Compressor - Outdoor Rating***

***Spec'd model is not outdoor rated, adding custom shroud to provide the rating.***

## 2.6 ROTARY SCREW AIR COMPRESSORS

A. Provide rotary screw air compressor with splash type lubrication sized to deliver air at the volume and pressure required for the application, with air cooled after cooler, coalescing type oil filter, air intake filter, silencer and sound attenuation weather resistant housing for outdoor installation.

B. The compressor shall be direct driven by and electric motor having a maximum speed of
C. 1,800 rpm. The motor shall be provided with a magnetic type across-the-line starter, enclosed in a watertight enclosure meeting the requirements of NEMA 4. It shall have a

molded case circuit breaker with thermal and overload protection. Guards, meeting OSHA requirements, shall be provided for all exposed moving parts.

D. Safety shutdown devices including, but not necessarily limited to, low oil pressure and high oil temperature devices shall be provided. Safety valves shall be installed on the compressor.

E. The air compressor shall be a self-contained, packaged unit complete with master slave controller, start/stop and high temperature and low oil pressure shut down controls. It shall also be equipped with external connections for electrical, supply and discharge air piping.

RFI 0502 GEN - Compressed Air System Sequence of Operations Air Dryer Removed, FPT-NABCO, SOO for ACU-1/2

~~2.7 AIR DRYER~~

~~A. Air Dryer refrigerant type shall be provided having a rated capacity equal to or greater than compressor capacity and maximum operating pressure. Refrigerated compressed air dryer shall have a built-in oil and dirt removal filter and a pre-cooler section to improve energy efficiency. A separator with moisture accumulator and timer controlled solenoid valve for moisture removal shall be provided to maintain high efficiency separation and prevent moisture carry over. No outside cooling water supply or external cooling packages are allowed.~~

~~B. Air Connections: Inlet and outlet connections at same level, factory insulated.~~

~~C. Heat Exchangers: Air to air and refrigerant to air coils. Furnish heat exchangers with automatic control system to bypass refrigeration system on low or no load condition.~~

~~D. Moisture Separator: Centrifugal type located at discharge of heat exchanger.~~

~~E. Refrigeration Unit: Hermetically sealed type to operate continuously to maintain specified 21 degrees F (-6 degrees C) dew point. House unit in steel cabinet with access door and panel for maintenance and inspection.~~

~~F. Accessories: Air inlet temperature gage, air inlet pressure gage, on/off switch, high temperature light, power on light, refrigerant gage, air outlet temperature gage, air outlet pressure gage.~~

2.8 COMPRESSED AIR AFTERCOOLER

A. Construction: Removable tube nests of non-ferrous metal tubes and corrosion resistant tube plates, safety valves, pressure gage, moisture separator, moisture drain valve, water inlet piping with automatic water valve, automatic condensate trap and overflow piping with open funnel.

B. Working Pressure: 135 psi.

C. Discharge: Cool air to within 12 degrees F of ambient air temperature at specified flow capacity.

2.9 RECEIVERS

A. Receiver shall be vertical or horizontal as indicated on the Contract Drawings. The receiver shall be an ASME and National Board stamped pressure vessel. A base plate for mounting the compressor shall be welded to the receiver.

B. The following accessories shall be provided

1. ASME certified pressure relief valve.

2. Gate valve for air discharge.

3. Pressure gage.

4. Manual drain valve.

5. Automatic tank drain.

2.10 COALESCING AIR FILTERS

A. Coalescing air filters shall be provided as specified or indicated. Filters shall be rated to trap all 0.3 micron sized particles and above. Filter shall be rated at minimum 200 psig. A pressure drop indicator shall be provided to show when filter element should be replaced. An automatic moisture drain shall be provided.

2.11 COMPRESSOR MOTORS

A. Motors shall be three phase, 460V, 60Hz and suitable for full voltage across the line starting.

B. Motor enclosure shall be manufacturer standard drop-proof fully guarded type. Motors shall be suitable for mounting as specified in Articles 2.01 and 2.02.

C. Motors shall be provided and factory tested in accordance with Contract Specification Section 20 60 13 -Motors for Facility Services.

2.12 MOTOR STARTERS

A. Motor starters shall be across the line magnetic starter operable on 480V, three phase, 60Hz supply.

B. Motor starters enclosure shall be NEMA 12 indoor type. Enclosure shall be manufactured to fit single or dual starters with the necessary auxiliary relays, terminal blocks, and other associated electrical components. Enclosure door shall be cut out and wired to fit the Contactor provided compressor controls, indication lights, and local annunciator and the DFE air compressor-monitoring unit.

C. Motor starters shall be provided and factory tested in accordance with the Contract Specification Section 26 24 22 - Motor Starters and Contactors.

2.13 WIRING

A. Power, control, signal, and communication wiring shall be provided and factory tested in accordance with Contract Specification Section 26 05 24 - Low and Medium Voltage Wires and Cables.

B. ACMU and pressure transmitter control and signal wiring shall be shielded twisted pair type.

2.14 GROUNDING AND BONDING

A. Electrical equipment, devices, and materials shall be grounded in accordance with Contract Specifications Section 26 05 26 - Grounding and Bonding for Electrical Systems.

2.15 PIPING ACCESSORIES

A. Provide piping accessories of types and sizes as required.

B. Provide escutcheons as specified in Contract Specifications.

C. Hose and blowguns.

1. Hose shall be self-retracting nylon air hose. Fittings shall be brass. Each end shall be fitted with a swivel coupling.

2. Blowguns shall have aluminum body. Tamperproof pressure reducers shall limit outlet pressure to 30 psi, and comply with Cal-OSHA requirements.

D. Hose reels: Hose reels shall be enclosed and shall be of heavy steel construction. Drum shall be ratcheting, self-retracting. Hose shall be for intended service.

E. Condensate Trap Drains: Trap drains shall consist of brass, bronze, or 304 stainless steel bowl and internal components. Internal components shall consist of float, outlet valve and piston that automatically open to eject moisture that has collected in the system. Materials shall be compatible with synthetic compressor oils.

F. Wall sleeves and seals shall be in accordance with Contract Specifications.

## PART 3- EXECUTION

3.1 INSTALLATION (PIPING)

A. Install piping true to line and grade, supported and guided to ensure alignment under all conditions. Installed piping shall clear obstructions, preserve headroom, and keep openings and passageways clear.

B. All air line branch connections shall be made off the top of the header. All condensate of drain connections shall be made off the bottom. Lines shall be pitched toward drip legs and receivers.

C. Install drip legs and automatic drain traps at all low points in the system. Pipe condensate drains to floor drains or other acceptable locations.

D. Valves shall be accessible for operation and servicing. Valves located in furred spaces shall be accessible through access panels or access doors. Valves shall be installed as required, and shall not be installed having stems located below the horizontal position.

E. Pipe joints on copper piping shall be made with soldered connections unless otherwise noted or required.

F. Threaded joints shall only be made with PTFE sealing tape. Thread sealing compounds shall not be used.

G. Install unions at each connection to valves, equipment, and tanks. Soldered-to-threaded connections shall be made-up with male thread-to-solder adapters.

H. After installation of pipes, end of pipes shall be either capped or plugged. No piping shall be buried, furred in, or concealed before being inspected and tested.

I. Provide access panels in accordance with Contract Specifications.

3.2 INSTALLATION (AIR COMPRESSOR)

A. Install, align, connect, and test the equipment m accordance with the manufacturer's installation instructions and recommendations.

B. Install conduits in accordance with Contract Specifications.

C. Install, connect, and test power cables and control wires in accordance with Contract Specification Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables.

D. Install and test motor starters in accordance with Contract Specification.

E. Pipe drains to disposal location.

F. Make adjustments required to place system in proper operating condition in accordance with the manufacturer's instructions and recommendations.

G. Set pressure switches as required.

3.3 FIELD TESTS

A. Perform field test for each installation in the presence of the Engineer. The Contractor shall give 48 hours notice to the Engineer prior to the test. Provide all necessary instruments, test setup, connections, labor and tools for testing. Defective workmanship, materials and equipment shall be connected or replaced in accordance with the manufacturer's recommendations

and to the satisfaction of the Engineer at no additional cost to the District. All connected work shall be retested to ensure compliance with these specifications.

B. Field tests shall demonstrate workmanship, operation, and performance. Each test attribute shall be completed to the satisfaction of the Engineer. Submit written record indicating that the following items have been completed:

1. Compressor starts below switch set point.

2. Compressor stops at switch set point.

3. Automatic drain valve discharges; and

4. Operation of pressure relief valves.

C. Field testing of electrical equipment and devices shall include the field tests specified in the following Contract Specifications.

D. Test compressed air piping system, pneumatically in sections, to a pressure of at least 150 psi for not less than 15 minutes witnessed by the ~~Engineer~~. Repair leaks and retest the system until the system is leak free. Use testing instruments calibrated by a qualified laboratory in accordance with Contract Specifications Section 01 40 00 - Quality Control. Test sequence shall be as follows:

1. Lines will be fully blown out.

2. Lines shall be pneumatically tested.

RFI 0437 — GEN - Compressed Air Piping System Test — IOR to witness the compressed air piping system test in lieu of the Engineer

## 3.4 ADJUSTING AND CLEANING

A. Make adjustments required to place system in proper operating condition in accordance with manufacturer's instructions and recommendations.

B. Remove foreign materials from the installed air-to-air booster equipment and piping system.

C. Provide training to County personnel.

## 3.5 IDENTIFICATION

A. Comply with the requirements of Contract Specifications, Section 22 05 53 - Identification for Plumbing Piping and Equipment

**END OF SECTION 22 15 00**

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# SECTION 22 15 13 – GENERAL SERVICE COMPRESSED AIR PIPING

## PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes piping and related specialties for general-service compressed-air systems operating at 200 psig or less.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. CR: Chlorosulfonated polyethylene synthetic rubber.

C. EPDM: Ethylene-propylene-diene terpolymer rubber.

D. HDPE: High-density polyethylene plastic.

E. NBR: Acrylonitrile-butadiene rubber.

F. PE: Polyethylene plastic.

G. PVC: Polyvinyl chloride plastic.

H. High-Pressure Compressed-Air Piping: System of compressed-air piping and specialties operating at pressures between 150 and 200 psig.

I. Low-Pressure Compressed-Air Piping: System of compressed-air piping and specialties operating at pressures of 150 psig or less.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Compressed-air piping and support and installation shall withstand effects of seismic events determined according to SEI/ASCE 7, "Minimum Design Loads for Buildings and Other Structures."

1.5 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Plastic pipes, fittings, and valves.
   2. Dielectric fittings.
   3. Flexible pipe connectors.

4. Safety valves.
5. Pressure regulators. Include rated capacities and operating characteristics.
6. Automatic drain valves.
7. Filters. Include rated capacities and operating characteristics.
8. Lubricators. Include rated capacities and operating characteristics.
9. Quick couplings.
10. Hose assemblies.

1.6 INFORMATIONAL SUBMITTALS

A. Brazing certificates.

B. Qualification Data: For Installers.

C. Field quality-control test reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For general-service compressed-air piping specialties to include in emergency, operation, and maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications:
1. Extruded-Tee Outlet Procedure: Qualify operators according to training provided by T-DRILL Industries Inc., for making branch outlets.
2. Pressure-Seal Joining Procedure for Copper Tubing: Qualify operators according to training provided by Viega; Plumbing and Heating Systems.
3. Pressure-Seal Joining Procedure for Steel Piping. Qualify operators according to training provided by Victaulic Company.

B. Brazing: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications," or to AWS B2.2, "Standard for Brazing Procedure and Performance Qualification."

C. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

D. ASME Compliance:
1. Comply with ASME B31.1, "Power Piping," for high-pressure compressed-air piping.
2. Comply with ASME B31.9, "Building Services Piping," for low-pressure compressed-air piping.

1.9 PROJECT CONDITIONS

A. Interruption of Existing Compressed-Air Service: Do not interrupt compressed-air service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary compressed-air service according to requirements indicated:

1. Notify Construction Manager no fewer than two days in advance of proposed interruption of compressed-air service.
2. Do not proceed with interruption of compressed-air service without Construction Manager's written permission.

## PART 2 - PRODUCTS

RFI 0463 — GEN - Compressed Air Piping Clarification — Copper Tube in Lieu of Black-steel pipe

### 2.1 PIPES, TUBES, AND FITTINGS

A. Copper Tube: ASTM B 88, Type K or L (ASTM B 88M, Type A or B) and ASTM B 88, Type M (ASTM B 88M, Type C) seamless, drawn-temper, water tube.
   1. Wrought-Copper Fittings: ASME B16.22, solder-joint pressure type or MSS SP-73, wrought copper with dimensions for brazed joints.
   2. Cast-Copper-Alloy Flanges: ASME B16.24, Class 150 or 300.
   3. Copper Unions: ASME B16.22 or MSS SP-123.
   4. Press-Type Fittings, NPS 2 and Smaller: Wrought-copper fitting with EPDM O-ring seal in each end.
   5. Press-Type Fittings, NPS 2-1/2 to NPS 4: Bronze fitting with stainless-steel grip ring and EPDM O-ring seal in each end.
   6. Extruded-Tee Outlets: Procedure for making branch outlets in copper tube according to ASTM F 2014.
   7. Grooved-End Fittings and Couplings:
      a. Grooved-End Fittings: ASTM B 75 (ASTM B 75M), copper tube or ASTM B 584, bronze castings.
      b. Couplings: Copper-tube dimensions and design similar to AWWA C606. Include ferrous housing sections, gasket suitable for compressed air, and bolts and nuts. Provide EDPM gasket for oil-free compressed air. Provide NBR gasket if compressed air contains oil or oil vapor.

### 2.2 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for compressed-air piping system contents.
   1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
      a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
      b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated.

F. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

G. Solvent Cements for Joining Plastic Piping:
1. ABS Piping: ASTM D 2235.
2. PVC Piping: ASTM D 2564. Include primer complying with ASTM F 656.

2.3 VALVES

A. Metal Ball, Butterfly, Check, and Gate Valves: Comply with requirements in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.14 "Check Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."

2.4 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:
1. Description:
a. Standard: ASSE 1079.
b. Pressure Rating: 125 psig minimum at 180 deg F, 150 psig, and 250 psig.
c. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:
1. Description:
a. Standard: ASSE 1079.
b. Factory-fabricated, bolted, companion-flange assembly.
c. Pressure Rating: 125 psig minimum at 180 deg F, 150 psig, 175 psig, and 300 psig.
d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:
1. Description:
a. Nonconducting materials for field assembly of companion flanges.
b. Pressure Rating: 150 psig.
c. Gasket: Neoprene or phenolic.
d. Bolt Sleeves: Phenolic or polyethylene.
e. Washers: Phenolic with steel backing washers.

2.5 FLEXIBLE PIPE CONNECTORS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Bronze-Hose Flexible Pipe Connectors: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.
1. Working-Pressure Rating: 200 psig and 250 psig minimum.
2. End Connections, NPS 2 and Smaller: Threaded copper pipe or plain-end copper tube.
3. End Connections, NPS 2-1/2 and Larger: Flanged copper alloy.

C. Stainless-Steel-Hose Flexible Pipe Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.
   1. Working-Pressure Rating: 200 psig and 250 psig minimum.
   2. End Connections, NPS 2 and Smaller: Threaded steel pipe nipple.
   3. End Connections, NPS 2-1/2 and Larger: Flanged steel nipple.

2.6 SPECIALTIES

A. Safety Valves: ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," construction; National Board certified, labeled, and factory sealed; constructed of bronze body with poppet-type safety valve for compressed-air service.
   1. Pressure Settings: Higher than discharge pressure and same or lower than receiver pressure rating.

B. Air-Main Pressure Regulators: Bronze body, direct acting, spring-loaded manual pressure-setting adjustment, and rated for 250-psig inlet pressure, unless otherwise indicated.
   1. Type: Pilot operated.

C. Air-Line Pressure Regulators: Diaphragm operated, aluminum alloy or plastic body, direct acting, spring-loaded manual pressure-setting adjustment, and rated for 200-psig minimum inlet pressure, unless otherwise indicated.

D. Automatic Drain Valves: Stainless-steel body and internal parts, rated for 200-psig minimum working pressure, capable of automatic discharge of collected condensate. Include mounting bracket if wall mounting is indicated.

E. Air-Line Lubricators: With drip chamber and sight dome for observing oil drop entering air stream; with oil-feed adjustment screw and quick-release collar for easy bowl removal. Include mounting bracket if wall mounting is indicated.
   1. Provide with automatic feed device for supplying oil to lubricator.

2.7 QUICK COUPLINGS

A. General Requirements for Quick Couplings: Assembly with locking-mechanism feature for quick connection and disconnection of compressed-air hose.

B. Automatic-Shutoff Quick Couplings: Straight-through brass body with O-ring or gasket seal and stainless-steel or nickel-plated-steel operating parts.
   1. Socket End: With one-way valve and threaded inlet for connection to piping or threaded hose fitting.
   2. Plug End: Straight-through type with barbed outlet for attaching hose.

C. Valveless Quick Couplings: Straight-through brass body with stainless-steel or nickel-plated-steel operating parts.
   1. Socket End: With O-ring or gasket seal, without valve, and with barbed inlet for attaching hose.
   2. Plug End: With barbed outlet for attaching hose.

2.8 HOSE ASSEMBLIES

A. Description: Compatible hose, clamps, couplings, and splicers suitable for compressed-air service, of nominal diameter indicated, and rated for 300-psig minimum working pressure, unless otherwise indicated.
   1. Hose: Reinforced single- or double -wire-braid, CR-covered hose for compressed-air service.
   2. Hose Clamps: Stainless-steel clamps or bands.
   3. Hose Couplings: Two-piece, straight-through, threaded brass or stainless-steel O-ring or gasket-seal swivel coupling with barbed ends for connecting two sections of hose.
   4. Hose Splicers: One-piece, straight-through brass or stainless-steel fitting with barbed ends for connecting two sections of hose.

**PART 3 - EXECUTION**

3.1 PIPING APPLICATIONS

A. Compressed-Air Piping between Air Compressors and Receivers: Use one of the following piping materials for each size range:
   1. NPS 2 and Smaller: Schedule 40, black -steel pipe; threaded, malleable-iron fittings; and threaded joints.

B. Low-Pressure Compressed-Air Distribution Piping: Use one of the following piping materials for each size range:
   1. NPS 2 and Smaller: Schedule 40, black steel pipe; threaded, malleable-iron fittings; and threaded joints.

C. High-Pressure Compressed-Air Distribution Piping: Use one of the following piping materials for each size range:
   1. NPS 2 and Smaller: Schedule 40, black -steel pipe; threaded, malleable-iron fittings; and threaded joints.

D. Drain Piping: Use the following piping materials:
   1. NPS 2 and Smaller: Type M (Type C) copper tube; wrought-copper fittings; and brazed or soldered joints.

3.2 VALVE APPLICATIONS

A. Metal General-Duty Valves: Comply with requirements and use valve types specified in "Valve Applications" Articles in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.14 "Check Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping," according to the following:
   1. Low-Pressure Compressed Air: Valve types specified for low-pressure compressed air.
   2. High-Pressure Compressed Air: Valve types specified for medium-pressure compressed air.
   3. Equipment Isolation NPS 2 and Smaller: Safety-exhaust, copper-alloy ball valve with exhaust vent and pressure rating at least as great as piping system operating pressure.
   4. Grooved-end valves may be used with grooved-end piping and grooved joints.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of compressed-air piping. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, air-compressor sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping concealed from view and protected from physical contact by building occupants, unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal and to coordinate with other services occupying that space.

E. Install piping adjacent to equipment and machines to allow service and maintenance.

F. Install air and drain piping with 1 percent slope downward in direction of flow.

G. Install nipples, flanges, unions, transition and special fittings, and valves with pressure ratings same as or higher than system pressure rating, unless otherwise indicated.

H. Equipment and Specialty Flanged Connections:
   1. Use steel companion flange with gasket for connection to steel pipe.
   2. Use cast-copper-alloy companion flange with gasket and brazed joint for connection to copper tube. Do not use soldered joints for connection to air compressors or to equipment or machines producing shock or vibration.

I. Flanged joints may be used instead of specified joint for any piping or tubing system.

J. Extended-tee outlets with brazed branch connection may be used for copper tubing, within extruded-tee connection diameter to run tube diameter ratio for tube type, according to Extruded Tee Connections Sizes and Wall Thickness for Copper Tube (Inches) Table in ASTM F 2014.

K. Install eccentric reducers where compressed-air piping is reduced in direction of flow, with bottoms of both pipes and reducer fitting flush.

L. Install branch connections to compressed-air mains from top of main. Provide drain leg and drain trap at end of each main and branch and at low points.

M. Install thermometer and pressure gage on discharge piping from each air compressor and on each receiver. Install piping to permit valve servicing.

N. Install piping free of sags and bends.

O. Install fittings for changes in direction and branch connections.

P. Install seismic restraints on piping. Seismic-restraint devices are specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

Q. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

R. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

3.4 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints for Steel Piping: Join according to AWS D10.12/D10.12M.

E. Brazed Joints for Copper Tubing: Join according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

F. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Join according to ASTM B 828 or CDA's "Copper Tube Handbook."

G. Extruded-Tee Outlets for Copper Tubing: Form branches according to ASTM F 2014, with tools recommended by procedure manufacturer, and using operators qualified according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Use asbestos-free, nonmetallic gasket suitable for compressed air. Join flanges with gasket and bolts according to ASME B31.9 for bolting procedure.

I. Grooved Joints: Assemble couplings with housing, gasket, lubricant, and bolts. Join according to AWWA C606 for grooved joints. Do not apply lubricant to prelubricated gaskets.

J. Heat-Fusion Joints for PE Piping: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657 for socket-fusion joints.

K. Pressure-Sealed Joints: Join with tools recommended by fitting manufacturer, using operators qualified according to Part 1 "Quality Assurance" Article.

L. Solvent-Cemented Joints for ABS Piping: Clean and dry joining surfaces. Join according to the following:
1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.

2. Join according to ASME B31.9 for solvent-cemented joints and to ASTM D 2235 Appendix.

M. Solvent-Cemented Joints for PVC Piping: Clean and dry joining surfaces. Join according to the following:
1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. Apply primer and join according to ASME B31.9 for solvent-cemented joints and to ASTM D 2672.

N. Dissimilar Metal Piping Material Joints: Use dielectric fittings.

3.5 VALVE INSTALLATION

A. General-Duty Valves: Comply with requirements in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.14 "Check Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."

B. Install shutoff valves and unions or flanged joints at compressed-air piping to air compressors.

C. Install shutoff valve at inlet to each automatic drain valve, filter, lubricator, and pressure regulator.

D. Install check valves to maintain correct direction of compressed-air flow to and from compressed-air piping specialties and equipment.

3.6 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. NPS 2 and Smaller: Use dielectric unions.

3.7 FLEXIBLE PIPE CONNECTOR INSTALLATION

A. Install flexible pipe connectors in discharge piping and in inlet air piping from remote air-inlet filter of each air compressor.

B. Install bronze-hose flexible pipe connectors in copper compressed-air tubing.

C. Install stainless-steel-hose flexible pipe connectors in steel compressed-air piping.

3.8 SPECIALTY INSTALLATION

A. Install safety valves on receivers in quantity and size to relieve at least the capacity of connected air compressors.

B. Install air-main pressure regulators in compressed-air piping at or near air compressors.

C. Install air-line pressure regulators in branch piping to equipment and tools.

D. Install automatic drain valves on aftercoolers, receivers, and dryers. Discharge condensate onto nearest floor drain.

E. Install coalescing filters in compressed-air piping at or near air compressors and upstream from mechanical filters. Mount on wall at locations indicated.

F. Install mechanical filters in compressed-air piping at or near air compressors and downstream from coalescing filters. Mount on wall at locations indicated.

Install air-line lubricators in branch piping to machine tools. Mount on wall at locations indicated.

G. Install quick couplings at piping terminals for hose connections.

H. Install hose assemblies at hose connections.

3.9 CONNECTIONS

A. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment and machine.

B. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment and machine.

3.10 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for pipe hanger and support devices.

B. Vertical Piping: MSS Type 8 or 42, clamps.

C. Individual, Straight, Horizontal Piping Runs:
1. 100 Feet or Less: MSS Type 1, adjustable, steel clevis hangers.
2. Longer than 100 Feet: MSS Type 43, adjustable roller hangers.

D. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.

E. Base of Vertical Piping: MSS Type 52, spring hangers.

F. Support horizontal piping within 12 inches of each fitting and coupling.

G. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.

H. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1/4: 60 inches with 3/8-inch rod.
2. NPS 3/8 and NPS 1/2: 72 inches with 3/8-inch rod.
3. NPS 3/4: 84 inches with 3/8-inch rod.
4. NPS 1: 96 inches with 3/8-inch rod.
5. NPS 1-1/4: 108 inches with 3/8-inch rod.

6. NPS 1-1/2: 10 feet with 3/8-inch rod.
7. NPS 2: 11 feet with 3/8-inch rod.
8. NPS 2-1/2: 13 feet with 1/2-inch rod.
9. NPS 3: 14 feet with 1/2-inch rod.

I. Install supports for vertical copper tubing every 10 feet.

3.11 LABELING AND IDENTIFICATION

A. Install identifying labels and devices for general-service compressed-air piping, valves, and specialties.

3.12 FIELD QUALITY CONTROL

A. Perform field tests and inspections.

B. Tests and Inspections:
1. Piping Leak Tests for Metal Compressed-Air Piping: Test new and modified parts of existing piping. Cap and fill general-service compressed-air piping with oil-free dry air or gaseous nitrogen to pressure of 50 psig above system operating pressure, but not less than 150 psig. Isolate test source and let stand for four hours to equalize temperature. Refill system, if required, to test pressure; hold for two hours with no drop in pressure.
2. Repair leaks and retest until no leaks exist.
3. Inspect filters, lubricators, and pressure regulators for proper operation.

C. Prepare test reports.

**END OF SECTION 22 15 13**

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# SECTION 22 34 00 – FUEL FIRED DOMESTIC WATER HEATERS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
   1. Commercial, gas-fired, high-efficiency, storage, domestic-water heaters.
   2. Domestic-water heater accessories.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type and size of domestic-water heater indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

### 1.4 INFORMATIONAL SUBMITTALS

A. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.

### 1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fuel-fired, domestic-water heaters to include in emergency, operation, and maintenance manuals.

### 1.6 QUALITY ASSURANCE

A. ASME Compliance:
   1. Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
   2. Where ASME-code construction is indicated, fabricate and label commercial, finned-tube, domestic-water heaters to comply with ASME Boiler and Pressure Vessel Code: Section IV.

### 1.7 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

## PART 2 - PRODUCTS

2.1 COMMERCIAL, GAS-FIRED, STORAGE, DOMESTIC-WATER HEATERS

A. Commercial, Gas-Fired, High-Efficiency, Storage, Domestic-Water Heaters:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Lochinvar, LLC.
   b. Smith, A. O. Corporation.
   c. State Industries.
2. Standard: ANSI Z21.10.3/CSA 4.3.
3. Description: Manufacturer's proprietary design to provide at least 95 percent combustion efficiency at optimum operating conditions.
4. Factory-Installed Storage-Tank Appurtenances:
   a. Anode Rod: Replaceable magnesium.
   b. Dip Tube: Required unless cold-water inlet is near bottom of tank.
   c. Drain Valve: Corrosion-resistant metal complying with ASSE 1005.
   d. Insulation: Comply with ASHRAE/IESNA 90.1. Surround entire storage tank except connections and controls.
   e. Jacket: Steel with enameled finish.
   f. Burner or Heat Exchanger: Comply with UL 795 or approved testing agency requirements for gas-fired, high-efficiency, domestic-water heaters and natural-gas fuel.
   g. Temperature Control: Adjustable thermostat.
   h. Safety Controls: Automatic, high-temperature-limit and low-water cutoff devices or systems.
   i. Combination Temperature-and-Pressure Relief Valves: ANSI Z21.22/CSA 4.4-M. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select one relief valve with sensing element that extends into storage tank.

2.2 DOMESTIC-WATER HEATER ACCESSORIES

A. Drain Pans: Corrosion-resistant metal with raised edge. Comply with ANSI/CSA LC 3. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than NPS 3/4 with ASME B1.20.1 pipe threads or with ASME B1.20.7 garden-hose threads.

B. Comply with requirements for ball-, butterfly-, or gate-type shutoff valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."
1. Comply with requirements for balancing valves specified in Section 221119 "Domestic Water Piping Specialties."

C. Gas Shutoff Valves: ANSI Z21.15/CSA 9.1-M, manually operated. Furnish for installation in piping.

D. Gas Pressure Regulators: ANSI Z21.18/CSA 6.3, appliance type. Include pressure rating as required to match gas supply.

E. Automatic Gas Valves: ANSI Z21.21/CSA 6.5, appliance, electrically operated, on-off automatic valve.

F. Combination Temperature-and-Pressure Relief Valves: Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.
   1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4-M.

G. Pressure Relief Valves: Include pressure setting less than domestic-water heater working-pressure rating.
   1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4-M.

RFI 0496

BLDG A&B - Thermostatic Mixing Valves at Water Heaters

Powers Series LFMM430 TMV is required on the domestic hot water system in each building.

## PART 3 - EXECUTION

### 3.1 DOMESTIC-WATER HEATER INSTALLATION

A. Commercial, Domestic-Water Heater Mounting: Install commercial domestic-water heaters on concrete base. Comply with requirements for concrete base specified in
   1. Exception: Omit concrete bases for commercial domestic-water heaters if installation on stand, bracket, suspended platform, or directly on floor is indicated.
   2. Maintain manufacturer's recommended clearances.
   3. Arrange units so controls and devices that require servicing are accessible.
   4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
   5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
   6. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   7. Install anchor bolts to elevations required for proper attachment to supported equipment.
   8. Anchor domestic-water heaters to substrate.

B. Install domestic-water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

C. Install gas-fired, domestic-water heaters according to NFPA 54.
   1. Install gas shutoff valves on gas supply piping to gas-fired, domestic-water heaters without shutoff valves.
   2. Install gas pressure regulators on gas supplies to gas-fired, domestic-water heaters without gas pressure regulators if gas pressure regulators are required to reduce gas pressure at burner.
   3. Install automatic gas valves on gas supplies to gas-fired, domestic-water heaters if required for operation of safety control.

D. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

E. Install combination temperature-and-pressure relief valves in water piping for domestic-water heaters without storage. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

F. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for domestic-water heaters that do not have tank drains.

G. Install thermometer on outlet piping of domestic-water heaters. Comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."

H. Fill domestic-water heaters with water.

I. Charge domestic-water compression tanks with air.

3.2 CONNECTIONS

A. Comply with requirements for domestic-water piping specified in Section 221116 "Domestic Water Piping."

B. Drawings indicate general arrangement of piping, fittings, and specialties.

C. Where installing piping adjacent to fuel-fired, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 IDENTIFICATION

A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

**END OF SECTION 22 34 00**

# SECTION 22 40 00 - PLUMBING FIXTURES

REVISED - BULLETIN 3.1

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes
1. Water Closets
2. Lavatories
3. Combination Water Closet/Lavatory.
4. Urinals
5. Sinks
6. Emergency Shower/Eyewash
7. Drinking Fountains

### 1.2 DEFINITIONS

A. Accessible: Describes a plumbing fixture, building, facility, or portion thereof that can be approached, entered, and used by physically handicapped people.

B. Accessory: Device that adds effectiveness, convenience, or improved appearance to a fixture but is not essential to its operation.

C. Appliance: Device or machine designed and intended to perform a specific function.

D. Appurtenance: Device or assembly designed to perform some useful function when attached to or used with a fixture.

E. Equipment: Device used with plumbing fixtures or plumbing systems to perform a certain function for plumbing fixtures but that is not part of the fixture.

F. Fitting: Fitting installed on or attached to a fixture to control the flow of water into or out of the fixture.

G. Fixture: Installed receptor connected to the water distribution system that receives and makes available potable water and discharges the used liquid or liquid-borne wastes directly or indirectly into the drainage system. The term “fixture” means the actual receptor, except when used in a general application where terms “Fixture” and “Plumbing Fixture” include associated trim, fittings, accessories, appliances, appurtenances, support, and equipment.

H. Roughing-In: Installation of piping and support for the fixture prior to the actual installation of the fixture.

I. Support: Device normally concealed in building construction, for supporting and securing plumbing fixtures to walls and structural members. Supports for urinals, lavatories, and sinks are made in types suitable for fixture construction and the mounting required. Categories of supports are:
1. Carrier: Floor-mounted support for wall-mounted water closet, and support fixed to wall construction for wall-hung fixture.

2. Chair Carrier: Support for wall-hung fixture, having steel pipe uprights that transfer weight to the floor.
3. Chair Carrier, Heavy Duty: Support for wall-hung fixture, having rectangular steel uprights that transfer weight to the floor.
4. Reinforcement: Wood blocking or steel plate built into wall construction, for securing fixture to wall.

J. Trim: Hardware and miscellaneous parts, specific to a fixture and normally supplied with it required to complete fixture assembly and installation.

1.3 SUBMITTALS

REVISED - BULLETIN 3.1

A. General: Submit the following in accordance with Conditions of Contract and Division 1.

B. Product Data: For each type of plumbing fixture specified, provide catalogue illustrations, sizes, rough-in dimensions, utility sizes including fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports and indicate materials and finishes, dimensions, construction details, and flow-control rates for each type of fixture indicated.

C. Shop Drawings: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring, as required.

D. Maintenance Data: Include fixture trim exploded view and replacement paints list. Plumbing fixtures to include in maintenance manuals specified in Division 1.

E. Warranty: Submit manufacturer's standard warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.4 QUALITY ASSURANCE

A. Design Concept: The drawings indicate types of plumbing fixtures and are based on the specific descriptions, manufacturers, models, and numbers indicated. Plumbing fixture having equal performance characteristics by other manufacturers may be considered provided that deviations in dimensions, operation, color or finish, or other characteristics are minor and do not change the design concept or intended performance as judged by the Architect. Burden of proof for equality of plumbing fixture is on the proposer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; about plumbing fixtures for people with disabilities.

D. Regulatory Requirements: Comply with requirements in U.S. Architectural & Transportation Barriers Compliance Board's "Uniform Federal Accessibility Standards (UFAS), 1985-494-187" about plumbing fixtures for people with disabilities.

E. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

F. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

G. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

1.5 COORDINATION

REVISED - BULLETIN 3.1

A. Coordinate roughing-in and final plumbing fixture locations, and verify that fixtures can be installed to comply with original design and referenced standards.

1.6 DELIVERY, STORAGE, HANDLING. AND PROTECTION

A. Deliver plumbing fixtures in manufacturer's protective packing, crafting, and covering. Inspect for damage. Report damage to OWNER field responsible.

B. Store and protect plumbing fixtures from damage on elevated platforms in a dry location by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Faucet Washers and O-Rings: Furnish quantity of identical units not less than 10 percent of amount of each type and size installed.
   2. Faucet Cartridges and O-Rings: Furnish quantity of identical units not less than 5 percent of amount of each type and size installed.
   3. Faucet, Laminar-Flow Fittings: Furnish quantity of identical units not less than 10 percent of amount of each type and size installed.
   4. Faucet, Flow-Control Fittings: Furnish quantity of identical units not less than 10 percent of amount of each type and size installed.
   5. Flushometer Repair kits: Furnish quantity of identical units not less than 10 percent of amount of each type and size installed.
   6. Toilet Seats: Furnish quantity of identical units not less than 10 percent of amount of each type toilet seat installed.

**PART 2 - PRODUCTS**

2.1 WATER CLOSET WC-1

A. Manufacturers:
   1. Zurn.
   2. American Standard, Inc.
   3. Kohler.

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B. Description:
1. Material: Vitreous China.
2. Color: White
3. Bowl Configuration: Elongated, top spud.
4. Spud Size: 1-1/2 inch.
5. Passageway: 2-1/8 inch.
6. Mounting and Outlet: Wall mounted, back outlet.
7. Rim Height: 16-3/4 inches above finished floor. Coordinate mounting heights with Architectural Plans and Elevations.
8. Water Consumption: 1.28 gpf.
9. Wall Construction: As indicated on Architectural Drawings.
10. Fittings and Accessories :Provide the following compatible components:
    a. Flushometer: Exposed, Zurn 1.28gpf.
    b. Support: J.R. Smith, adjustable fixture support for siphon jet water closet, shallow rough-in type, Model 0210LY (No-Hub left hand) and/or Model 0210RY (No-Hub right hand).

2.2 WATER CLOSET WC-2

A. Manufacturers:
1. Willoughby
2. Acorn
3. Metcraft

B. Description:
1. Fixture: Stainless Steel Wall Mounted Blow-Out Series.
2. Material: 14 gauge, Type 304 stainless steel, all welded construction, exposed stainless surfaces polished to a #4 satin finish.
3. Spud Location and Size: Top spud and 1-1/2 inch flushing inlet.
4. Passageway: 2-1/8 inch.
5. Mounting and Outlet: Wall mounted, back outlet.
6. Rim Height: 15 inches above finished floor.
7. Consumption: 1.28 gpf.
8. Wall Thickness: 8 inches.
9. Wall Type: Block, grout filled.
10. Fittings and Accessories: Provide the following compatible components:
    a. Flushometer: Sloan Prison (600 Series) Flushometers. Royal 9603-1.28 High Efficiency (1.28 gpf).With Sloan Model WB-1-A Access Wall Box Assembly and Sloan Model HY-108-A push button for water closet.
11. Options - Provide the following:
    a. Recessed Tissue Holder: As shown on Architectural Drawings.
    b. Flush Valve Cover: N.A.

2.3 URINAL (STUDENT) (ADA COMPLIANT) UR-1

A. Manufacturers:
1. Willoghby
2. Acorn
3. Metcraft

REVISED - BULLETIN 3.1

B. Description:
1. Fixture: Stainless Steel Wall Mounted Straddle Urinal.
2. Material: 14 gauge, Type 304 Stainless Steel.
3. Spud Size: 3/4-inch Back Spud.
4. Passageway: 2 inch.
5. Mounting and Outlet: Wall Mounted, Back Outlet.
6. Rim Height and Depth: Coordinate mounting heights with Architectural Plans and Elevations, accessible units to meet codes.
7. Consumption: 0.5 gpf
8. Wall Construction: 8-inch grout-filled block wall.
9. Fittings and Accessories Provide the following compatible components:
10. Flushometer: Sloan Royal Model 613-0.5, low consumption (0.5gpf) with Sloan Model WB-1-A Access Wall Box Assembly and Sloan Model HY-108-A push button for urinal, operating force to meet code requirements.
11. Options:
    a. Metal Template (MT)
    b. Flush Valve (FV)
    c. Flush Valve Thru-Wall Connection (FVT)

2.4 LAVATORY L-1

A. Manufacturers:
1. Kohler.
2. American Standard, Inc.
3. Crane Plumbing/Fiat Products.

B. Description:
1. Material: Vitreous China
2. Color: White
3. Lavatory Size: 21-1/4 inches x 18-1/8 inches
4. Mounting and Outlet: Wall mounted, wall outlet.
5. Rim Height: ADA Compliant. (Coordinate mounting height with Architectural Plans and Elevations.)
6. Wall Construction: Type of wall indicated on Architectural Floor Plans.
7. Faucet, Fittings and Accessories: Provide the following compatible components:
    a. Faucet: "Symmons" S-90-2-FR-G, single control lavatory faucet. 0.5 gal/min maximum flow rate.
    b. Supplies: Lavatory Type 1.
    c. Drain: Kohler K-7715 Grid Drain.
    d. Trap: Lavatory Type 1.
    e. Support Type: J.R. Smith, lavatory supports with concealed arms; floor mounted with “Pro-Set” uprights, Model 0700.

2.5 LAVATORY (STUDENT) L-2

A. Manufacturers:
1. Willoughby
2. Acorn
3. Metcraft

B. Description:

1. Fixture: Stainless Steel.
2. Material: 14 gauge, Type 304 stainless steel, all welded construction, exposed stainless surfaces polished to a #4 satin finish.
3. Drain: 1-1/2 inches.
4. Consumption: 0.5 gpm
5. Wall Thickness: 8 inches.
6. Wall Type: Grout-filled block wall.
7. Valve Body: Brass Only.
8. Push Button: Willoughby stainless steel.

2.6 COMBINATION WATER CLOSET/LAVATORY (ADA COMPLIANT) COMBI-1

A. Manufacturers:
1. Willoughby
2. Acorn
3. Metcraft

B. Description:
1. Material: 14 gauge, Type 304 stainless steel, seamless welded construction with satin finish.
2. Toilet Bowl Orientation: Left / Right / Center. Verify with Architectural Floor Plan.
3. Lavatory Bowl Type: Oval, 9-3/4 inch x 13-1/2 inch x 5 inch deep.
4. Mounting and Outlet: Floor mounted, back outlet.
5. Rim Height: 18 inches above finished floor.
6. Toilet Consumption: Low Flow, 1.28 GPF.
7. Wall Thickness: 6-1/2 inches.
8. Wall Type: Concrete, poured in place.
9. Fittings and Accessories: Provide the following compatible components:
    a. Flushometer: Sloan Royal Prison Model 603-1.28, low consumption; ESM (solenoid operated with modular plug for use with Sloan PWT System, 24 VAC only).
    b. Push Buttons: Water Closet: Sloan 1-1/4 inch Model MCR-60A-6, Lavatory: (2), 1-inch diameter “D” style hole, Sloan Model MCR-231D, operating force to meet code requirements.
    c. Toilet Seat: Integral with fixture, standard finish.
    d. Filler / Bubbler: Penal Bubbler (BP).
    e. Valve Selection: Dual Temperature Electronic (EL-2).
    f. Valve Manifold: MA2 (2 Fixtures).
10. Options - Provide the following:
    a. Recessed Tissue Holder: (RTH); Location of tissue holder must be visible from cell door.
    b. Support: Wall Sleeve (WS) with horizontal and vertical 1/2-inch diameter steel rebar, similar to Willoughby Drawing P078000A.
    c. Toilet Waste Connection: 3 inch to 4 inch No-Hub connection with pinned clean-out (TW3/PCB).
    d. Lavatory Waste Connection: Integral P-Trap (PT).
    e. Toilet Flush Extension: TFE.
    f. Wall Grab Bar: WA-GB-48 standard, WA-GB-42-inch-Modified in existing buildings with restricted spaces. Willoughby Drawing P961051D (provide anti-suicide grab bar for combo unit).

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g. Rear Grab Bar: Unit will be designed and installed as needed to permit a compliant rear grab bar installation.

2.7 COMBINATION LAVATORY AND WATER CLOSET COMBI-2

A. Manufacturers:
1. Willoughby
2. Acorn
3. Metcraft

B. Description:
1. Materials: 14 gauge, Type 304 stainless steel, seamless welded construction with satin finish.
2. Toilet Orientation: Left / Right / Center. Verify bowl location with Architectural Floor Plan.
3. Lavatory Bowl Type: Multi-sided, 12-3/4 inches x 8-1/4 inches x 5 inches deep.
4. Mounting and Outlet: Floor mounted, back outlet.
5. Rim Height: 15 inches above finished floor.
6. Toilet Consumption: Low Flow, 1.28 GPF.
7. Wall Thickness: 6-1/2 inches.
8. Wall Type: Concrete, poured in place.
9. Fittings and Accessories: Provide the following compatible components:
   a. Flushometer: Sloan Royal Prison, Model 603-1.28, low consumption; ESM (solenoid operated with modular plug for use with Sloan PWT System, 24 VAC only)
   b. Push Buttons: Water Closet: Sloan 1-1/4 inches, Model MCR-60A-6. Lavatory: (2), 1 inch diameter “D” style hole, Sloan, Model MCR-231D.
   c. Toilet Seat: Integral with fixture, standard finish.
   d. Filler / Bubbler: Penal Bubbler (BP).
   e. Valve Selection: Dual Temperature Electronic (EL-2).
   f. Valve Manifold: MA2 (2 Fixtures).
10. Options - Provide the following:
   a. Recessed Tissue Holder: (RTH), Location of tissue holder must be visible from cell door.
   b. Support: Wall Sleeve (WS) with horizontal and vertical 1/2 inch diameter steel rebar, similar to Willoughby Drawing P078000A.
   c. Toilet Waste Connection: 3 inches to 4 inches. No Hub connection with brass pinned clean-out (TW3/PCB).
   d. Lavatory Waste Connection: Integral P-Trap (PT).
   e. Toilet Flush Extension: TFE.

2.8 URINAL (STUDENT) (ADA COMPLIANT) UR-1

A. Manufacturers:
1. Willoghby
2. Acorn
3. Metcraft

B. Description:
1. Fixture: Stainless Steel Wall Mounted Straddle Urinal.
2. Material: 14 gauge, Type 304 Stainless Steel.

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3. Spud Size: 3/4-inch Back Spud.
4. Passageway: 2 inch.
5. Mounting and Outlet: Wall Mounted, Back Outlet.
6. Rim Height and Depth: Coordinate mounting heights with Architectural Plans and Elevations, accessible units to meet codes.
7. Consumption: 0.5 gpf
8. Wall Construction: 8-inch grout-filled block wall.
9. Fittings and Accessories Provide the following compatible components:
10. Flushometer: Sloan Royal Model 613-0.5, low consumption (0.5gpf) with Sloan Model WB-1-A Access Wall Box Assembly and Sloan Model HY-108-A push button for urinal, operating force to meet code requirements.
11. Options:
    a. Metal Template (MT)
    b. Flush Valve (FV)
    c. Flush Valve Thru-Wall Connection (FVT)

2.9 SERVICE SINK SS-1

A. Manufacturers:
1. Acorn,
2. Elkay.
3. Approved Equal.

B. Description:
1. Material: Stainless steel, type 304
2. Gauge: 18 gauge.
3. Sink Type: Semi-circular wash fountain.
4. Sink Dimensions: 38 inches wide by 34 inches high by 32 inches deep.
5. Bowl Dimensions: 38 inches wide.
6. Faucet: Four station pushbutton 0.5 spray nozzle.

2.10 MOP SINK MS-1

A. Manufacturers:
1. Willoughby
2. Acorn
3. Elkay

B. Description:
1. Fixture: Stainless Steel Corner Mop Sink with Backsplash.
2. Material: 14-gauge, Type 304 stainless steel, all welded; exposed stainless steel surfaces #4 finish and bead blast interior and sound deaden underside.
3. Sink Dimensions: 36 inch by 36 inch.
4. Faucet, Fittings and Accessories: Provide the following compatible components:
    a. Faucet: Speakman Model SC-5812 polished chrome plated brass service sink fitting with 1/4 turn ceramic cartridges; integral stops; cast brass nozzle with 3/4-inch hose thread and pail hook; brass vacuum breaker; brass top brace assembly with wall flange and mounting screws; 9-inch distance from finished wall to nozzle outlet; 8-inch centers with adjustable threaded brass wall flange; 1/2-inch NPTF outlets; 5 feet vinyl hose with wall hook; ASSE-1001.

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2.11 KITCHEN SINK KS-1

A. Manufacturers:
1. Elkay; Model LRAD2918
2. Acorn
3. Willoughby

B. Description:
1. Fixture: Stainless Steel Double Bowl Top Mount Sink.
2. Material: Type 304 stainless steel
3. Sink Dimensions: 29" x 18" x 7-5/8".

2.12 LAB SINK S-1

A. Manufacturers:
1. Durcon, Model D24C
2. Or equal.

B. Description:
1. Fixture: Epoxy resin drop-in sink.
2. Material: Epoxy resin.
3. Sink Dimensions: 18”x 14” x 10.5”

2.13 COMBINATION EMERGENCY SHOWER/ EYEWASH EEW-1

A. Manufacturers:
1. Guardian, Model: GBF 1909
2. Or equal.

B. Description: Shower safety station with eyewash. Stainless steel bowl extended for ADA requirements. Shower head to be activated by extended pull rod.

2.14 DRINKING FOUNTAINS DF-1

A. Manufacturers:
1. Acorn
2. Haws
3. Elkay

B. Description: Wall mounted, vandal resistant drinking fountain made from 18-gauge, 304 stainless steel with a brushed finish. Unit shall be activated by self-closing, frontal push pad, which activates an internally mounted valve with an adjustable stream regulator controlling the water flow. Bubbler shall be brass with a non-squirt feature. Unit shall adhere to ANSI A117.1 and Americans with Disabilities Act of 1990 frontal approach and protruding objects requirements, and ANSI/NSF 61, Section 9.

## PART 3 - EXECUTION

3.1 EXAMINATION

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A. Examine roughing-in for potable cold water and hot water supplies and soil and for waste and vent piping systems and supports to verify actual locations and sizes of piping connections and that locations and types of supports match those indicated, before plumbing fixture installation. Use manufacturer's roughing-in data if roughing-in data are not indicated.

B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.

C. Do not proceed until unsatisfactory conditions have been corrected.

3.2 APPLICATION

A. Install plumbing fixtures and specified components, in accordance with designations and locations indicated on Drawings.

B. Install supports for plumbing fixtures in accordance with categories indicated, and of type required:
   1. Carriers for following fixtures:
      a. Wall-hanging water closets.
      b. Wall-hanging fixtures supported from wall construction.
   2. Chair carriers for the following fixtures:
      a. Wall-hanging lavatories and sinks.
      b. Wall-hanging electric water coolers.
   3. Heavy-duty chair carriers for the following fixtures:
      a. Accessible lavatories.
      b. Fixtures where specified.
   4. Reinforcement for the following fixtures:
      a. Wall-mounted lavatories required to be secured to wall.
      b. Wall-mounted sinks required to be secured to wall.

3.3 INSTALLATION OF PLUMBING FIXTURES

A. Assemble fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. For wall-hanging fixtures, install off-floor supports affixed to building substrate.
   1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
   2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
   3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.

C. Install back-outlet, wall-hanging fixtures onto waste fitting seals and attach to supports.

D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.

E. Install wall-hanging fixtures with tubular waste piping attached to supports.

F. Install floor-mounting, back-outlet water closets attached to building floor substrate and wall bracket and onto waste fitting seals.

G. Install counter-mounting fixtures in and attached to casework.

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H. Install fixtures level and plumb according to manufacturers' written instructions and roughing-in drawings.

I. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

J. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

K. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

L. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

M. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.

N. Install toilet seats on water closets.

O. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

P. Install water-supply, flow-control fittings with specified flow rates in fixture supplies at stop valves.

Q. Install faucet, flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

R. Install traps on fixture outlets.
   1. Exception: Omit trap on fixtures with integral traps.
   2. Exception: Omit trap on indirect wastes, unless otherwise indicated.

S. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings.

T. Seal joints between fixtures and walls, floors, and counters using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Comply with Division 7 Section "Joint Sealants" for sealant and installation requirements.

## 3.4 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. The drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:
   1. Connect water supplies from water distribution piping to fixtures.
   2. Connect drain piping from fixtures to drainage piping.

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3. Supply and Waste Connections to Plumbing Fixtures: Connect fixtures with water supplies, stops, risers, traps, and waste piping. Use size fittings required to match fixtures. Connect to plumbing piping.
4. Supply and Waste Connections to Fixtures and Equipment Specified in Other Sections: Connect fixtures and equipment with water supplies, stops, risers, traps, and waste piping specified. Use size fittings required to match fixtures and equipment. Connect to plumbing piping.
5. Ground equipment.
   a. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL

A. Verify that installed fixtures are categories and types specified for locations where installed.

B. Check that fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.6 ADJUSTING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at faucets and flushometer valves to produce proper flow and stream.

C. Replace washers and seals of leaking and dripping faucets and stops.

3.7 CLEANING

A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Clean to new condition. Do the following:
1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
2. Remove sediment and debris from drains.

3.8 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

**END OF SECTION 22 40 00**

# SECTION 22 40 00 - PLUMBING FIXTURES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes
1. Water Closets
2. Lavatories
3. Combination Water Closet/Lavatory.
4. Urinals
5. Sinks
6. Emergency Shower/Eyewash
7. Water Tempering Equipment
8. Drinking Fountains

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### 1.2 DEFINITIONS

A. Accessible: Describes a plumbing fixture, building, facility, or portion thereof that can be approached, entered, and used by physically handicapped people.

B. Accessory: Device that adds effectiveness, convenience, or improved appearance to a fixture but is not essential to its operation.

C. Appliance: Device or machine designed and intended to perform a specific function.

D. Appurtenance: Device or assembly designed to perform some useful function when attached to or used with a fixture.

E. Equipment: Device used with plumbing fixtures or plumbing systems to perform a certain function for plumbing fixtures but that is not part of the fixture.

F. Fitting: Fitting installed on or attached to a fixture to control the flow of water into or out of the fixture.

G. Fixture: Installed receptor connected to the water distribution system that receives and makes available potable water and discharges the used liquid or liquid-borne wastes directly or indirectly into the drainage system. The term “fixture” means the actual receptor, except when used in a general application where terms “Fixture” and “Plumbing Fixture” include associated trim, fittings, accessories, appliances, appurtenances, support, and equipment.

H. Roughing-In: Installation of piping and support for the fixture prior to the actual installation of the fixture.

I. Support: Device normally concealed in building construction, for supporting and securing plumbing fixtures to walls and structural members. Supports for urinals, lavatories, and sinks are made in types suitable for fixture construction and the mounting required. Categories of supports are:
1. Carrier: Floor-mounted support for wall-mounted water closet, and support fixed to wall construction for wall-hung fixture.

2. Chair Carrier: Support for wall-hung fixture, having steel pipe uprights that transfer weight to the floor.
3. Chair Carrier, Heavy Duty: Support for wall-hung fixture, having rectangular steel uprights that transfer weight to the floor.
4. Reinforcement: Wood blocking or steel plate built into wall construction, for securing fixture to wall.

J. Trim: Hardware and miscellaneous parts, specific to a fixture and normally supplied with it required to complete fixture assembly and installation.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1.

B. Product Data: For each type of plumbing fixture specified, provide catalogue illustrations, sizes, rough-in dimensions, utility sizes including fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports and indicate materials and finishes, dimensions, construction details, and flow-control rates for each type of fixture indicated.

C. Shop Drawings: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring, as required.

D. Maintenance Data: Include fixture trim exploded view and replacement paints list. Plumbing fixtures to include in maintenance manuals specified in Division 1.

E. Warranty: Submit manufacturer's standard warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

RFI 0544 — GEN - Plumbing Shop Drawings Clarification — Shop Drawings not required

1.4 QUALITY ASSURANCE

A. Design Concept: The drawings indicate types of plumbing fixtures and are based on the specific descriptions, manufacturers, models, and numbers indicated. Plumbing fixture having equal performance characteristics by other manufacturers may be considered provided that deviations in dimensions, operation, color or finish, or other characteristics are minor and do not change the design concept or intended performance as judged by the Architect. Burden of proof for equality of plumbing fixture is on the proposer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; about plumbing fixtures for people with disabilities.

D. Regulatory Requirements: Comply with requirements in U.S. Architectural & Transportation Barriers Compliance Board's "Uniform Federal Accessibility Standards (UFAS), 1985-494-187" about plumbing fixtures for people with disabilities.

E. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

F. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

G. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

1.5 COORDINATION

A. Coordinate roughing-in and final plumbing fixture locations, and verify that fixtures can be installed to comply with original design and referenced standards.

1.6 DELIVERY, STORAGE, HANDLING. AND PROTECTION

A. Deliver plumbing fixtures in manufacturer's protective packing, crafting, and covering. Inspect for damage. Report damage to OWNER field responsible.

B. Store and protect plumbing fixtures from damage on elevated platforms in a dry location by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Faucet Washers and O-Rings: Furnish quantity of identical units not less than 10 percent of amount of each type and size installed.
   2. Faucet Cartridges and O-Rings: Furnish quantity of identical units not less than 5 percent of amount of each type and size installed.
   3. Faucet, Laminar-Flow Fittings: Furnish quantity of identical units not less than 10 percent of amount of each type and size installed.
   4. Faucet, Flow-Control Fittings: Furnish quantity of identical units not less than 10 percent of amount of each type and size installed.
   5. Flushometer Repair kits: Furnish quantity of identical units not less than 10 percent of amount of each type and size installed.
   6. Toilet Seats: Furnish quantity of identical units not less than 10 percent of amount of each type toilet seat installed.

**PART 2 - PRODUCTS**

2.1 WATER CLOSET WC-1

A. Manufacturers:
   1. Zurn.
   2. American Standard, Inc.
   3. Kohler.

B. Description:
1. Material: Vitreous China.
2. Color: White
3. Bowl Configuration: Elongated, top spud.
4. Spud Size: 1-1/2 inch.
5. Passageway: 2-1/8 inch.
6. Mounting and Outlet: Wall mounted, back outlet.
7. Rim Height: 16-3/4 inches above finished floor. Coordinate mounting heights with Architectural Plans and Elevations.
8. Water Consumption: 1.28 gpf.
9. Wall Construction: As indicated on Architectural Drawings.
10. Fittings and Accessories :Provide the following compatible components:
    a. Flushometer: Exposed, Zurn 1.28gpf.
    b. Support: J.R. Smith, adjustable fixture support for siphon jet water closet, shallow rough-in type, Model 0210LY (No-Hub left hand) and/or Model 0210RY (No-Hub right hand).

2.2 WATER CLOSET WC-2

A. Manufacturers:
1. Willoughby
2. Acorn
3. Metcraft

RFI 0304 — BLDG A&B - WC-2 & UR-1 Clarification
Confirmed modified WC-2 toilet

B. Description:
1. Fixture: Stainless Steel Wall Mounted Blow-Out Series.
2. Material: 14 gauge, Type 304 stainless steel, all welded construction, exposed stainless surfaces polished to a #4 satin finish.
3. Spud Location and Size: Top spud and 1-1/2 inch flushing inlet.
4. Passageway: 2-1/8 inch.
5. Mounting and Outlet: Wall mounted, back outlet.
6. Rim Height: 15 inches above finished floor.
7. Consumption: 1.28 gpf.
8. Wall Thickness: 8 inches.
9. Wall Type: Block, grout filled.
10. Fittings and Accessories: Provide the following compatible components:
    a. Flushometer: Sloan Prison (600 Series) Flushometers. Royal 9603-1.28 High Efficiency (1.28 gpf).With Sloan Model WB-1-A Access Wall Box Assembly and Sloan Model HY-108-A push button for water closet.
11. Options - Provide the following:
    a. Recessed Tissue Holder: As shown on Architectural Drawings.
    b. Flush Valve Cover: N.A.

2.3 URINAL (STUDENT) (ADA COMPLIANT) UR-1

A. Manufacturers:
1. Willoghby
2. Acorn
3. Metcraft

RFI 0025 — Plumbing - UR-1 Urinal Student ADA Compliant
1. 0.125 gpf flush valve
2. Wall bracket in lieu of wall mount configuration.
3. Top mounted exposed flush valve w/ flush valve cover.
4. Removable plate to access the p-trap is required and shall be stainless steel and installed with tamper resistant screws.

B. Description:
1. Fixture: Stainless Steel Wall Mounted Straddle Urinal.
2. Material: 14 gauge, Type 304 Stainless Steel.
3. Spud Size: 3/4-inch Back Spud.
4. Passageway: 2 inch.
5. Mounting and Outlet: Wall Mounted, Back Outlet.
6. Rim Height and Depth: Coordinate mounting heights with Architectural Plans and Elevations, accessible units to meet codes.
7. Consumption: 0.5 gpf
8. Wall Construction: 8-inch grout-filled block wall.
9. Fittings and Accessories Provide the following compatible components:
10. Flushometer: Sloan Royal Model 613-0.5, low consumption (0.5gpf) with Sloan Model WB-1-A Access Wall Box Assembly and Sloan Model HY-108-A push button for urinal, operating force to meet code requirements.
11. Options:
    a. Metal Template (MT)
    b. Flush Valve (FV)
    c. Flush Valve Thru-Wall Connection (FVT)

## 2.4 LAVATORY L-1

A. Manufacturers:
1. Kohler.
2. American Standard, Inc.
3. Crane Plumbing/Fiat Products.

B. Description:
1. Material: Vitreous China
2. Color: White
3. Lavatory Size: 21-1/4 inches x 18-1/8 inches.
4. Mounting and Outlet: Wall mounted, wall outlet.
5. Rim Height: ADA Compliant. (Coordinate mounting height with Architectural Plans and Elevations.)
6. Wall Construction: Type of wall indicated on Architectural Floor Plans.
7. Faucet, Fittings and Accessories: Provide the following compatible components:
    a. Faucet: "Symmons" S-90-2-FR-G, single control lavatory faucet. 0.5 gal/min maximum flow rate.
    b. Supplies: Lavatory Type 1.
    c. Drain: Kohler K-7715 Grid Drain.
    d. Trap: Lavatory Type 1.
    e. Support Type: J.R. Smith, lavatory supports with concealed arms; floor mounted with “Pro-Set” uprights, Model 0700.

## 2.5 LAVATORY (STUDENT) L-2

A. Manufacturers:
1. Willoughby
2. Acorn
3. Metcraft

RFI 0135

*PLUMBING - L2 Not Listed as ADA*

*Acorn Model 1652 fixture to be used in lieu of 1951*

B. Description:

1. Fixture: Stainless Steel.
2. Material: 14 gauge, Type 304 stainless steel, all welded construction, exposed stainless surfaces polished to a #4 satin finish.
3. Drain: 1-1/2 inches.
4. Consumption: 0.5 gpm
5. Wall Thickness: 8 inches.
6. Wall Type: Grout-filled block wall.
7. Valve Body: Brass Only.
8. Push Button: Willoughby stainless steel.

RFI 0024 — Plumbing Fixture L-2 Clarification — Wall Bracket in lieu of wall sleeve

2.6 COMBINATION WATER CLOSET/LAVATORY (ADA COMPLIANT) COMBI-1

A. Manufacturers:
1. Willoughby
2. Acorn
3. Metcraft

B. Description:
1. Material: 14 gauge, Type 304 stainless steel, seamless welded construction with satin finish.
2. Toilet Bowl Orientation: Left / Right / Center. Verify with Architectural Floor Plan.
3. Lavatory Bowl Type: Oval, 9-3/4 inch x 13-1/2 inch x 5 inch deep.
4. Mounting and Outlet: Floor mounted, back outlet.
5. Rim Height: 18 inches above finished floor.
6. Toilet Consumption: Low Flow, 1.28 GPF.
7. Wall Thickness: 6-1/2 inches.
8. Wall Type: Concrete, poured in place.

RFI 0302 — BLDG A&B - COMBI-1 Bowl Dimension Clarification — Acorn bowl dimensions are acceptable at 15 1/4" x 12 1/2" X 4".

9. Fittings and Accessories: Provide the following compatible components:
   a. Flushometer: Sloan Royal Prison Model 603-1.28, low consumption; ESM (solenoid operated with modular plug for use with Sloan PWT System, 24 VAC only).
   b. Push Buttons: Water Closet: Sloan 1-1/4 inch Model MCR-60A-6, Lavatory: (2), 1-inch diameter “D” style hole, Sloan Model MCR-231D, operating force to meet code requirements.
   c. Toilet Seat: Integral with fixture, standard finish.
   d. Filler / Bubbler: Penal Bubbler (BP).
   e. Valve Selection: Dual Temperature Electronic (EL-2).
   f. Valve Manifold: MA2 (2 Fixtures).
10. Options - Provide the following:
   a. Recessed Tissue Holder: (RTH); Location of tissue holder must be visible from cell door.
   b. Support: Wall Sleeve (WS) with horizontal and vertical 1/2-inch diameter steel rebar, similar to Willoughby Drawing P078000A.
   c. Toilet Waste Connection: 3 inch to 4 inch No-Hub connection with pinned clean-out (TW3/PCB).
   d. Lavatory Waste Connection: Integral P-Trap (PT).
   e. Toilet Flush Extension: TFE.
   f. Wall Grab Bar: WA-GB-48 standard, WA-GB-42-inch-Modified in existing buildings with restricted spaces. Willoughby Drawing P961051D (provide anti-suicide grab bar for combo unit).

g. Rear Grab Bar: Unit will be designed and installed as needed to permit a compliant rear grab bar installation.

2.7 COMBINATION LAVATORY AND WATER CLOSET COMBI-2

A. Manufacturers:
1. Willoughby
2. Acorn
3. Metcraft

B. Description:
1. Materials: 14 gauge, Type 304 stainless steel, seamless welded construction with satin finish.
2. Toilet Orientation: Left / Right / Center. Verify bowl location with Architectural Floor Plan.
3. Lavatory Bowl Type: Multi-sided, 12-3/4 inches x 8-1/4 inches x 5 inches deep.
4. Mounting and Outlet: Floor mounted, back outlet.
5. Rim Height: 15 inches above finished floor.
6. Toilet Consumption: Low Flow, 1.28 GPF.
7. Wall Thickness: 6-1/2 inches.
8. Wall Type: Concrete, poured in place.
9. Fittings and Accessories: Provide the following compatible components:
   a. Flushometer: Sloan Royal Prison, Model 603-1.28, low consumption; ESM (solenoid operated with modular plug for use with Sloan PWT System, 24 VAC only)
   b. Push Buttons: Water Closet: Sloan 1-1/4 inches, Model MCR-60A-6. Lavatory: (2), 1 inch diameter “D” style hole, Sloan, Model MCR-231D.
   c. Toilet Seat: Integral with fixture, standard finish.
   d. Filler / Bubbler: Penal Bubbler (BP).
   e. Valve Selection: Dual Temperature Electronic (EL-2).
   f. Valve Manifold: MA2 (2 Fixtures).
10. Options - Provide the following:
   a. Recessed Tissue Holder: (RTH), Location of tissue holder must be visible from cell door.
   b. Support: Wall Sleeve (WS) with horizontal and vertical 1/2 inch diameter steel rebar, similar to Willoughby Drawing P078000A.
   c. Toilet Waste Connection: 3 inches to 4 inches. No-Hub connection with brass pinned clean-out (TW3/PCB).
   d. Lavatory Waste Connection: Integral P-Trap (PT).
   e. Toilet Flush Extension: TFE.

2.8 URINAL (STUDENT) (ADA COMPLIANT) UR-1

A. Manufacturers:
1. Willoghby
2. Acorn
3. Metcraft

B. Description:
1. Fixture: Stainless Steel Wall Mounted Straddle Urinal.
2. Material: 14 gauge, Type 304 Stainless Steel.

3. Spud Size: 3/4-inch Back Spud.
4. Passageway: 2 inch.
5. Mounting and Outlet: Wall Mounted, Back Outlet.
6. Rim Height and Depth: Coordinate mounting heights with Architectural Plans and Elevations, accessible units to meet codes.
7. Consumption: 0.5 gpf
8. Wall Construction: 8-inch grout-filled block wall.
9. Fittings and Accessories Provide the following compatible components:
10. Flushometer: Sloan Royal Model 613-0.5, low consumption (0.5gpf) with Sloan Model WB-1-A Access Wall Box Assembly and Sloan Model HY-108-A push button for urinal, operating force to meet code requirements.
11. Options:
    a. Metal Template (MT)
    b. Flush Valve (FV)
    c. Flush Valve Thru-Wall Connection (FVT)

2.9 SERVICE SINK SS-1

A. Manufacturers:
1. Acorn,
2. Elkay.
3. Approved Equal.

B. Description:
1. Material: Stainless steel, type 304.
2. Gauge: 18 gauge.
3. Sink Type: Semi-circular wash fountain.
4. Sink Dimensions: 38 inches wide by 34 inches high by 32 inches deep.
5. Bowl Dimensions: 38 inches wide.
6. Faucet: Four station pushbutton 0.5 spray nozzle.

2.10 MOP SINK MS-1

A. Manufacturers:
1. Willoughby
2. Acorn
3. Elkay

RFI 0009 — BLDG AB - Mop Sink Clarification
MS-1 finish confirmed as stainless steel.

B. Description:
1. Fixture: Stainless Steel Corner Mop Sink with Backsplash.
2. Material: 14 gauge, Type 304 stainless steel, all welded; exposed stainless steel surfaces #4 finish and bead blast interior and sound deaden underside.
3. Sink Dimensions: 36 inch by 36 inch.
4. Faucet, Fittings and Accessories: Provide the following compatible components:
    a. Faucet: Speakman Model SC-5812 polished chrome plated brass service sink fitting with 1/4 turn ceramic cartridges; integral stops; cast brass nozzle with 3/4-inch hose thread and pail hook; brass vacuum breaker; brass top brace assembly with wall flange and mounting screws; 9-inch distance from finished wall to nozzle outlet; 8-inch centers with adjustable threaded brass wall flange; 1/2-inch NPTF outlets; 5 feet vinyl hose with wall hook; ASSE-1001.

RFI 0057 Kitchen Sink Clarification
Changed KS-1 Sink model number to LRADQ1919

2.11 KITCHEN SINK KS-1

A. Manufacturers:
1. Elkay; Model ~~LRAD2918~~ LRADQ1919
2. Acorn
3. Willoughby

B. Description:
1. Fixture: Stainless Steel Double Bowl Top Mount Sink.
2. Material: Type 304 stainless steel
3. Sink Dimensions: 29" x 18" x 7-5/8".

2.12 LAB SINK S-1

A. Manufacturers:
1. Durcon, Model D24C
2. Or equal.

B. Description:
1. Fixture: Epoxy resin drop-in sink.
2. Material: Epoxy resin.
3. ~~Sink Dimensions: 18"x 14" x 10.5"~~

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2.13 COMBINATION EMERGENCY SHOWER/ EYEWASH EWS-1

A. Manufacturers:
1. Guardian, Model: GBF 1909
2. Or equal.

B. Description:
1. Piping:
   a. Material: Schedule 40 galvanized steel.
   b. Unit Supply: NPS 1-1/4.
   c. Unit Drain: Outlet at back or side near bottom.
2. Shower:
   a. Capacity: Not less than 20 gpm for at least 15 minutes.
   b. Supply Piping: NPS 1 with stay-open ball valve.
   c. Control-Valve Actuator: Pull rod.
   d. Shower Head: 10-inch- minimum diameter, ABS plastic.
   e. Mounting: Pedestal.
3. Eyewash Unit:
   a. Capacity: Not less than 0.4 gpm for at least 15 minutes.
   b. Supply Piping: NPS 1/2 with stay-open ball valve.
   c. Control-Valve Actuator: Paddle.
   d. Spray-Head Assembly: Four receptor-mounted spray heads.
   e. Receptor: Stainless-steel bowl.
   f. Mounting: Attached shower pedestal.

2.14 WATER TEMPERING EQUIPMENT

A. Manufacturers:
1. Guardian, Model: G3802LF

2. Or equal.

B. Description: Factory-fabricated equipment with thermostatic mixing valve.
1. Thermostatic Mixing Valve: Designed to provide 85 deg F tepid, potable water at emergency plumbing fixtures, to maintain temperature at plus or minus 5 deg F throughout required 15-minute test period, and in case of unit failure to continue cold-water flow, with union connections, controls, metal piping, and corrosion-resistant enclosure.
2. Supply Connections: For hot and cold water.

2.15 DRINKING FOUNTAINS DF-1

A. Manufacturers:
1. Acorn
2. Haws
3. Elkay

RFI 0026 — BLDG A&B - Plumbing DF-1 Fixture Clarification: Acorn model A172.8-FG-VR Series High low drinking fountain to be used

B. Description: Wall mounted, vandal resistant drinking fountain made from 18-gauge, 304 stainless steel with a brushed finish. Unit shall be activated by self-closing, frontal push pad, which activates an internally mounted valve with an adjustable stream regulator controlling the water flow. Bubbler shall be brass with a non-squirt feature. Unit shall adhere to ANSI A117.1 and Americans with Disabilities Act of 1990 frontal approach and protruding objects requirements, and ANSI/NSF 61, Section 9.

## PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for potable cold water and hot water supplies and soil and for waste and vent piping systems and supports to verify actual locations and sizes of piping connections and that locations and types of supports match those indicated, before plumbing fixture installation. Use manufacturer's roughing-in data if roughing-in data are not indicated.

B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.

C. Do not proceed until unsatisfactory conditions have been corrected.

3.2 APPLICATION

A. Install plumbing fixtures and specified components, in accordance with designations and locations indicated on Drawings.

B. Install supports for plumbing fixtures in accordance with categories indicated, and of type required:
1. Carriers for following fixtures:
   a. Wall-hanging water closets.
   b. Wall-hanging fixtures supported from wall construction.
2. Chair carriers for the following fixtures:
   a. Wall-hanging lavatories and sinks.
   b. Wall-hanging electric water coolers.
3. Heavy-duty chair carriers for the following fixtures:

a. Accessible lavatories.
b. Fixtures where specified.

4. Reinforcement for the following fixtures:
   a. Wall-mounted lavatories required to be secured to wall.
   b. Wall-mounted sinks required to be secured to wall.

3.3 INSTALLATION OF PLUMBING FIXTURES

A. Assemble fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. For wall-hanging fixtures, install off-floor supports affixed to building substrate.
   1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
   2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
   3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.

C. Install back-outlet, wall-hanging fixtures onto waste fitting seals and attach to supports.

D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.

E. Install wall-hanging fixtures with tubular waste piping attached to supports.

F. Install floor-mounting, back-outlet water closets attached to building floor substrate and wall bracket and onto waste fitting seals.

G. Install counter-mounting fixtures in and attached to casework.

H. Install fixtures level and plumb according to manufacturers' written instructions and roughing-in drawings.

I. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

J. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

K. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

L. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

M. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.

N. Install toilet seats on water closets.

O. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

P. Install water-supply, flow-control fittings with specified flow rates in fixture supplies at stop valves.

Q. Install faucet, flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

R. Install traps on fixture outlets.
1. Exception: Omit trap on fixtures with integral traps.
2. Exception: Omit trap on indirect wastes, unless otherwise indicated.

S. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings.

T. Seal joints between fixtures and walls, floors, and counters using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Comply with Division 7 Section "Joint Sealants" for sealant and installation requirements.

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U. Install thermometers in supply and outlet piping connections to water-tempering equipment. Comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."

V. Install indirect waste piping on drain outlet of emergency equipment receptors that are indicated to be indirectly connected to drainage system. Comply with requirements for waste piping specified in Section 221316 "Sanitary Waste and Vent Piping."

## 3.4 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. The drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:
1. Connect water supplies from water distribution piping to fixtures.
2. Connect drain piping from fixtures to drainage piping.
3. Supply and Waste Connections to Plumbing Fixtures: Connect fixtures with water supplies, stops, risers, traps, and waste piping. Use size fittings required to match fixtures. Connect to plumbing piping.
4. Supply and Waste Connections to Fixtures and Equipment Specified in Other Sections: Connect fixtures and equipment with water supplies, stops, risers, traps, and waste piping specified. Use size fittings required to match fixtures and equipment. Connect to plumbing piping.
5. Ground equipment.
   a. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

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B. Connect hot- and cold-water-supply piping to hot- and cold-water, water-tempering equipment. Connect output from water-tempering equipment to emergency plumbing fixtures. Comply with requirements for hot- and cold-water piping specified in Section 221116 "Domestic Water Piping."

C. Indirectly connect emergency plumbing fixture receptors without trapped drain outlet to sanitary waste or storm drainage piping.

3.5 FIELD QUALITY CONTROL

A. Verify that installed fixtures are categories and types specified for locations where installed.

B. Check that fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

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E. Emergency plumbing fixtures and water-tempering equipment will be considered defective if they do not pass tests and inspections.

3.6 ADJUSTING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at faucets and flushometer valves to produce proper flow and stream.

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C. Replace washers and seals of leaking and dripping faucets and stops.

D. Adjust or replace fixture flow regulators for proper flow.

E. Adjust equipment temperature settings.

3.7 CLEANING

A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Clean to new condition. Do the following:
   1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
   2. Remove sediment and debris from drains.

3.8 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

**END OF SECTION 22 40 00**

# SECTION 23 05 00 - COMMON WORK RESULTS FOR HVAC

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes
1. Piping materials and installation common to most piping systems.
2. Dielectric unions and flanges.
3. Escutcheons.
4. Mechanical sleeve seals.
5. Sleeves.
6. Motors and drives.
7. Combination magnetic starters.
8. Equipment guards.
9. Equipment installation requirements common to equipment Sections.
10. Adjusting and cleaning

### 1.2 DEFINITIONS

A. “Piping” includes, in addition to pipe, all fittings, flanges, valves, hangers and other accessories related to such piping.

B. “Wiring” includes in addition to conductors, all raceway, conduit, fittings, boxes, switches, hangers and other accessories related to such wiring.

C. “Concealed” means hidden from sight in chases, furred spaces, shafts, hung ceilings or embedded in construction.

D. “Exposed” means not installed underground or “concealed” as defined above.

E. “Provide” means to furnish and install.

### 1.3 SUBMITTALS

A. General
1. Comply with the requirements of Division 01 and the specific requirements of the Sections of Division 23.
2. Submit all similar equipment together as part of the same submittal. For example:
   a. All exhaust fans shall be contained in the same submittal.
   b. All unit heaters shall be contained in the same submittal.
   c. All air outlets shall be contained in the same submittal.
3. Contractor shall review all submittals prepared by each supplier and mark all copies as acceptable to the Contractor. This acceptance shall signify that all required service connections are shown and in the proper location to meet the installation requirements and that the equipment can fit in the space allowed.
4. Do not order equipment until submittals have been reviewed and approved by the Owner.
5. Each item submitted shall be labeled or identified the same as on the Drawings.

6. Mark submittal "Exactly as Specified" or accompanied by a letter from the supplier explaining in detail what difference, if any, exists between the submitted item and the specified item. Failure to point out the differences will be considered cause for disapproval. The Owner will not assume any responsibility for differences concealed or otherwise not brought to their attention, and the Contractor will be required to correct any deficiencies or differences discovered at a later date, and assume responsibility for any delays, damage, and/or expenses incurred by others due to such action.
7. Brands or trade names are mentioned to set standards of quality only; use no substitute materials, however, unless approved in writing by the Owner. Approval of substitute materials does not relieve the Contractor of responsibility for providing a workable and functioning system as specified.
8. Submittals will be checked for general conformance with the design concept but acceptance by the Owner's in no manner is meant to verify that dimensions, quantities, or location of services are as necessary to meet the job requirements. This remains the responsibility of the Contractor.

B. Shop Drawings
1. General: Prepare and submit plans, sections, details and diagrams to required scales for specified areas. Drawings shall be coordinated, dimensioned and indicate equipment, piping, and ductwork in relation to architectural and structural features as well as other building systems. Include Minor piping, drains, air vents, etc. Indicate exact locations and elevations of valves, piping specialties, access doors, dampers etc.
2. Required Drawings: Prepare and submit drawings for all areas and all mechanical work. Scale shall be minimum 3/8" = 1'-0" in mechanical rooms, fan rooms, and mechanical areas, and minimum 1/4" = 1'-0" elsewhere.

C. Coordination Drawings
1. General: Coordination drawings are defined as "shop drawings" which also indicate, on the same drawings, the major utilities of all other trades. "Coordination Drawings" shall indicate location and elevations of structural slabs and beams, architectural elements, domestic water piping, plumbing vents, sanitary drains, storm drains, fire protection piping, lighting fixtures, electrical conduits (2-inch and larger), ductwork, penetrations of walls and roof, fire dampers, fire/smoke dampers, automatic dampers, terminal boxes, air outlets, access panels, ceiling mounted equipment and controls, gas piping, flues, fans, air handling equipment, etc.
2. Submit coordination drawings for the following:
   a. Entire building.
   b. Other areas for which space is limited.
3. It is the intent of the coordination drawings to ensure coordination of all major utilities, prior to the start of installation. This is a substantial effort which will require careful and detailed coordination and planning to ensure appropriate information is available, from all trades, in a timely manner. The coordination drawing effort shall be integrated into the project schedule and monitored to ensure conformance.
4. Conflicts between trades, which cannot be resolved through generally accepted practice of coordination between trades, shall be clouded on the coordination drawings and an appropriate description of the problem noted for review by the Owner.
5. Nonconforming M/E work installed within designated coordination areas is subject to removal and replacement by installing contractor at no additional cost to Owner.
6. Coordination drawings shall be signed and dated by individual trade constrictors. By act of signature and submittal of singular combined coordination drawings, each trade

contractor acknowledges coordination of their portion of the Work with all other plumbing, mechanical, electrical, architectural, and structural work contractors.

D. Product Data
   1. General: Manufacturer's specifications, data sheets, certified drawings, and installation instructions. Include physical and performance data such as weights, sizes, capacities, required clearances, performance curves, acoustical characteristics, finishes, color selection, location and size of field connections, and accessories.
   2. Motors: Submit manufacturer's name, type, RPM, HP (KW), full load amps, efficiency, and power factor.
   3. Part Load Performance: Submit equipment data to indicate performance characteristics throughout ranges of possible load conditions.
   4. Include operating weight and location of center of gravity of each item of equipment in manufacturer's cut sheet for purposes of seismic calculation.
   5. Pipes and Pipe Fittings: Submit schedule showing pipe material data, sizes, fitting valve type k factor, working pressure for each service.
   6. Submit valve schedule showing manufacturer's figure number, size, location, and valve features for each required valve.
   7. Submit schedule showing manufacturer's figure number, size, location, and features for each required piping specialty.
      a. Strainers: include pressure drop or chart for each type and size.
   8. Meters and gauges: include scale range for each service.

E. Test Reports
   1. Manufacturer's Tests
      a. Factory Tests: As specified for specific equipment.
      b. Field Tests: As specified.
   2. System Pressure Tests: As specified under "Testing" article. Test log of pressure tests on each system. Indicate date of test, scope of test, test pressure, duration, and observers.
   3. Balancing Reports: As specified under Section 23 05 93.

F. Certification
   1. Seismic Restraints: As specified under Sections 23 05 29.
   2. Welding Certificates.
   3. Brazing Certificates.

G. Operating and Maintenance Manuals: Include, but not limited to, the following:
   1. List of all equipment with Manufacturer's name, model number, and local representative, service facilities and normal channel of supply for each item. Include phone number and address of service facilities
   2. System Description: Description of start-up, operating, and shutdown procedures.
   3. Controls: Diagrams and description of operation sequence of each system.
   4. Equipment: Manufacturer's brochures, ratings, certified shop drawings, lubrication charts and data, parts lists with part numbers, and belt and sheave data. Mark each sheet with equipment identification number and actual installed condition.
   5. Materials and Accessories: Manufacturer's brochures parts list with part numbers and lubrication data where applicable. Mark each sheet with equipment identification number or system and location of installation; and to specifically identify which options are provided (in case where data sheet shows multiple options).
   6. Certificate of factory tests, field tests and code compliance as specified.

7. Wiring and controls schematics.
8. Trouble shooting directions.
9. Maintenance procedures and frequencies.
10. Description of special tools.
11. Copies of warranties.
12. Safety precautions.
13. Emergency contingencies.

H. Record Documents
1. Comply with the Conditions of the Contract and the requirements of Section 23 05 53.
2. Indicate ductwork mains and branches, size and location, for both exterior and interior; locations of dampers, control devices, filters, and terminal units requiring maintenance or repair.
3. Indicate mains and branches of piping systems, with valves and control devices located and numbered per valve schedule, concealed unions located, and with items requiring maintenance located (i.e. traps, strainers, expansion compensators, vents, etc.). Indicate actual inverts and horizontal locations of underground piping.
4. Indicate equipment locations (exposed and concealed), dimensioned from prominent building lines.
5. Identify approved substitutions, Contract Modifications, and actual equipment and materials installed.

I. Samples: When specified under applicable Sections.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Provide factory-applied plastic end-caps on each length of pipe and tube. Maintain end-caps through shipping, storage and handling as required to prevent pipe-end damage and eliminate dirt and moisture from inside of pipe and tube.

B. Where possible, store pipe and tube inside and protected from weather. Where necessary to store outside, elevate above grade and enclose with durable, waterproof wrapping.

C. Protect flanges and fittings from moisture and dirt by inside storage and enclosure, or by packaging with durable, waterproof wrapping.

1.5 SUBSTITUTIONS

A. General:
1. Base manufacturer is indicated in equipment schedules.
2. In Specification, additional acceptable manufacturer(s) may be indicated.
3. Other manufacturers, materials, or methods shall not be used unless approved in writing by the Owner.
4. The burden of proof as to the equality of any proposed substitute manufacturer, material, or method shall be upon the Contractor.
5. The Owner’s decision shall be final.

B. Requests for substitution review and acceptance shall be accomplished by table of comparison listing pertinent features of both specified and proposed materials, such as materials of construction, performance, dimensions, weights, replacement or maintenance

access, motor type, horsepower, voltage, phase, service factor. Review of proposed substitutions will not be made until receipt of satisfactory comparison tabulation.

C. Submittal of substitutions shall be limited to one proposal for each type or kind of item, unless otherwise permitted by the Owner. If first proposed product submittal is rejected, Contractor shall then submit the first-named or scheduled product.

D. Contractor shall be responsible for all costs and coordination due to the substitution, such as impacts on electrical requirements, weight, openings in slabs and roofs, structural framing, housekeeping pad size, etc.

1.6 JOB CONDITIONS

A. Cause as little interference or interruption of existing utilities and services as possible. Schedule Work which will cause interference or interruption in advance with Construction Manager.

B. Examine Contract Documents to determine how other Work will affect execution of mechanical Work.

C. Determine and verify locations of all existing utilities.

D. Arrange for, coordinate, and pay costs incidental to providing utility company services indicated.

E. Establish lines and levels for each system and coordinate with other systems to prevent conflicts and maintain proper clearances and accessibility.

## PART 2 PRODUCTS

2.1 PIPE, TUBE AND FITTINGS

A. Refer to individual Division 23 piping sections for pipe, tube, fitting materials joining methods. Comply with governing regulations.

2.2 MISCELLANEOUS PIPING MATERIALS/PRODUCTS

A. Welding Materials: Provide welding materials to comply with installation requirements.
1. Comply with Section II, Part C, ASME Boiler and Pressure Vessel Code for welding materials.

B. Gaskets for Flanged Joints: ASME B16.21; full-faced for cast-iron flanges; raised-face for steel flanges, unless otherwise indicated.

2.3 PIPING SPECIALITIES

A. General: Provide factory-fabricated piping specialties recommended by manufacturer for use in service indicated. Provide piping specialties of types and pressure ratings indicated for each service or, if not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes as indicated, and connections, which

properly mate with pipe, tube, equipment connections. Where more than one type is indicated, selection is Installer's option.

B. Dielectric Unions and Flanges
   1. General: Provide standard products recommended by manufacturer for use in service indicated, which effectively isolate ferrous from non-ferrous piping (electrical conductance), prevent galvanic action, and stop corrosion. Pressure rating equal to or greater than that of nearby valves.
   2. Manufacturer:
      a. B & K Industries, Inc.
      b. Capitol Mfg. Co.; Div. of Harsco Corp.
      c. Eclipse, Inc.
      d. Epco Sales, Inc.
      e. Perfection Corp.
      f. Rockford-Eclipse Div.
      g. Victaulic, Clearflow.
      h. Calpico, Inc.

2.4 PIPE ESCUTCHEONS

A. General: Provide solid (not split-hinged) pipe escutcheons as specified herein with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extension, if any. Furnish pipe escutcheons with nickel or chrome finish for occupied areas, prime paint finish for unoccupied areas. All escutcheons shall be vandal proof.

B. Pipe Escutcheons for Moist Areas: For waterproof floors, and areas where water and condensation can be expected to accumulate, provide solid brass or solid sheet brass pipe escutcheons.

C. Pipe Escutcheons for Dry Areas: Provide solid sheet metal escutcheons.

D. Manufacturer: Chicago Specialty, Producers Specialty, Sanitary-Dash.

2.5 MOTORS AND DRIVES

A. Motor controls and power wiring.
   1. Provided as part of Division 26 work, unless indicated otherwise, including motor control switches, starters, disconnects, conduit and wiring, except for low voltage control wiring required for temperature controls.
   2. Where equipment is specified with factory pre-wired controls and is furnished instead with components shipped loose, mechanical contractor shall be responsible for coordinating the complete installation and assume any additional costs.

B. Motors
   1. Ball or roller bearing type, high efficiency type, with starting and running characteristics consistent with torque and speed requirements of driven machine.

2. Use motors rated in accordance with NEMA performance standards to carry full nameplate load continuously at maximum temperature rise of 72 degrees F above ambient with service factor of 1.15.
3. Motors driven by variable frequency drives shall be rated for inverter duty and shall meet the requirements of NEMA MG-1 part 31.4.4.2.
4. Where substitute manufacturers are provided with different control panels, starters, or electrical characteristics from scheduled equipment, contractor shall coordinate complete installation and assume any additional costs.
5. Do not allow power requirements of driven machine to exceed nominal nameplate rating of motor furnished.
6. Do not include service factor when selecting motor horsepower.
7. Motors exposed to moisture or rain shall be totally enclosed, fan cooled (TEFC). Others may be open drip proof (ODP), unless otherwise indicated.

C. Motor electrical power characteristics: 460 volt, 3 phase, 60 Hz for 1/2 HP and larger; 115 volt, 1 phase, 60 Hz for smaller than 1/2 HP, unless noted otherwise.

D. Efficiency
1. Requirements apply to all motors, 1/2 HP and larger, except for refrigeration compressors, and for fans which run only in emergency mode, such as chemical exhaust fans.
2. Ratings in accordance with IEEE 112b Rating Method.
3. Motors shall be labeled as NEMA “Premium” Efficient, with efficiencies as follows, based on 1750 RPM.;
   a. Motors with other than 1750 RPM shall be same type motor as would meet requirements for 1750 RPM motors.

E. Belt Drives
1. Manufacturers: Browning, Gates, Woods, or Dayton.
2. Belts: V-belt drives rated at 1-1/2 times the motor horsepower. High quality commercial-grade rubber with polyester reinforcing.
   a. Provide two belts minimum for motor sizes 2 HP and larger.
3. Sheaves: Per ARI Standard 435-78.

| Motor HP | Fan RPM | Sheave |
|---|---|---|
| 0-100 | 1800 | Adjustable or Fixed |
| 15 and Above | 0-1800 | Fixed |
| 0-3 | 1801 & above | Adjustable or Fixed |
| 5 & above | 1801 & above | Fixed |

4. Adjustments: Fan static pressures shown and related RPM’s are only approximate. Adjust sheaves or change drives to obtain required performance.
5. Provide metal belt guard having sides of galvanized steel and expanded metal face with openings for fan tachometer readings. Belt guard shall be sized to allow either sheave to be increased by two sizes.
6. Spare Parts: Provide one complete set of spare belts for all equipment items. When two or more pieces of equipment require identical belts, provide quantity of spare belts sufficient to serve two pieces of equipment. (For example, if there are three identical fans, each requiring two fan belts, then provide four spare fan belts.)
   a. Obtain receipt from Owner.

b. Identify each belt by equipment ID.
c. For fans with two or more belts, fasten set of belts together to prevent separation during storage.

2.6 COMBINATION MAGNETIC STARTERS

A. These requirements apply to starters which are provided as part of mechanical equipment such as air handling units, air conditioning units, etc.

B. Circuit breaker type with motor circuit protector. Provide external operator handles for circuit breakers. Color code handles to display red in ON position and black in OFF position; design handle with up-down motion and with down position indicating OFF. Construct handles which permit locking handle in OFF position with three padlocks. Provide NEMA 4X weatherproof type enclosure. 24 VAC control circuit type; provide with integral 24 VAC transformer.

2.7 EQUIPMENT GUARDS

A. Use suitable structural frames with minimum 12-gauge, 3/4-inch galvanized mesh, or expanded metal mesh.

B. Attach to equipment by removable clips and bolts with swing nuts, or other approved connectors.

C. At belts, provide opening for measuring RPM's.

D. Provide at all belts, couplings, moving machinery and equipment in accord with OSHA.

E. Design for easy access to belts and other items requiring replacement.

F. Provide holes in guards for tachometer readings and checking of belt tension.

G. Install in least obstructive manner as possible, with respect to equipment operation. For example, keep fan drive guards as far out of inlet air stream as practical, so as to minimize effect losses.

## PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. General: Install pipes and pipe fittings in accordance with recognized industry practices which will achieve permanently-leakproof piping systems, capable of performing each indicated service without piping failure. Install each run with minimum joints and couplings, but with adequate and accessible unions for disassembly and maintenance/replacement of valves and equipment. Reduce sizes (where indicated) by use of reducing fittings. Align piping accurately at connections, within 1/16-inch misalignment tolerance.

B. Locate piping runs, except as otherwise indicated, vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines. Locate runs as shown or described by diagrams, details and notations or, if

not otherwise indicated, run piping in shortest route which does not obstruct usable space or block access for servicing building and its equipment. Hold piping close to walls, overhead construction, columns and other clearance to 1/2 inch where furring is shown for enclosure or concealment of piping, but allow for insulation thickness, if any. Where possible, locate insulated piping for 1-inch clearance outside insulation. Wherever possible in finished and occupied spaces, conceal piping from view, by locating in column enclosures, in hollow wall construction or above suspended ceilings; do not encase horizontal runs in solid partitions, except as indicated.

C. Locate groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

D. Electrical and Elevator Equipment Spaces: Do not run piping or ductwork through transformer vaults, electrical rooms and other electrical or electronic equipment spaces and enclosures, unless piping or ductwork is for equipment serving that electrical space.

E. Comply with ASME B31.1.

F. Pressures: Do not install piping, valves or piping specialties where exposed to system pressures greater than their rated working pressures.

G. Sloping, Air Venting and Draining
1. Slope piping as indicated, true to line and grade, and free of traps and air pockets. Unless indicated otherwise, slope piping in direction of flow as follows:

H. Install piping free of sags and bends. Support requirements are specified in Section 23 05 29.

I. Refrigerant: Clean, dehydrate, and cap refrigerant piping. Take care to ensure that entire system is clean and dry during installation. Clean tubing by means of swab saturated in methyl alcohol or refrigerant 12 drawn through tubing as many times as necessary to thoroughly clean and dry interior of tubing and to eliminate formation of copper oxide. Before refrigerant lines are silver brazed, flush all air from tubing and pass slow-running stream of dry nitrogen through system during brazing process. Purge lines completely and maintain nitrogen flow at steady rate of not less than three cubic feet per hour. After brazing, interior of refrigerant lines must be clean and bright.

J. Fittings
1. Provide standard, manufactured fittings in all cases. Field fabricated fittings are prohibited. Bushings are prohibited on pressure piping.
2. Weld-O-Lets and Thread-O-Lets may be used for non-galvanized steel piping if main pipe size is at least three standard pipe sizes larger than branch pipe, e.g. 2-inch main and 1-inch branch.
3. Provide insulating couplings at connections of ferrous piping to non-ferrous piping.

## 3.2 INSTALLATION OF VALVES

A. General: Except as otherwise indicated, comply with the following requirements:
1. Install valves where required for proper operation and isolation of equipment, including valves in branch lines where necessary to isolate sections of piping. Locate valves so as to be accessible and so that separate support can be provided when necessary.

2. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward from horizontal plane unless unavoidable. Install valve drains with hose-end adapter for each valve that must be installed with stem below horizontal plane.

B. Insulation: Where insulation is indicated, install extended-stem valves, arranged in proper manner to receive insulation.

C. Renewable Seats: Select and install valves with renewable seats, except where otherwise indicated.

D. Fluid Control: Except as otherwise indicated, install gate, ball, globe, and butterfly valves to comply with ASME B31.9. Where throttling is indicated or recognized as principal reason for valve, install globe valves.

E. Installation of Check Valves
1. Swing Check Valves: Install in horizontal position with hinge pin horizontally perpendicular to center line of pipe. Install for proper direction of flow.
2. Wafer Check Valves: Install between two flanges in horizontal or vertical position, position for proper direction of flow. Provide silent type wafer check valves at pump discharge locations.
3. Lift Check Valve: Install in piping line with stem vertically upward, position for proper direction of flow.

F. Install globe valves to close against pressure.

G. Install plug valve with seat toward equipment to be isolated.

H. Valve Discharge Piping: Provide discharge pipe to atmosphere from all relief and safety valves, sized with area equal to sum of outlet areas of all valves connected thereto, unless indicated larger.

3.3 INSTALLATION OF PIPING SPECIALTIES

A. Pipe Escutcheons: Install pipe escutcheons on each pipe penetration thru floors, walls, partitions, and ceilings where penetration is exposed to view; and on exterior of building. Secure escutcheon to pipe or insulation so escutcheon covers penetration hole, and is flush with adjoining surfaces.

B. Dielectric Unions and Flanges: Install at each piping joint between ferrous and non-ferrous piping. Comply with manufacturer’s installation instructions.

C. Mechanical Sleeve Seals: Loosely assemble rubber links around pipe with bolts and pressure plates located under each bolt head and nut. Push into sleeve and center. Tighten bolts until links have expanded to form watertight seal.

D. Fire Barrier Penetration Seals: Fill entire opening with sealing compound. Adhere to manufacturer’s installation instructions and ASTM, UL Classified listings.

3.4 INSTALLATION OF FABRICATED PIPING SPECIALTIES

A. Pipe Sleeves: Install pipe sleeves of types indicated where piping passes through walls, floors, ceilings, and roofs.
   1. Do not install sleeves through structural members, except as detailed on Drawings, or as reviewed by the Owner.
   2. Install sleeves accurately centered on pipe runs.
   3. Size sleeves so that piping and insulation (if any) will have free movement in sleeve, including allowance for thermal expansion; but not less than two pipe sizes larger than piping run.
   4. Where insulation includes vapor-barrier jacket, provide sleeve with sufficient clearance for installation.
   5. Pack 100 percent of annular space between sleeve and pipe or pipe insulation. Provide acoustical sealant at each end of pipe sleeve to seal packing in place.
      a. At fire-rated walls, partitions, floors, roofs, and ceilings: Packing shall be through-penetration firestop.
      b. At non-fire-rated walls, partitions, floors, roofs, and ceilings: Packing shall be fiberglass insulation, with density of 1.5 pcf.
   6. Install length of sleeve equal to thickness of construction penetrated, and finish flush to surface; except floor sleeves.
   7. Extend floor sleeves 1 inch above level floor finish.
   8. Provide temporary support of sleeves during placement of concrete and other work around sleeves.
   9. Provide temporary closure to prevent concrete and other materials from entering sleeves.

B. Type of Sleeves
   1. Install sheet-metal sleeves at walls and partitions.
   2. Install schedule 40 pipe sleeves in concrete slabs.
   3. Install mechanical sleeve seals at exterior penetrations; below grade, and at slabs-on-grade.

C. Mechanical Sleeve Seals: Install in accordance with the manufacture’s instructions.

3.5 PIPING EXPANSION PROVISIONS

A. General: Install domestic hot water piping with at least 4 elbows or tees at following locations.
   1. Between piping mains and risers.
   2. Between equipment and pump or tank.
   3. Between piping main and equipment.

B. Expansion Loops: Fabricate expansion loops as indicated, and elsewhere as determined by Installer for adequate expansion of installed piping system. Provide pipe anchor and pipe alignment guides as indicated, and elsewhere as determined by Installer to properly anchor piping in relationship to expansion loops.
   1. At Contractor’s option, pipe anchors may be insulated lugged anchors; Pipe Shields, Inc., Model #C4000 Series. Comply with requirements for insulated pipe supports in Section 23 05 29.
   2. At Contractor’s option, pipe guides may be guided insulated pipe supports; Pipe Shields, Inc., Model #B3000 or B7000 Series. Comply with requirements for insulated pipe supports in Section 23 05 29.

3.6 TESTING

A. General: Provide labor and test equipment including test pumps, gauges, instruments and other equipment required. Use test quality pressure gauges, instruments and other equipment required. Use test quality pressure gauges with range of approximately twice test pressure. Use calibrated gauges and instruments.

B. Piping
   1. General: Remove from systems, during testing, equipment which would be damaged by test pressure. Replace removed equipment after testing. Systems may be tested in sections as work progresses; however, any previously tested portion shall become a part of any later test of composite system.
   2. Correct leaks by remaking joints with new material; makeshift remedies will not be permitted. Test time accrues only while full test pressure is on system. Test before backfilling, concealing, insulating or making connections to potable water system.
   3. Test Schedule: Test each section of systems at one and one-half times the maximum working pressure of that section, but at not less than scheduled test pressure. Obtain maximum working pressures from the Owner if not indicated on Drawings. Unless indicated otherwise, scheduled tolerance is “no pressure loss”, except that due to temperature change, in 24 hour period.

C. Valves
   1. General Service Valves: Test bonnets for tightness. Test operate from closed-to-open-to-closed position while under test pressure.
   2. Automatic Valves: Test, including solenoid valves, water regulating valves, pressure reducing valves, pressure relief valves, safety valves and temperature and pressure relief valves for proper operation at settings indicated.
   3. Safety Valves: Test relief valves, safety relief valves, safety valves and temperature and pressure relief valves 3 times.

D. Piping Specialties: Test thermometers, pressure gauges, flow measuring devices, and water meters for accurate indication; automatic water feeders, air vents, trap primers, vacuum breakers, and other specialties for proper performance.

E. Hangers and Supports: With systems in normal operation, test hangers, supports and rods to ensure they are plumb and supporting proper share of load. Additionally support systems and equipment that sway, crawl, or vibrate.

F. Ductwork: Comply with the requirements of Section 23 31 13.

G. Ductwork Specialties
   1. Verify fire dampers, fire/smoke dampers, smoke dampers, and two position AVD’s (automatic volume dampers) are 100% open, unless damper is indicated to be closed during normal operation.

H. Buried Pipe and Equipment Wrapping and Coating: Test surfaces with standard 8,000 to 10,000 volt electrical holiday detector.

I. Other Materials and Equipment
   1. Rotation: Verify.

2. Motor Amperage: Verify operating motor amperage does not exceed motor nameplate rating.
3. Test as specified; as recommended by equipment manufacturer; and as otherwise necessary or directed to assure they are complete, operable, and ready for use.

3.7 ADJUSTING AND CLEANING

A. Inspect all equipment and put in good working order.

B. Clean all exposed and concealed items
1. Clean air surfaces of all coils, fans (including fan wheels and motors), air handler plenums and air filter frames.
2. Clean floor drains, cleanouts, and plumbing fixtures.
3. Clean specialties such as traps and strainers. Replace strainer screens with new prior to system commissioning.

C. Ductwork: Blow-out ducts with fans before connecting terminal units. Clean ducts before installing air outlets.

D. Equipment and Materials: Remove foreign materials including dirt, grease, splashed paint, and plaster, etc. Restore damaged finishes to original condition.

E. Piping: Flush clean interior of piping. Upon completion of flushing, completely drain systems at low points; remove, clean, and replace strainer baskets and refill systems.

F. Gas: After testing of natural gas system, and before any gas is put into line, blow out entire system of piping to remove scale and dirt; purge air by filling system with gas.

G. Adjusting: Adjust equipment and system components as indicated or as otherwise required to result in intended system operation. Thereafter, as a result of system operation, or as directed, make readjustments as necessary to refine performance and to effect complete system tune-up.

3.8 SPECIAL TOOLS

A. Furnish to Owner not later than when Owner takes possession of equipment.

B. Definition of Special Tools: Identified in or otherwise implied by, the manufacturer's operation and maintenance manuals for the furnished equipment, or which are otherwise required for the operation, with the manufacturer's recommended procedures for operation, adjustment and maintenance. Special tools do not include those required for major repairs normally done by factory trained or otherwise specialized service personnel, nor do they include those normally found in the possession of Owner's onsite maintenance personnel.

3.9 MANUFACTURER'S START-UP ASSISTANCE

A. Where the services of a factory authorized service representative are specified for the start-up of certain pieces of equipment, arrange to have the manufacturer of such equipment perform start-up and check-out service. Manufacturer shall provide a letter which shall be on the manufacturer's letterhead, shall list the equipment, shall certify that the equipment has been examined, that it has been installed in accordance with the manufacturer's installation

instructions, started up, adjusted, and checked out in accordance with the manufacturer's instructions, and is operating properly. The letter shall be addressed to the Owner and shall be signed by an authorized representative of the manufacturer.

3.10 CLEANING, FLUSHING, INSPECTING

A. General: Clean exterior surfaces of installed piping systems of superfluous materials, and prepare for application of specified coatings (if any). Flush clean interior of piping. Inspect each run of each system for completion of joints, supports and accessory items. Upon completion of flushing, completely drain systems at low points; remove, clean and replace strainer baskets and refill systems.
   1. Inspect pressure piping in accordance with procedures of ASME B31.

3.11 ADJUSTING AND CLEANING OF VALVES

A. Valve Adjustment: After piping systems have been tested and put into service, but before final testing, adjusting, and balancing, inspect each valve for possible leaks. Adjust or replace packing to stop leaks, replace valve if leak persists.

B. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

C. Valve Identification: Tag each valve in accordance with Section 23 05 53.

3.12 ADJUSTING AND CLEANING OF PIPING SPECIALTIES

A. Adjusting: Adjust faces of meters and gauges to proper angle for best visibility.

B. Cleaning: Clean windows of meters and gauges and factory-finished surfaces. Replace cracked or broken windows, repair any scratched or marred surfaces with manufacturer's touch-up paint.

3.13 EQUIPMENT VIBRATION

A. Mechanical Balance: Fans, pumps, motors, and drives, when equipment is installed and in normal operation, shall be within the following maximum limits, unless specified more restrictively for individual equipment items:
   1. 600 RPM and Less: 0.003-inch displacement, peak-to-peak.
   2. Over 600 RPM: 0.10-inch per second velocity, peak.

B. Pulley Run-Out: When equipment is installed and in normal operation, pulley run-out in radial and axial directions not to exceed 0.001-inch.

C. Field Tests: If requested, test equipment to determine compliance with specified requirements. Measure vibration displacement and velocity in vertical direction relative to floor. Make measurements on bearing housings (not end caps), or other heavy structural element directly connected to bearing housing, at each end of equipment.

D. Field Balancing: Balance and retest equipment as required for compliance with specified requirements.

**END OF SECTION 23 05 00**

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# SECTION 23 05 29 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
   1. Metal pipe hangers and supports.
   2. Trapeze pipe hangers.

### 1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

### 1.4 SEISMIC RESTRAINTS

A. Submit manufacturer's technical product data, including installation instructions for each type of support and anchor. Include the following:
   1. Manufacturer's data (catalog cuts and data sheets), for each manufactured component including hangers, attachments, inserts, thermal shields anchors and guides, auxiliary framing and wall seals. Provide a project specific hanger and support schedule indicating all devices, manufacture and model, where used. Cross reference to product data and specification paragraph. Data must demonstrate that components comply with Specifications.
   2. Support and Bracing Shop Drawings: Submit plans, sections, details, schedules and other information necessary to describe support hangers for all HVAC systems. Submittal must indicate location and type of all hangers and supports. Each attachment to the building structure must have vertical and horizontal point loads identified.
   3. Maintenance Data: Submit maintenance data and parts list for each type of support and anchor. Include this data, product data, and shop drawings in maintenance manual in accordance with requirements of Division 1.
   4. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.
   5. Shop drawings for each type of hanger and support, indicating dimensions weights, required clearances, and methods of component assembly.
   6. Licensed Engineers hanger and support drawings specified in the "Quality Assurance' Article
   7. Licensed Engineer's hanger and support installation report specified in the "Field Quality Control" Article.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

**PART 2 - PRODUCTS**

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:
1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
**5.** Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

**PART 3 - EXECUTION**

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.

2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

D. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

E. Install lateral bracing with pipe hangers and supports to prevent swaying.

F. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

G. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

H. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

I. Insulated Piping:
1. Attach clamps and spacers to piping.
   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
   b. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
2. Shield Dimensions for Pipe: Not less than the following:
   a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
   b. NPS 4: 12 inches long and 0.06 inchthick.
   c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
   d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
   e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
3. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
4. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

## 3.2 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers .

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.3 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.4 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports metal trapeze pipe hangers and attachments for general service applications.

F. Use and or corrosion-resistant attachments for hostile environment applications.

G. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

**END OF SECTION 23 05 29**

# SECTION 23 05 53 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

## PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Equipment labels.
2. Pipe labels.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Valve numbering scheme.

## PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Brady Corporation.
   b. emedco.
   c. Seton Identification Products.
2. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
3. Letter Color: White.
4. Background Color: Black.
5. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
6. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
7. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 PIPE LABELS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Brady Corporation.
2. emedco.
3. Seton Identification Products.

B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction according to ASME A13.1.

C. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.

D. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

E. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.
1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: Size letters according to ASME A13.1 for piping.

**PART 3 - EXECUTION**

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.4 PIPE LABEL INSTALLATION

A. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
   1. Near each valve and control device.
   2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
   3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
   4. At access doors, manholes, and similar access points that permit view of concealed piping.
   5. Near major equipment items and other points of origination and termination.
   6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
   7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

C. Pipe Label Color Schedule:
   1. Refrigerant Piping: Black letters on a safety-orange background.

**END OF SECTION 23 05 53**

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# SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
   1. Balancing Air Systems:
      a. Variable-air-volume systems.

### 1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. BAS: Building automation systems.

C. NEBB: National Environmental Balancing Bureau.

D. TAB: Testing, adjusting, and balancing.

E. TABB: Testing, Adjusting, and Balancing Bureau.

F. TAB Specialist: An independent entity meeting qualifications to perform TAB work.

G. TDH: Total dynamic head.

### 1.4 QUALITY ASSURANCE

A. TAB Specialists Qualifications: Certified by AABC, NEBB or TABB.
   1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC, NEBB or TABB.
   2. TAB Technician: Employee of the TAB specialist and certified by AABC, NEBB or TABB as a TAB technician.

B. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."

### 1.5 FIELD CONDITIONS

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

B. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.6 SUBMITTALS

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Early Occupancy will not be required.

A. Submit under provisions of Division 1.

B. Name of adjusting and balancing agency for approval within 30 days after award of Contract.

C. Test Reports: Report Forms.
   1. Submit reports on AABC National Standards for Total System Balance or NEBB forms.
   2. Forms must include the following information:
      a. Title Page:
         1) Company name, address, telephone number.
         2) Project name, location.
         3) Project Architect
         4) Project Engineer
         5) Project Contractor
         6) Project Altitude
      b. Instrument List:
         1) Instrument description; manufacturer; model; serial number; range; calibration date.
      c. Air Moving Equipment:
         1) Location; manufacturer; model; air flow, specified and actual; return air flow, specified and actual; outside air flow, specified and actual; total static pressure (total external), specified and actual; inlet pressure; discharge pressure; fan RPM.
      d. Exhaust Fan Data:
         1) Location; manufacturer; model; air flow, specified and actual; total static pressure (total external), specified and actual; inlet pressure; discharge pressure; fan RPM.
      e. Return Air/Outside Air Data:
         1) Identification/location; design air flow; actual air flow; design return air flow; actual return air flow; design outside air flow; actual outside air flow; return air temperature; outside air temperature; required mixed air temperature; actual mixed air temperature; design outside/return air ratio; actual outside/return air ratio.
      f. Electric Motors:
         1) Manufacturer; HP/BHP; phase, voltage, amperage; nameplate, actual, no load; RPM; service factor; starter size, rating, heater elements.
      g. V-Belt Drive:
         1) Identification/location; required driven RPM; driven sheave, diameter and RPM; belt, size and quantity; motor sheave, diameter and RPM; center to center distance, maximum, minimum, and actual.
      h. Duct Traverse:
         1) System zone/branch; duct size; area; design velocity; design air flow; test velocity; test air flow; duct static pressure; air temperature; air correction factor.
      i. Air Distribution Test Sheet:

1) Air terminal number; room number/location; terminal type; terminal size; area factor; design velocity; design air flow; test (final) velocity; test (final) air flow); percent of design air flow.

j. Pump Data:
   1) Identification/number; manufacturer; size/model; impeller; service; design flow rate, pressure drop, BHP; actual flow rate, pressure drop, BHP; discharge pressure; suction pressure; total operating head pressure; shut off, discharge and suction pressures; shut off, total head pressure.

k. Cooling Coil Data:
   1) Identification/number; location; service; manufacturer; air flow, design and actual; entering air DB temperature, design and actual; entering air WB temperature, design and actual; leaving air DB temperature, design and actual; leaving WB temperature, design and actual; air pressure drop, design and actual.

l. Sound Level Report:
   1) Location; octave bands - equipment off; octave bands - equipment on.

m. Vibration Test:
   1) Location of points:
      a) Fan bearing, drive end.
      b) Fan bearing, opposite end.
      c) Motor bearing, center (if applicable).
      d) Motor bearing, drive end.
      e) Motor bearing, opposite end.
      f) Casing (bottom or top).
      g) Casing (side).
      h) Duct after flexible connection (discharge).
      i) Duct after flexible connection (suction).
   2) Test readings:
      a) Horizontal, velocity and displacement.
      b) Vertical, velocity and displacement.
      c) Axial, velocity and displacement.
   3) Normally acceptable readings, velocity and acceleration.
   4) Unusual conditions at time of test.
   5) Vibration source (if non-complying).

n. Prior to commencing work, draft reports indicating adjusting, balancing, and equipment data required.

o. Draft copies of report for review prior to final acceptance of Project. Provide final copies for Owner Representative and for inclusion in operating and maintenance manuals.

p. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.

q. Include detailed procedures, agenda, sample report forms and copy of AABC National Project Performance Guaranty prior to commencing system balance.

D. Closeout Submittals.

E. Project Record Documents:
   1. Submit record documents under provisions of Division 1.

2. Accurately record actual locations of balancing valves and rough setting.

## PART 2 - PRODUCTS

2.1 GENERAL

A. Products and materials must be as described in pertinent sections of Division 23.

## PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.

B. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including fan and pump curves.
   1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
   2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.

J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

K. Examine strainers. Verify that startup screens have been replaced by permanent screens with indicated perforations.

L. Examine control valves for proper installation for their intended function of throttling, diverting, or mixing fluid flows.

M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

N. Examine system pumps to ensure absence of entrained air in the suction piping.

O. Examine operating safety interlocks and controls on HVAC equipment.

P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes the following:
   1. Equipment and systems to be tested.
   2. Strategies and step-by-step procedures for balancing the systems.
   3. Instrumentation to be used.
   4. Sample forms with specific identification for all equipment.
   5. Technician certification documentation.

B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:
   1. Airside:
      a. Verify that leakage and pressure tests on air distribution systems have been satisfactorily completed.
      b. Duct systems are complete with terminals installed.
      c. Volume, smoke, and fire dampers are open and functional.
      d. Clean filters are installed.
      e. Fans are operating, free of vibration, and rotating in correct direction.
      f. Variable-frequency controllers' startup is complete and safeties are verified.
      g. Automatic temperature-control systems are operational.
      h. Ceilings are installed.
      i. Windows and doors are installed.
      j. Suitable access to balancing devices and equipment is provided.
   2. Hydronics:
      a. Verify leakage and pressure tests on water distribution systems have been satisfactorily completed.
      b. Piping is complete with terminals installed.
      c. Water treatment is complete.

d. Systems are flushed, filled, and air purged.
e. Strainers are pulled and cleaned.
f. Control valves are functioning per the sequence of operation.
g. Shutoff and balance valves have been verified to be 100 percent open.
h. Pumps are started and proper rotation is verified.
i. Pump gage connections are installed directly at pump inlet and outlet flanges or in discharge and suction pipe prior to valves or strainers.
j. Variable-frequency controllers' startup is complete and safeties are verified.
k. Suitable access to balancing devices and equipment is provided.

## 3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in and in this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."
3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230700 “HVAC Insulation.”

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

## 3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of air-handling-unit components.

K. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.5 TOLERANCES

A. Set HVAC system's airflow rates and water flow rates within the following tolerances:
   1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
   2. Air Outlets and Inlets: Plus or minus 10 percent.

B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

**END OF SECTION 23 05 93**

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# SECTION 23 07 00 - HVAC INSULATION

## PART 1 GENERAL

### 1.1 SUMMARY

A. Section Includes

1. Acceptable Manufacturers.
2. Piping Insulation and Jacketing Materials.
3. Insulation Materials.
4. Equipment Insulation Materials.

### 1.2 QUALITY ASSURANCE

A. Manufacturer's qualifications: Firms regularly engaged in manufacture of mechanical insulation products, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.

B. Installer's qualifications: Firm with at least 5 years successful installation experience on projects with mechanical insulations similar to that required for this Project.

C. Flame/smoke ratings: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics and adhesives) with flame-spread index of 25 or less, and smoke-developed index of 50 or less, as tested by ASTM E84 (NFPA 255) method.

1. Exception: Outdoor mechanical insulation may have flame spread index of 75 and smoke developed index of 150.

D. Insulation on pipes, ducts, and plenums in building spaces shall not breed or promote microbial growth.

E. Insulation products shall be formaldehyde-free.

F. K Values: Thermal conductivity in BTU-in/hr. sq.ft. deg.F.

G. Density: In pound/cu.ft. (pcf).

H. Vapor Permeability, in perms: (0.02 perms = 0.02 grains/hr x sq. ft x inch Hg.)

### 1.3 SUBMITTALS

A. Product data: Submit manufacturer's technical product data and installation instructions for each type of mechanical insulation. Submit schedule showing manufacturer's product number, k-value, thickness, and furnished accessories for each mechanical system requiring insulation.

B. Maintenance data: Submit maintenance data and replacement material lists for each type of mechanical insulation. Include this data and product data in maintenance manual.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver insulation, coverings, cements, adhesives, and coatings to site in containers with manufacturer's stamp or label, affixed showing fire hazard indexes of products.

B. Protect insulation against dirt, water, and chemical and mechanical damage. Do not install damaged or wet insulation; remove from Project site.

**PART 2 PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

A. Available manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:

1. Armacell.
2. CertainTeed Corp.
3. Knauf Fiber Glass GmbH.
4. Johns Manville Corp.
5. Owens-Corning Corp.
6. RBX Industries.

2.2 PIPING INSULATION MATERIALS

A. Fiberglass piping insulation: Preformed, one piece, with all service jacket/self sealing lap; K value of 0.23 at 75°F (33.1 at 24°C mean temperature) mean temperature.

1. Vapor Barrier Jacket: With integral, factory-applied, paintable, white reinforced kraft outer surface bonded to aluminum foil with self-sealing lap. Maximum vapor permeance of 0.02 perms, and minimum beach puncture of 50 units.

B. Elastomeric Foam Piping Insulation: Closed cell. K-value of 0.27 or less at 75°F (39 or less at 24°C) mean temperature. Maximum vapor permeance of 0.08 perms. Meet 25 flame / 50 smoke rating for thicknesses up to 1.5 inch. Insulation shall be CFC free.

1. Pipe sizes up to 6": Preformed, one-piece insulation. Armacell AP/Armaflex, Rubatex Insul-Tube 180, or approved equal.

C. Jackets:

1. Interior Applications:

a. Vapor Barrier Jackets: Kraft, reinforced foil vapor barrier with self-sealing adhesive joints.
b. PVC Jackets: One piece, premolded type.
c. Canvas Jackets: UL listed treated cotton fabric, 6oz/sq. yd.

2. Exterior Applications:

   a. Aluminum Jackets: ASTM B209, 20 mils thick; with 2 joint longitudinal seams, and factory supplied butt straps.

D. Fittings and Valves: Manville Zeston, Speed-Line. Premolded PVC fitting covers over pre-cut insulation of same thickness as adjacent piping. Do not use for engine exhaust piping.

E. Bands, wires, and cement: As recommended by insulation manufacturer for applications indicated.

F. Adhesives, sealers, and protective finishes: As recommended by insulation manufacturer for applications indicated.

2.3 DUCTWORK INSULATION MATERIALS

A. Duct Wrap with Vapor Barrier: 1.5 inch thick fiberglass; 0.75 lb/cu. ft.. R-value of 5.2 at 75°F mean temperature (0.92 at 24°C mean temperature); installed R-value of 4.2. With factory-applied FSK (foil scrim kraft) facing with maximum vapor permeance of 0.02 perms. Formaldehyde free.

B. Elastomeric Foam Duct Insulation: Closed Cell. K-value of 0.27 or less at 75°F (39 or Less at 24°C) mean temperature. Maximum vapor permeance of 0.08 perms. Meet 25 flame / 50 smoke rating for thickness up to 1.5 inch. Insulation shall be CFC free.

   1. Sheet and Roll: Armacell AP, Rubatex Insul-Sheet 1800.

C. Fire Wrap Duct Insulation: 2 inch thick. Thermal Ceramics Firemaster, 3M Firemaster, or Certainteed Flamecheck.

D. Ductwork insulation accessories: Provide staples, bands, wires, tape, anchors, corner angles and similar accessories as recommended by insulation manufacturer for applications indicated.

E. Ductwork insulation compounds: Provide cements, adhesives, coatings, sealers, protective finishes and similar compounds as recommended by insulation manufacturer for applications indicated.

F. Internal Duct Liner: Insulation inside the ductwork shall not be used on HVAC systems utilizing evaporative cooling.

2.4 EQUIPMENT INSULATION MATERIALS

A. Rigid fiberglass equipment insulation: 6 lb./cu.ft. insulation board; All Service Jacket; K value of 0.22 at 75 degrees F mean temperature mean temperature.

B. Flexible equipment insulation:

   1. Johns Manville Micro-Flex APT Jacket. K value of 0.24 at 75 degrees F mean temperature.

2. Elastomeric Foam: Closed cell sheet and roll. K-value of 0.27 or less at 75 degrees F mean temperature. Maximum vapor permeance of 0.08 perms. Meet 25 flame/50 smoke rating for thicknesses up to 1 inch. Armacell AP/Armaflex, Rubatex Insul-Sheet 1800.

C. Jacketing material for equipment insulation: Provide pre-sized glass cloth jacketing material, not less than 7.8 ounces per square yard, or metal jacket at Installer's option, except as otherwise indicated.

D. Equipment insulation compounds: Provide adhesives, cements, sealers, mastics and protective finishes as recommended by insulation manufacturer for applications indicated.

E. Equipment insulation accessories: Provide staples, bands, wire, wire netting, tape, corner angles, anchors and stud pins as recommended by insulation manufacturer for applications indicated.

## PART 3 EXECUTION

### 3.1 INSPECTION

A. Examine areas and conditions under which mechanical insulation is to be installed. Do not proceed with Work of this Section until unsatisfactory conditions have been corrected in manner acceptable to Installer.

### 3.2 PIPING SYSTEM INSULATION

A. General: Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.

B. Install insulation on pipe systems after acceptance of pressure testing.

C. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with single cut piece to complete run. Do not use cut pieces or scraps abutting each other.

D. Clean and dry pipe surfaces prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.

E. Insulate valves, fittings and similar items in each piping system with equivalent thickness and composition of insulation as applied to adjoining pipe run. Factory molded, precut or job fabricated units may be used in accordance with manufacturer's published recommendations. Cover with premolded PVC fitting covers for fiberglass insulation.

F. Maintain integrity of vapor-barrier jackets on cold pipe insulation, including at valves and fittings. Protect vapor barrier to prevent puncture or other damage. Do not use staples. Follow recommendations of insulation manufacturer for applications indicated.

G. Extend piping insulation without interruption through walls, floors and similar piping penetrations, except where otherwise indicated.

H. Insulation shall be butted against insulated pipe supports, as specified in Section 23 05 29. For hot pipes, apply 3 inches wide vapor barrier tape or band over the butt joints. For cold piping apply wet coat of vapor barrier lap cement on butt joints and seal joints with 3 inches wide vapor barrier tape or band.

I. If grooved piping system is employed where piping insulation is specified, insulate all mechanical joints as specified for pipe fittings. Maintain thermal expansion capability of grooved piping system intact.

J. Elastormeric Foam insulation:

1. Install per manufacturer's published recommendations.
2. Cut custom pieces from insulation sheets for use at elbows, valves, Victaulic fittings, strainers, and other irregular surfaces. Follow manufacturer's published recommendations. Obtain manufacturer's cutting templates.
3. Seal all joints completely with proper adhesive such as Armacell 520 or Rubatex Contact Adhesive. Apply adhesive to both sides of all joints.

K. For insulated piping installed in locations exposed to weather, provide sealants, etc.for aluminum jacketing to result in watertight finished installation.

L. For insulated valves installed out-of-doors, provide removable weatherproof stainless steel box at each valve to completely enclose and protect the insulation and (if applicable) the piping freeze protection heater strips.

M. Provide fiberglass piping insulation for all applications unless indicated otherwise:

1. Refrigerant: Provide closed cell elastomeric foam insulation. If required insulation thickness is greater than 1.5 inch, provide fiberglass insulation.
2. Indoor Cooling Coil Condensate Drain Lines: Provide elastomeric foam insulation.

N. Minimum pipe insulation thickness:

1. Insulation thicknesses (inch / mm) for system type and pipe diameters per following table based on specified K factor. Comply with California Title 24 as a minimum, unless a more stringent requirement is specified.

| Insulation Thickness Schedule | | | | | | |
|---|---|---|---|---|---|---|
| Piping System | Runouts up to 2" | 3/4" to 1" | 1-1/2" to 2" | 2-1/2" to 4" | 5" to 6" | 8" and greater |
| Hot Water to 200 degrees F | 1/2" | 1-1/2" | 1-1/2" | 1-1/2" | 1-1/2" | 1-1/2" |
| Refrigerant | 1" | 1" | 1-1/2" | 1-1/2" | 1-1/2" | 1-1/2" |

3.3 DUCTWORK SYSTEM INSULATION

A. General: Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.

B. Install insulation materials with smooth and even surfaces.

C. Clean and dry ductwork prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.

D. Maintain integrity of vapor-barrier on ductwork insulation, and protect it to prevent puncture and other damage.

E. Extend ductwork insulation without interruption through walls, floors and similar ductwork penetrations, except at fire dampers, fire/smoke dampers, or where otherwise indicated.

F. Insulate all ductwork except for the following, unless otherwise indicated:

1. Exhaust ductwork, unless within 25 feet of fan.
2. Factory insulated or lined items such as terminal units, air supply chambers, etc.
3. Conditioned air supply duct exposed in conditioned area served by that duct.
4. 10 feet downstream of humidifiers.
5. When code prohibits.

G. Application requirements:

1. Ductwork Installed within Buildings: Insulate with minimum 1-1/2 inches thick (installed thickness 1 inch), fiberglass duct wrap insulation with vapor barrier, unless otherwise specified.
2. Ductwork Installed out-of-doors (Including Ductwork within Architectural Screen or Enclosure):

a. Insulate with 2-inch thick elastomeric foam insulation.
b. Install per manufacturer’s published recommendations.
c. Cut custom pieces from insulation sheets.
d. Seal all joints completely with proper adhesive such as Armacell 520 or Rubatex Contact Adhesive. Apply adhesive to both sides of all joints.
e. Enclose within 0.016 inch aluminum jacket with Z-joint seams and butt straps. Provide sealants, etc. to result in watertight finished installation.

## 3.4 EQUIPMENT INSULATION

A. General: Install equipment thermal insulation products in accordance with manufacturer’s written instructions, and in compliance with recognized industry practices to ensure that insulation serves intended purpose.

B. Install insulation materials with smooth and even surfaces and on clean and dry surfaces. Redo poorly fitted joints. Do not use mastic or joint sealer as filler for gapping joints and excessive voids resulting from poor workmanship.

C. Apply insulation using staggered joint method for both single and double layer construction, where feasible. Apply each layer of insulation separately.

D. Coat insulated surfaces with layer of insulating cement, troweled in workmanlike manner, leaving smooth continuous surface. Fill in scored block, seams, chipped edges and depressions, and cover over wire netting and joints with cement of sufficient thickness to remove surface irregularities.

E. Cover insulated surfaces with all-service jacketing neatly fitted and firmly secured. Lap seams at least 2 inches. Apply over vapor barrier where applicable.

F. Provide removable insulation sections to cover parts of equipment which must be opened periodically for maintenance; include metal vessel covers, fasteners, flanges, frames and accessories.

**END OF SECTION 23 07 00**

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# SECTION 23 09 23 DIRECT DIGITAL CONTROL SYSTEM FOR HVAC

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Furnish all labor, materials, equipment, and service necessary for a complete and operating Temperature Control System (TCS) and Building Management System (BMS), utilizing Direct Digital Controls as shown on the drawings and as described herein. Drawings are diagrammatic only.

B. All labor, material, equipment and software not specifically referred to herein or on the plans, that is required to meet the functional intent of this specification, shall be provided without additional cost to the Owner.

C. The Owner shall be the named license holder of all software associated with any and all incremental work on the project(s).

### 1.2 DEFINITIONS

A. Abbreviations used in this Section include the following. Additional abbreviations are indicated on the Drawings.

1. AI Analog Input to BMS.
2. AO Analog Output from BMS.
3. AVD Automatic Volume Damper.
4. BMS Building Management System.
5. DDC Direct Digital Controls
6. DI Digital Input to BMS.
7. DO Digital Output from BMS.
8. EA Exhaust Air.
9. GUI Graphical User Interface
10. IBC Interoperable BACnet Controller
11. IDC Interoperable Digital Controller
12. LAN Local Area Network
13. NAC Network Area Controller
14. MA Mixed Air.
15. OA Outside Air.
16. OOT Object Oriented Technology
17. PICS Product Interoperability Compliance Statement
18. PMI Power Measurement Interface
19. POT Portable Operator's Terminal
20. RA Return Air.
21. SA Supply Air.
22. TCS Temperature Control System
23. WAN Wide Area Network
24. WBI Web Browser Interface

1.3 APPROVED CONTROL SYSTEM INTEGRATORS

A. Approved control system contractors shall be a Controlco Premier Automation Contractor and VYKON System Integrator. Acceptable alternates shall meet the Counties system requirements, specifications and interface integration capabilities and shall be approved by the County prior to acceptance.

B. The control system contractor/integrator shall employee a minimum of two Tridium Niagara AX Framework™ certified application engineers or technicians. The control system contractor/integrator shall have a minimum of five years of experience with the Tridium Niagara AX Framework™ and have completed no less than three projects of similar size and scope with the Tridium Niagara AX product. The controls contractor/integrator shall provide documentation in the submittal package verifying the company's experience.

C. The control system contractor/integrator shall have a full service facility within 50 miles of the project that is staffed with fully trained technicians. During the warranty period the controls contractor/integrator shall respond on site to emergency calls from the Owner within 4 hours.

1.4 SYSTEM DESCRIPTION

A. Control system shall be direct digital control (DDC) type, consisting of stand-alone distributed controllers. Failure of any single controller or panel shall not affect other controllers or panels.

B. Provide hardware, equipment, wiring, software, inputs, outputs, and controllers, in quantities and locations as required, to meet the functions, performance, and sequences specified and indicated.

C. The system shall be capable of being operated and maintained by competent Owner's staff members without additional materials and services. Provide all software, instruction manuals, operation manuals, maintenance manuals, programming manuals, diagrams, diagnostic or exercise software, configuration / binding tool, and any special accessories that would typically be required to ensure initial and continued system operational integrity in the proposed configuration.

D. Control wiring, both line voltage and low voltage, to serve controls components is Work of this Section.

E. Electrical Power:
1. Coordinate with Electrical Work to determine acceptable emergency electrical panels and circuits at which to obtain power.

F. Provide and locate control devices required to perform the specified Sequences of Operation.

G. Following control devices shall be furnished and connected under this Section and installed under other Sections of Division 23 Work in accordance with control manufacturer's instructions. Coordinate to achieve proper location of these devices.
1. Under Section 23 31 00, "HVAC Ducts and Casings": Duct temperature sensors, and automatic dampers, unless otherwise specified.

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Motorized Dampers not required, only dampers are for fire smoke.

E. Shop Drawings:
1. System architecture schematic.
2. Floor Plans: Floor plans indicating locations of DDC panels, and routing of transmission cable.
3. All drawings shall be prepared on a CAD system that produces drawing files that are either compatible with or that may be converted to AUTOCAD and be provided on a disk.
4. Sequences of Operation: Complete narrative text describing, for this Project, sequences of operation and system performance, including control schematic diagrams.
5. Points List: Complete with proposed address identification and description.

F. Quality Control Submittals
1. Test Log: Sample of checkout sheets to be used later, under testing, to check off that each point is performing properly.
2. Test Reports: Reports of field testing indicating proper performance of all systems and points.

G. Closeout Submittals:
1. Operation and Maintenance Manuals: All information shall be contained in three ring binders, logically divided into sections with a detailed table of contents for each binder and each section. All information shall be either letter size or folded 11-inches x 17-inches size.
   a. All O&M Manual data shall be modified from the submittal data to include changes made in the field during construction, demonstration testing and commissioning. The O&M Manuals shall, therefore, represent the "as-built" condition corrected for testing and commissioning.
   b. Manufacturer's/Installer's name, address, phone number, and e-mail address.
   c. Single-line diagram(s) of BMS network complete with controller locations and identification, clearly indicating network architecture.
   d. Written Sequences of Operation.
   e. Points List, with each point uniquely identified. For each point, include system identification (e.g. "VRF" or "central fan system"), a brief descriptive name (e.g. "supply air temperature"), the point type (AI, AO, DI, DO, calculated, etc.), and the field device reference, expected variable range (e.g. 50-85 deg.F).
   f. Control Diagrams.
   g. Floor Plans.
   h. System Operational Instructions. Include all setpoints, time schedules, alarms, reports, trend logging, and other functions.
   i. Programming Manual with flow charts and documentation of all programs, including source code.
   j. Maintenance and Repair Instructions.
   k. Product data.
   l. Parts List, with manufacturer's catalog numbers and ordering information.
   m. Lists of ordinary and special tools, operating materials, supplies, and test equipment recommended for operation and servicing.
   n. List of spare parts with current prices, which supplier recommends that Owner purchase.

H. The entire Temperature Control System (TCS) shall be comprised of a network of interoperable, stand-alone digital controllers communicating via BACnet™ communication protocols to a Network Area Controller (NAC). Temperature Control System products shall be by approved manufacturers. The approved manufacture is Tridium VYKON Niagara AX Framework™.

I. The Temperature Control Systems (TCS) consisting of thermostats, control valves, dampers and operators, indicating devices, interface equipment and other apparatus and accessories required to operate mechanical systems, and perform functions specified. The Building Management System (BMS) shall be comprised of Network Area Controller or Controllers (NAC) within each building. The NAC shall connect to the Owner's local or wide area network, depending on configuration. Access to the system, either locally in each building, or remotely from a central site or sites, shall be accomplished through standard Web browsers, via the Internet and/or local area network. Each NAC shall communicate to Interoperable BACnet™ Controllers (IBC) and other open protocol systems/devices provided under Division 23 or Division 26.

J. The Building Management System (BMS) and Temperature Control System (TCS) as provided in this Division shall be based on a hierarchical architecture incorporating the Tridium VYKON Niagara AX Framework™. All network area controllers shall be Tridium VYKON Niagara AX to match the existing (NAC) and the existing Solano County Tridium VYKON AX WEB Supervisor Server.

K. The Building Management System (BMS) shall monitor and control equipment as called for by the "Sequence of Operation" and points list.

L. The Building Management System (BMS) shall provide full graphic software capable of complete system operation for up to 34 simultaneous Thin-Client workstations.

M. The Building Management System (BMS) shall provide full graphic operator interface to include the following graphics as a minimum:
1. Home page to include a critical points, i.e. outside air temperature, outside air relative humidity, tempered air temperature, supply air temperature, return air temperature, kW, kWh, and other critical alarm points as determined by the facility maintenance personnel.
2. Graphic floor plans accurately depicting rooms, walls, hallways, and showing accurate locations of space sensors and major mechanical equipment.
3. Detail graphics for each mechanical system to include but not limited to; ~~outdoor condensers, heat pumps, indoor fan coils, refrigerant branch circuit controllers~~, exhaust fans and associated controls as a minimum. Mechanical equipment graphics shall be developed from the standard graphics package that is provided with each VYKON JACE network controller. All system graphics shall reside on the VYKON JACE NAC and the Tridium VYKON AX WEB Supervisor Server.
4. Access corresponding system drawings, technical literature, and sequences of operations directly from each system graphic.

N. The Building Management System (BMS) shall provide the following data links to electronically formatted information for operator access and use.
1. Project control as-built documentation; to include all TCS drawings and diagrams converted to Adobe Acrobat .pdf files.
2. TCS Bill of Material with part number for each system, i.e. VRF outdoor heat pump, VRF refrigerant branch circuit controller, VRF fan coils, etc.

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BLDG A&B - BMS Graphic Points
Items listed Eliminated

3. Technical literature specification data sheets for all components listed in the TCS Bill of Material.
4. Sequence of operation for all TCS provided systems.

O. The BMS shall provide automated alarming software capable of sending messages to email compatible cellular telephones and pagers via the Owner's e-mail service. The email alarm paging system shall be able to segregate users, time schedules, and equipment, and be capable of being programmed by the Owner.

P. It is preferable that any dedicated configuration tool required for controller configuration have the capability to be launched from within the applicable Network Management Software. If the configuration tool(s) cannot be launched from the Network Management Software, any software required for controller configuration shall be included as a leave-behind tool with enough license capability to support the installation. All network area controllers shall be configured with the Tridium VYKON Workplace AX software configuration tool.

Q. The contractor shall provide the appropriate quantity of legal copies of all software tools, configuration tools, management tools, and utilities used during system commissioning and installation. All tools shall be generally available in the market. No closed and/or unavailable tools will be permitted**.** Contractor shall convey all software tools and their legal licenses at project close out.

1.5 SUBMITTALS

A. General: Follow procedures specified in Division 1 Sections for submittals, project record documents, and operation and maintenance manuals. All information shall be contained in three ring binders, logically divided into sections with a detailed table of contents for each binder and each section. All information shall be either letter size or folded 11" x 17" size.

B. At the time of Bid, submit an outline of the process for system start-up, testing, commissioning, and demonstration. Describe the activities intended to be performed. Describe interface between BMS manufacturer/installer and the other contractors, and the Owner Representatives.

C. Compliance with Specifications:
1. At the time of Bid, submit a copy of this Section, and in the right-hand margin clearly indicate compliance with the Specification on a point-by-point basis.
2. Where the proposed system complies fully, indicate by placing the word "comply" in the right-hand margin.
3. Where the proposed system does not comply, or accomplishes the stated function in manner different from that described, provide a full description of the deviation. Use a separate sheet of paper if necessary.

D. Product data:
1. Submit manufacturer's specifications, catalog cuts, and technical bulletins for each control device and equipment, including installation instructions and start-up instructions. Clearly identify, by use of symbol or tag number, the service of each item. All irrelevant information shall be marked out leaving only pertinent data.

H. Project Record Documents: Accurately record actual location of control components, including panels, thermostats, and sensors.
   1. Revise shop drawings to reflect actual installation and operating sequences.
   2. Include data specified in "Submittals" in final "Record Documents" form.

I. Warranty: Special warranty specified in this Section.

J. Submittal shall also include a trunk cable schematic diagram depicting operator workstations, control panel locations and a description of the communication type, media, and protocol.

K. The network infrastructure shall conform to the published guidelines for wire type, length, number of nodes per channel, termination, and other relevant wiring and infrastructure criteria as published. The number of nodes per channel shall be no more than 80% of the defined segment (logical or physical) limit in order to provide future system expansion with minimal infrastructure modifications.

L. Submittal shall also include a complete point list of all points to be connected to the TCS and BMS. Division 23 and 26 contractors shall provide necessary point lists, protocol documentation, and factory support information for systems provided in their respective divisions but integrated into the BMS.

M. Submittal shall also include a copy of each of the graphics developed for the Graphic User Interface including a flowchart (site map) indicating how the graphics are to be linked to one another for system navigation. The graphics are intended to be 80% - 90% complete at this stage with the only remaining changes to be based on review comments from the A/E design team and/or Owner.

N. Upon completion of the work, provide a complete set of 'as-built' drawings and application software on compact disk. Drawings shall be provided as AutoCAD™ or Visio™ compatible files. Eight copies of the 'as-built' drawings shall be provided in addition to the documents on compact disk. Division 23 and 26 contractors shall provide as-builts for their portions of work. The Division 23 contractor shall be responsible for as-builts pertaining to overall TCS and BMS architecture and network diagrams. All as-built drawings shall also be installed into the BMS server in a dedicated directory.

1.6 DIVISION OF WORK

A. The Division 23 contractor shall be responsible for all controllers (IDC and IBC), control devices, control panels, controller programming, controller programming software, controller input/output and power wiring and controller network wiring.

B. The Division 23 contractor shall be responsible for the Network Area Controller(s) (NAC), software and programming of the NAC, graphical user interface software (GUI), development of all graphical screens, Web browser pages, setup of schedules, logs and alarms, network management, connection of the NAC to the local or wide area network and integration with the existing VYKON WEB Supervisor Server.

1.7 RELATED WORK SPECIFIED ELSEWHERE

A. Division 26, Electrical:
1. Providing motor starters and disconnect switches (unless otherwise noted).
2. Power wiring and conduit (unless otherwise noted).
3. Provision, installation and wiring of smoke detectors (unless otherwise noted).
4. Other equipment and wiring as specified in Division 26.

1.8 SOFTWARE LICENSE AGREEMENT

A. The Owner shall agree to the manufacturer's standard software and firmware licensing agreement as a condition of this contract. Such license shall grant use of all programs and application software to Owner as defined by the manufacturer's license agreement, but shall protect manufacturer's rights to disclosure of trade secrets contained within such software.

B. The Owner shall be the named license holder of all software associated with any and all incremental work on the project(s). In addition, the Owner shall receive Ownership of all job specific configuration documentation, data files, and application-level software developed for the project. This shall include all custom, job specific software code and documentation for all configuration and programming that is generated for a given project and/or configured for use with the NAC, BMS, and any related LAN / WAN / Intranet and Internet connected routers and devices. The Tridium VYKON JACE shall have the same software version as other Tridium VYKON JACE controllers on the Solano County network. Any and all required IDs and passwords for access to any component or software program shall be provided to the Owner. All Niagara$^{AX}$ software licenses shall have the “accept.station.in=*”; “accept.station.out=*” and “accept.wb.in=*” and “accept.wb.out=*” section of the software licenses. The intent is to insure that the installed Niagara$^{AX}$ products may be completely open for integrations. The Owner shall be free to direct the modification of any software license.

C. The Owner, or his appointed agent, shall receive Ownership of all job specific software configuration documentation, data files, and application-level software developed for the project. This shall include all custom, job specific software code and documentation for all configuration and programming that is generated for a given project and /or configured for use within Niagara AX Framework (Niagara) based controllers and/or servers and any related LAN / WAN / Intranet and all connected routers and devices.

1.9 QUALITY ASSURANCE

A. Qualifications:
1. Installation shall be by control vendor’s branch office unless indicated otherwise.
2. The manufacturer and installer shall have a minimum of 5 years of demonstrated technical expertise and experience in the manufacture, installation and maintenance of BMS systems similar in size and complexity to this project. A list of successful past projects of similar type, size and complexity shall be submitted. In addition, a reference list of names, addresses and telephone numbers of the design Engineer and the Owner’s representative for each installation shall be provided. The references may be contacted and questioned about the timely delivery, installation, operation and service received for each installation.
3. The manufacturer and installer shall maintain a service organization consisting of at least 10-competent servicemen, within 50-miles of the project site, for a period of not less than 5-years. Facility shall include spare parts inventory and all necessary test and diagnostic equipment.

4. Control components shall be products of the same manufacturer only, unless indicated otherwise.

B. Regulatory Requirements:
1. Comply with all codes and local regulations, including the Energy Code. Meet all requirements of local authorities and State Fire Marshal.
2. Electrical standards: Provide electrical products which have been tested, listed and labeled by Underwriters' Laboratories (UL) and comply with NEMA standards. Electrical work shall be installed per NEC.
3. All electronic equipment shall conform to the requirements of FCC Regulation, Part 15, Section 15, and Governing Radio Frequency Electromagnetic Interference and be so labeled.
4. Prior to delivery of software, the Owner and the party providing the software will enter into a software license agreement with provisions for the following:
   a. Limiting use of software to equipment provided under these specifications.
   b. Limiting copying.
   c. Preserving confidentiality.

C. All system components shall be fault-tolerant.
1. Components shall maintain satisfactory operation without damage at 110-percent and 85-percent of rated voltage and at plus 3-Hertz variation in line frequency.
2. Provide static, transient and short-circuit protection on all inputs and outputs.
3. Protect communication lines against incorrect wiring, static transients and induced magnetic interference.
4. Failure of network-connected devices shall not disrupt or halt network communication.

D. Future compatibility shall be supported for no less than 10 years. Compatibility shall be defined as the ability to upgrade the existing field panels to the latest technology and the ability to install the newest field panel on the existing network without bridges, routers, protocol converters or gateways.

E. Pre-Installation Meeting:
1. Convene a conference one week prior to commencing work of this Section, under provisions of Division 1.
2. Require attendance of parties directly affecting the work of this Section.
3. Review scope of work of this Contract.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Provide factory-shipping cartons for each piece of equipment and control device. Maintain cartons through shipping, storage, and handling as required to prevent equipment damage. Store equipment and materials inside and protected from weather.

1.11 PROJECT CONDITIONS

A. All equipment and devices shall be capable of operation in the following conditions without detriment:
1. 32 to 115-degrees F
2. 0 to 95-percent RH (non-condensing).

B. Cooperation with Other Trades: Coordinate the Work of this section with that of other sections to ensure that the Work will be carried out in an orderly fashion. It shall be this

Contractor's responsibility to check the Contract Documents for possible conflicts between his Work and that of other crafts in equipment location, pipe, duct and conduit runs, electrical outlets and fixtures, air diffusers, and structural and architectural features.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard or custom form in which manufacturer and Installer, through the Contractor, agree to repair, reprogram, or replace system components, system software, and parts that fail in defective materials or workmanship within specified warranty period.
   1. Provide labor at no charge during the warranty period.
   2. Update all corrective software modifications made during warranty periods on all user documentation and on user and manufacturer archived software disks.
   3. All work shall have a single warranty date, even when the Owner has received beneficial use due to an early system startup. If the work specified is split into multiple contracts or a multi-phase contract, then each contract or phase shall have a separate warranty start date and period as agreed to by Owner and Contractor.
   4. At the end of the final startup, testing, and commissioning phase, if equipment and systems are operating satisfactorily to Owner's Representative, Owner's Representative shall sign certificates certifying that the control system's operation has been tested and accepted in accordance with the terms of this Section.
   5. Software and firmware updates which resolve known software deficiencies as identified by the Control System Contractor shall be provided to Owner at no charge during the warranty period. Any upgrades or functional enhancements associated with the above mentioned items also can be provided during the warranty period under the Maintenance Service Agreement. Obtain written authorization from Owner prior to the installation of any of the abovementioned items.
   6. Warranty Period: Two years from date of Project completion.

1.13 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Project completion, provide one year's full maintenance service by skilled employees of Control System Contractor. Include monthly maintenance, operational assistance, trouble-shooting assistance, parts, and labor. Provide components, software, and parts same as those used in the manufacture and installation of original system.
   1. Include upgrades and functional enhancements to software and firmware at additional cost to Owner. Obtain written authorization from Owner prior to installation.
   2. Include 24-hour-per-day, 7-day-per-week emergency callback service.
   3. Response Time: Four hours or less.

B. Continuing Maintenance Proposal: Provide a continuing maintenance proposal from Control System Contractor to Owner, in the form of a standard maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options. Provide prices for the following time periods:
   1. One Year.
   2. Two Years.
   3. Three Years.
   4. Four Years.
   5. Five Years.

**PART 2 PRODUCTS**

2.1 MANUFACTURERS

A. Basis-of-Design: Tridium VYKON-AX™ Network Controllers to integrate with the existing Tridium AX WEB Supervisor Server. All Tridium VYKON-AX™ Network Area Controllers shall be licensed for BACnet™ drivers as required for the application of the (NAC). Acceptable alternates shall meet the Counties system requirements, specifications and interface integration capabilities and shall be approved by the County prior to acceptance.

2.2 ELECTRIC WIRING AND DEVICES

A. Under this Section:
1. Electric wiring and wiring connections required for installation of temperature control system.
   a. Provide under this section unless specifically shown on drawings or specified to be under Division 26, ELECTRICAL.
   b. Wiring shall comply with requirements of State and National Electrical Codes.
2. Low Voltage Wiring: Class II control cable.
   a. Concealed and accessible as permitted by State Codes.
   b. Otherwise, installed in conduit in accordance with Division 26, ELECTRICAL.

B. Under Division 26, ELECTRICAL
1. Power Wiring: Defined as conductors carrying full load current of apparatus.

2.3 OPEN, INTEROPERABLE, INTEGRATED ARCHITECTURES

A. The intent of this specification is to provide a peer-to-peer networked, stand-alone, distributed control system with the capability to integrate ANSI/ASHRAE Standard 135 BACnet™, LonWorks™ technology, MODBUS ™, OPC, and other open and proprietary communication protocols into one open, interoperable system.

B. The supplied computer software shall employ object-oriented technology (OOT) for representation of all data and control devices within the system. In addition, adherence to industry standards including ANSI / ASHRAE™ Standard 135, BACnet and LonMark to assure interoperability between all system components is required. For each LonWorks device that does not have LonMark certification, the device supplier must provide an XIF file and a resource file for the device.

C. For each BACnet device, the device supplier must provide a PICS document showing the installed device's compliance level. Minimum compliance is Level 3; with the ability to support data read and write functionality. Physical connection of BACnet devices shall be via Ethernet (BACnet Ethernet/IP,) and/or RS-485 (BACnet MSTP) as specified.

D. All components and controllers supplied under this Division shall be true "peer-to-peer" communicating devices. Components or controllers requiring "polling" by a host to pass data shall not be acceptable.

E. The supplied system must incorporate the ability to access all data using standard Web browsers without requiring proprietary operator interface and configuration programs. Systems requiring proprietary database and user interface programs shall not be acceptable.

F. A hierarchical topology is required to assure reasonable system response times and to manage the flow and sharing of data without unduly burdening the customer's internal Intranet network. Systems employing a "flat" single tiered architecture shall not be acceptable.
   1. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 5 seconds for local network connected user interfaces.
   2. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 60 seconds for remote or dial-up connected user interfaces.

2.4 NETWORKS

A. The Local Area Network (LAN) shall be a 100 Megabit/sec Ethernet network supporting BACnet, Java, XML, HTTP, and SOAP for maximum flexibility for integration of building data with enterprise information systems and providing support for multiple Network Area Controllers (NACs), user workstations and, if specified, a local server.

B. Local area network minimum physical and media access requirements:
   1. Ethernet; IEEE standard 802.3
   2. Cable; 100 Base-T, UTP-8 wire, category 6
   3. Minimum throughput; 100 Mbps.

2.5 NETWORK ACCESS

A. Remote Access.
   1. Remote access to the Owners Local Area Network will be provided with the Owner's approval. Network Security will be an issue and network access restrictions will apply.

2.6 NETWORK AREA CONTROLLER (NAC)

A. The Division 23 contractor shall supply one all Network Area Controllers (NAC) as part of this contract. The number of Network Area Controllers required is dependent on the type and quantity of field control devices.

B. The Network Area Controller (NAC) shall provide the interface between the LAN or WAN and the field control devices, and provide global supervisory control functions over the control devices connected to the NAC. It shall be capable of executing application control programs to provide:
   1. Calendar functions
   2. Scheduling
   3. Trending
   4. Alarm monitoring and routing
   5. Time synchronization
   6. Integration of LonWorks controller data and BACnet controller data
   7. Network Management functions for all LonWorks and/or BACnet based devices

C. The Network Area Controller shall provide the following hardware features as a minimum:
   1. One Ethernet Port – 10/100 Mbps
   2. One RS-232 port
   3. One LonWorks Interface Port – 78KB FTT-10A if Lon controllers are used and/or One RS-485 port if BACnet controllers are used.
   4. Battery Backup

5. Flash memory for long term data backup (If battery backup or flash memory is not supplied, the controller must contain a hard disk with at least 1 gigabyte storage capacity)
6. The NAC must be capable of operation over a temperature range of 32 to 122°F
7. The NAC must be capable of withstanding storage temperatures of between 0 and 158°F
8. The NAC must be capable of operation over a humidity range of 5 to 95% RH, non-condensing

D. The NAC shall provide multiple user access to the system and support for ODBC or SQL. A database resident on the NAC shall be an ODBC-compliant database or must provide an ODBC data access mechanism to read and write data stored within it.

E. The NAC shall support standard Web browser access via the Intranet/Internet. It shall support a minimum of 32 simultaneous users.

F. Event Alarm Notification and actions
1. The NAC shall provide alarm recognition, storage; routing, management, and analysis to supplement distributed capabilities of equipment or application specific controllers.
2. The NAC shall be able to route any alarm condition to any defined user location whether connected to a local network, or remote via dial-up telephone connection or wide-area network.
3. Alarm generation shall be selectable for annunciation type and acknowledgement requirements including, but not limited to:
   a. In alarm
   b. Return to normal
   c. Fault condition
4. Provide for the creation of a minimum of eight alarm classes for the purpose of routing types and/or classes of alarms, i.e.: security, HVAC, Fire, etc.
5. Provide timed (schedule) routing of alarms by class, object, group, or node.
6. Provide alarm generation from binary object "runtime" and/or event counts for equipment maintenance. The user shall be able to reset runtime or event count values with appropriate password control.

G. Controller and network failures shall be treated as alarms and annunciated.

H. Alarms shall be annunciated in any of the following manners as defined by the user:
1. Screen message text
2. Email of the complete alarm message to multiple recipients via the Owner's e-mail service. Provide the ability to route and email alarms based on:
   a. Day of week
   b. Time of day
   c. Recipient
3. Pagers via paging services that initiate a page on receipt of email message via the Owner's e-mail service
4. Graphic with flashing alarm object(s)
5. Printed message, routed directly to a dedicated alarm printer

I. The following shall be recorded by the NAC for each alarm (at a minimum):
1. Time and date
2. Location (building, floor, zone, office number, etc.)
3. Equipment (air handler #, access way, etc.)
4. Acknowledge time, date, and user who issued acknowledgement.

5. Number of occurrences since last acknowledgement.

J. Alarm actions may be initiated by user defined programmable objects created for that purpose.

K. Defined users shall be given proper access to acknowledge any alarm, or specific types or classes of alarms defined by the user.

L. A log of all alarms shall be maintained by the NAC and/or a server (if configured in the system) and shall be available for review by the user.

M. Provide a "query" feature to allow review of specific alarms by user defined parameters.

N. A separate log for system alerts (controller failures, network failures, etc.) shall be provided and available for review by the user.

O. An Error Log to record invalid property changes or commands shall be provided and available for review by the user.

2.7 DATA COLLECTION AND STORAGE

A. The NAC shall have the ability to collect data for any property of any object and store this data for future use.

B. The data collection shall be performed by log objects, resident in the NAC that shall have, at a minimum, the following configurable properties:
1. Designating the log as interval or deviation.
2. For interval logs, the object shall be configured for time of day, day of week and the sample collection interval.
3. For deviation logs, the object shall be configured for the deviation of a variable to a fixed value. This value, when reached, will initiate logging of the object.
4. For all logs, provide the ability to set the maximum number of data stores for the log and to set whether the log will stop collecting when full, or rollover the data on a first-in, first-out basis.
5. Each log shall have the ability to have its data cleared on a time-based event or by a user-defined event or action.

C. All log data shall be stored in a relational database in the NAC and the data shall be accessed from a server (if the system is so configured) or a standard Web browser.

D. All log data, when accessed from a server, shall be capable of being manipulated using standard SQL statements.

E. All log data shall be available to the user in the following data formats:
1. HTML
2. XML
3. Plain Text
4. Comma or tab separated values
5. PDF

F. Systems that do not provide log data in HTML and XML formats at a minimum shall not be acceptable.

G. The NAC shall have the ability to archive its log data either locally (to itself), or remotely to a server or other NAC on the network. Provide the ability to configure the following archiving properties, at a minimum:
1. Archive on time of day
2. Archive on user-defined number of data stores in the log (buffer size)
3. Archive when log has reached its user-defined capacity of data stores
4. Provide ability to clear logs once archived

2.8 AUDIT LOG

A. Provide and maintain an Audit Log that tracks all activities performed on the NAC. Provide the ability to specify a buffer size for the log and the ability to archive log based on time or when the log has reached its user-defined buffer size. Provide the ability to archive the log locally (to the NAC), to another NAC on the network, or to a server. For each log entry, provide the following data:
1. Time and date
2. User ID
3. Change or activity: i.e., Change setpoint, add or delete objects, commands, etc.

2.9 DATABASE BACKUP AND STORAGE

A. The NAC shall have the ability to automatically backup its database. The database shall be backed up based on a user-defined time interval.

B. Copies of the current database and, at the most recently saved database shall be stored in the NAC. The age of the most recently saved database is dependent on the user-defined database save interval.

C. The NAC database shall be stored, at a minimum, in XML format to allow for user viewing and editing, if desired. Other formats are acceptable as well, as long as XML format is supported.

2.10 WEB BROWSER CLIENTS

A. The system shall be capable of supporting an unlimited number of clients using a standard Web browser such as Internet Explorer™. Systems requiring additional software (to enable a standard Web browser) to be resident on the client machine, or manufacture-specific browsers shall not be acceptable.

B. The Web browser software shall run on any operating system and system configuration that is supported by the Web browser. Systems that require specific machine requirements in terms of processor speed, memory, etc., in order to allow the Web browser to function with the BMS, shall not be acceptable.

C. The Web browser shall provide the same view of the system, in terms of graphics, schedules, calendars, logs, etc., and provide the same interface methodology as is provided by the Graphical User Interface (if used). Systems that require different graphic views, different means of graphic generation, or that require different means of interacting with objects such as schedules, or logs, shall not be permitted.

D. The Web browser client shall support at a minimum, the following functions:

1. User log-on identification and password shall be required. If an unauthorized user attempts access, a blank web page shall be displayed. Security using Java authentication and encryption techniques to prevent unauthorized access shall be implemented.
2. Graphical screens developed for the GUI shall be the same screens used for the Web browser client. Any animated graphical objects supported by the GUI shall be supported by the Web browser interface.
3. HTML programming shall not be required to display system graphics or data on a Web page. HTML editing of the Web page shall be allowed if the user desires a specific look or format.
4. Storage of the graphical screens shall be in the Network Area Controller (NAC), without requiring any graphics to be stored on the client machine. Systems that require graphics storage on each client are not acceptable.
5. Real-time values displayed on a Web page shall update automatically without requiring a manual "refresh" of the Web page.
6. Users shall have administrator-defined access privileges. Depending on the access privileges assigned, the user shall be able to perform the following:
   a. Modify common application objects, such as schedules, calendars, and set points in a graphical manner.
      1) Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.
      2) Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.
   b. Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No text entry shall be required.
   c. View logs and charts
   d. View and acknowledge alarms
   e. Setup and execute SQL queries on log and archive information
7. The system shall provide the capability to specify a user's (as determined by the log-on user identification) home page. Provide the ability to set a specific home page for each user. From the home page, links to other views, or pages in the system shall be possible, if allowed by the system administrator.
8. Graphic screens on the Web Browser client shall support hypertext links to other locations on the Internet or on Intranet sites, by specifying the Uniform Resource Locator (URL) for the desired link.

2.11 SERVER FUNCTIONS AND HARDWARE

A. A central Tridium VYKON AX WEB Supervisor Server is existing and located in the IT Department server rack. The Division 23 contractor shall integrate all new Network Area Controllers with the existing Tridium VYKON AX WEB Supervisor Server.

B. Local connections shall be via an Ethernet LAN. Remote connections can be via ISDN, ADSL, T1 or dial-up connection.

C. It shall be possible to provide access to all Network Area Controllers via a single connection to the server. In this configuration, each Network Area Controller can be accessed from a remote Graphical User Interface (GUI) or from a standard Web browser (WBI) by connecting to the server.

D. The server shall provide the following functions, at a minimum:

1. Global Data Access: The server shall provide complete access to distributed data defined anywhere in the system.
2. Distributed Control: The server shall provide the ability to execute global control strategies based on control and data objects in any NAC in the network, local or remote.
3. The server shall include a master clock service for its subsystems and provide time synchronization for all Network Area Controllers (NAC).
4. The server shall accept time synchronization messages from trusted precision Atomic Clock Internet sites and update its master clock based on this data.
5. The server shall provide scheduling for all Network Area Controllers and their underlying field control devices.
6. The server shall be capable of providing demand limiting that operates across all Network Area Controllers. The server must be capable of multiple demand programs for sites with multiple meters and or multiple sources of energy. Each demand program shall be capable of supporting separate demand shed lists for effective demand control.
7. The server shall implement the BACnet Command Prioritization scheme (16 levels) for safe and effective contention resolution of all commands issued to Network Area Controllers. Systems not employing this prioritization shall not be accepted.
8. Each Network Area Controller supported by the server shall have the ability to archive its log data, alarm data and database to the server, automatically. Archiving options shall be user-defined including archive time and archive frequency.
9. The server shall provide central alarm management for all Network Area Controllers supported by the server. Alarm management shall include:
    1) Routing of alarms to display, printer, email and pagers
    2) View and acknowledge alarms
    3) Query alarm logs based on user-defined parameters
10. The server shall provide central management of log data for all Network Area Controllers supported by the server. Log data shall include process logs, runtime and event counter logs, audit logs and error logs. Log data management shall include:
    1) Viewing and printing log data
    2) Exporting log data to other software applications
    3) Query log data based on user-defined parameters

E. A Network Server Hardware Is Not Required:

2.12 SYSTEM CONFIGURATION TOOL

A. The Workstation Graphical User Interface software (GUI) shall provide the ability to perform system programming and graphic display engineering as part of a complete software package. Access to the programming functions and features of the GUI shall be through password access as assigned by the system administrator.

B. A library of control, application, and graphic objects shall be provided to enable the creation of all applications and user interface screens. Applications are to be created by selecting the desired control objects from the library, dragging or pasting them on the screen, and linking them together using a built in graphical connection tool. Completed applications may be stored in the library for future use. Graphical User Interface screens shall be created in the same fashion. Data for the user displays is obtained by graphically linking the user display objects to the application objects to provide “real-time” data updates. Any real-time data value or object property may be connected to display its current value on a user display. Systems requiring separate software tools or processes to create applications and user interface displays shall not be acceptable.

C. Programming Methods
1. Provide the capability to copy objects from the supplied libraries, or from a user-defined library to the user's application. Objects shall be linked by a graphical linking scheme by dragging a link from one object to another. Object links will support one-to-one, many-to-one, or one-to-many relationships. Linked objects shall maintain their connections to other objects regardless of where they are positioned on the page and shall show link identification for links to objects on other pages for easy identification. Links will vary in color depending on the type of link; i.e., internal, external, hardware, etc.
2. Configuration of each object will be done through the object's property sheet using fill-in the blank fields, list boxes, and selection buttons. Use of custom programming, scripting language, or a manufacturer-specific procedural language for configuration will not be accepted.
3. The software shall provide the ability to view the logic in a monitor mode. When on-line, the monitor mode shall provide the ability to view the logic in real time for easy diagnosis of the logic execution. When off-line (debug), the monitor mode shall allow the user to set values to inputs and monitor the logic for diagnosing execution before it is applied to the system.
4. All programming shall be done in real-time. Systems requiring the uploading, editing, and downloading of database objects shall not be allowed.
5. The system shall support object duplication within a customer's database. An application, once configured, can be copied and pasted for easy re-use and duplication. All links, other than to the hardware, shall be maintained during duplication.

2.13 LIBRARY

A. A standard library of objects shall be included for development and setup of application logic, user interface displays, system services, and communication networks.

B. The objects in this library shall be capable of being copied and pasted into the user's database and shall be organized according to their function. In addition, the user shall have the capability to group objects created in their application and store the new instances of these objects in a user-defined library.

C. In addition to the standard libraries specified here, the supplier of the system shall maintain an on-line accessible (over the Internet) library, available to all registered users to provide new or updated objects and applications as they are developed.

D. All control objects shall conform to the control objects specified in the BACnet specification.

E. The library shall include applications or objects for the following functions, at a minimum:
1. Scheduling Object. The schedule must conform to the schedule object as defined in the BACnet specification, providing 7-day plus holiday & temporary scheduling features and a minimum of 10 on/off events per day. Data entry to be by graphical sliders to speed creation and selection of on-off events.
2. Calendar Object. . The calendar must conform to the calendar object as defined in the BACnet specification, providing 12-month calendar features to allow for holiday or special event data entry. Data entry to be by graphical "point-and-click" selection. This object must be "linkable" to any or all scheduling objects for effective event control.
3. Duty Cycling Object. Provide a universal duty cycle object to allow repetitive on/off time control of equipment as an energy conserving measure. Any number of these objects may be created to control equipment at varying intervals

4. Temperature Override Object. Provide a temperature override object that is capable of overriding equipment turned off by other energy saving programs (scheduling, duty cycling etc.) to maintain occupant comfort or for equipment freeze protection.
5. Start-Stop Time Optimization Object. Provide a start-stop time optimization object to provide the capability of starting equipment just early enough to bring space conditions to desired conditions by the scheduled occupancy time. Also, allow equipment to be stopped before the scheduled un-occupancy time just far enough ahead to take advantage of the building's "flywheel" effect for energy savings. Provide automatic tuning of all start / stop time object properties based on the previous day's performance.
6. Demand Limiting Object. Provide a comprehensive demand-limiting object that is capable of controlling demand for any selected energy utility (electric, oil, and gas). The object shall provide the capability of monitoring a demand value and predicting (by use of a sliding window prediction algorithm) the demand at the end of the user defined interval period (1-60 minutes). This object shall also accommodate a utility meter time sync pulse for fixed interval demand control. Upon a prediction that will exceed the user defined demand limit (supply a minimum of 6 per day), the demand limiting object shall issue shed commands to either turn off user specified loads or modify equipment set points to effect the desired energy reduction. If the list of sheddable equipment is not enough to reduce the demand to below the set point, a message shall be displayed on the users screen (as an alarm) instructing the user to take manual actions to maintain the desired demand. The shed lists are specified by the user and shall be selectable to be shed in either a fixed or rotating order to control which equipment is shed the most often. Upon suitable reductions in demand, the demand-limiting object shall restore the equipment that was shed in the reverse order in which it was shed. Each sheddable object shall have a minimum and maximum shed time property to effect both equipment protection and occupant comfort.

F. The library shall include control objects for the following functions. All control objects shall conform to the objects as specified in the BACnet specification.
1. Analog Input Object - Minimum requirement is to comply with the BACnet standard for data sharing. Allow high, low and failure limits to be assigned for alarming. Also, provide a time delay filter property to prevent nuisance alarms caused by temporary excursions above or below the user defined alarm limits.
2. Analog Output Object - Minimum requirement is to comply with the BACnet standard for data sharing.
3. Binary Input Object - Minimum requirement is to comply with the BACnet standard for data sharing. The user must be able to specify either input condition for alarming. This object must also include the capability to record equipment run-time by counting the amount of time the hardware input is in an "on" condition. The user must be able to specify either input condition as the "on" condition.
4. Binary Output Object - Minimum requirement is to comply with the BACnet standard for data sharing. Properties to enable minimum on and off times for equipment protection as well as interstart delay must be provided. The BACnet Command Prioritization priority scheme shall be incorporated to allow multiple control applications to execute commands on this object with the highest priority command being invoked. Provide sixteen levels of priority as a minimum. Systems not employing the BACnet method of contention resolution shall not be acceptable.
5. PID Control Loop Object - Minimum requirement is to comply with the BACnet standard for data sharing. Each individual property must be adjustable as well as to be disabled to allow proportional control only, or proportional with integral control, as well as proportional, integral and derivative control.

6. Comparison Object - Allow a minimum of two analog objects to be compared to select either the highest, lowest, or equality between the two linked inputs. Also, allow limits to be applied to the output value for alarm generation.
7. Math Object - Allow a minimum of four analog objects to be tested for the minimum or maximum, or the sum, difference, or average of linked objects. Also, allow limits to be applied to the output value for alarm generation.
8. Custom Programming Objects - Provide a blank object template for the creation of new custom objects to meet specific user application requirements. This object must provide a simple BASIC-like programming language that is used to define object behavior. Provide a library of functions including math and logic functions, string manipulation, and e-mail as a minimum. Also, provide a comprehensive on-line debug tool to allow complete testing of the new object. Allow new objects to be stored in the library for re-use.
9. Interlock Object - Provide an interlock object that provides a means of coordination of objects within a piece of equipment such as an Air Handler or other similar types of equipment. An example is to link the return fan to the supply fan such that when the supply fan is started, the return fan object is also started automatically without the user having to issue separate commands or to link each object to a schedule object. In addition, the control loops, damper objects, and alarm monitoring (such as return air, supply air, and mixed air temperature objects) will be inhibited from alarming during a user-defined period after startup to allow for stabilization. When the air handler is stopped, the interlocked return fan is also stopped, the outside air damper is closed, and other related objects within the air handler unit are inhibited from alarming thereby eliminating nuisance alarms during the off period.
10. Temperature Override Object - Provide an object whose purpose is to provide the capability of overriding a binary output to an "On" state in the event a user specified high or low limit value is exceeded. This object is to be linked to the desired binary output object as well as to an analog object for temperature monitoring, to cause the override to be enabled. This object will execute a Start command at the Temperature Override level of start/stop command priority unless changed by the user.
11. Composite Object - Provide a container object that allows a collection of objects representing an application to be encapsulated to protect the application from tampering, or to more easily represent large applications. This object must have the ability to allow the user to select the appropriate parameters of the "contained" application that are represented on the graphical shell of this container.

G. The object library shall include objects to support the integration of devices connected to the Network Area Controller (NAC). At a minimum, provide the following as part of the standard library included with the programming software:
1. LonMark/LonWorks devices. These devices shall include, but not be limited to, devices for control of HVAC, lighting, access, and metering. Provide LonMark manufacturer-specific objects to facilitate simple integration of these devices. All network variables defined in the LonMark profile shall be supported. Information (type and function) regarding network variables not defined in the LonMark profile shall be provided by the device manufacturer.
2. For devices not conforming to the LonMark standard, provide a dynamic object that can be assigned to the device based on network variable information provided by the device manufacturer. Device manufacturer shall provide an XIF file, resource file and documentation for the device to facilitate device integration.

3. For BACnet devices, provide the following objects at a minimum:
   a. Analog In
   b. Analog Out
   c. Analog Value
   d. Binary
   e. Binary In
   f. Binary Out
   g. Binary Value
   h. Multi-State In
   i. Multi-State Out
   j. Multi-State Value
   k. Schedule Export
   l. Calendar Export
   m. Trend Export
   n. Device
4. For each BACnet object, provide the ability to assign the object a BACnet device and object instance number.
5. For BACnet devices, provide the following support at a minimum
   a. Segmentation
   b. Segmented Request
   c. Segmented Response
   d. Application Services
   e. Read Property
   f. Read Property Multiple
   g. Write Property
   h. Who-has
   i. I-have
   j. Who-is
   k. I-am
   l. Media Types
   m. Ethernet
   n. BACnet IP Annex J
   o. MSTP
   p. BACnet Broadcast Management Device (BBMD) function
   q. Routing

2.14 DDE DEVICE INTEGRATION

A. The Network Area Controller shall support the integration of device data via Dynamic Data Exchange (DDE), over the Ethernet Network. The Network Area Controller shall act as a DDE client to another software application that functions as a DDE server.

B. Provide the required objects in the library, included with the Graphical User Interface programming software, to support the integration of these devices into the BMS. Objects provided shall include at a minimum:
   1. DDE Generic AI Object
   2. DDE Generic AO Object
   3. DDE Generic BO Object
   4. DDE Generic BI Object

2.15 MODBUS SYSTEM INTEGRATION

A. The Network Area Controller shall be licensed as required to support the integration of device data from Modbus RTU, ASCII, or TCP control system devices. The connection to the Modbus system shall be via an RS-232, RS485, or Ethernet IP as required by the device.

B. Provide the required objects in the library, included with the Graphical User Interface programming software, to support the integration of the Modbus system data into the FPMS. Objects provided shall include at a minimum:
1. Read/Write Modbus AI Registers
2. Read/Write Modbus AO Registers
3. Read/Write Modbus BI Registers
4. Read/Write Modbus BO Registers

C. All scheduling, alarming, logging and global supervisory control functions, of the Modbus system devices, shall be performed by the Network Area Controller.

D. The BMS supplier shall provide a Modbus system communications driver. The equipment system vendor that provided the equipment utilizing Modbus shall provide documentation of the system's Modbus interface and shall provide factory support at no charge during system commissioning.

2.16 OPC SYSTEM INTEGRATION

A. The Network Area Controller shall act as an OPC client and shall support the integration of device data from OPC servers. The connection to the OPC server shall be Ethernet IP as required by the device. The OPC client shall support third party OPC servers compatible with the Data Access 1.0 and 2.0 specifications.

B. Provide the required objects in the library, included with the Graphical User Interface programming software, to support the integration of the OPC system data into the BAS. Objects provided shall include at a minimum:
1. Read/Write OPC AI Object
2. Read/Write OPC AO Object
3. Read/Write OPC BI Object
4. Read/Write OPC BO Object
5. Read/Write OPC Date/Time Input Object
6. Read/Write OPC Date/Time Output Object
7. Read/Write OPC String Input Object
8. Read/Write OPC String Output Object

C. All scheduling, alarming, logging and global supervisory control functions, of the OPC system devices, shall be performed by the Network Area Controller.

D. The BMS supplier shall provide an OPC client communications driver. The equipment system vendor that provided the equipment utilizing OPC shall provide documentation of the system's OPC server interface and shall provide factory support at no charge during system commissioning.

2.17 OTHER CONTROL SYSTEM HARDWARE

A. Duct Mount, and Outside Air Temperature Sensors:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
      a. ACI
      b. Honeywell
      c. or equal.
   2. Outside air sensors shall include an integral sun shield.
   3. Temperature sensors shall have an accuracy of plus or minus 1.0 deg. F. over operating range.
   4. Duct sensors shall have sensor approximately in center of the duct.
   5. Multipoint averaging element sensors shall be provided where specified, and shall have a minimum of one foot of sensor length for each square foot of duct area (provide multiple sensors if necessary).

B. Temperature Control Panels: Furnish temperature control panels of code gauge steel with locking doors for mounting all devices as shown. Control panels shall meet all requirements of Title 24, California Administrative Code. Provide engraved phenolic nameplates identifying all devices mounted on the face of control panels. A complete set of 'as-built' control drawings (relating to the controls within that panel) shall be furnished within each control panel.

2.18 SEQUENCE OF OPERATION

A. Provide fully implemented application and custom software and controls necessary to accomplish the control sequences as follows. See plans for applicable sequence of operations.

**PART 3 – EXECUTION**

3.1 INSTALLATION

A. All work described in this section shall be performed by system integrators or contractors that have a successful history in the design and installation of integrated control systems. The installing office shall have a minimum of five years of integration experience and shall provide documentation in the submittal package verifying the company's experience.

B. Install system and materials in accordance with manufacturer's instructions, and as detailed on the project drawing set.

C. Drawings of the TCS and BMS network are diagrammatic only and any apparatus not shown, but required to make the system operative to the complete satisfaction of the Architect shall be furnished and installed without additional cost.

D. Line and low voltage electrical connections to control equipment shown specified or shown on the control diagrams shall be furnished and installed by this contractor in accordance with these specifications.

E. Equipment furnished by the HVAC Contractor that is normally wired before installation shall be furnished completely wired. Control wiring normally performed in the field will be furnished and installed by this contractor.

3.2 WIRING

A. All electrical control wiring and power wiring to the control panels, NAC, computers and network components shall be the responsibility of the this contractor. All control panel wiring and final terminations at the control panels and field control devices shall be done by technicians employed by the controls contractor/integrator. This work shall not be subcontracted.

B. The electrical contractor (Div. 26) shall furnish all power wiring to electrical starters and motors.

C. All wiring shall be in accordance with the Project Electrical Specifications (Division 26), the National Electrical Code and any applicable local codes. All BMS wiring shall be installed in the conduit types specified in the Project Electrical Specifications (Division 26) unless otherwise allowed by the National Electrical Code or applicable local codes. Where BMS plenum rated cable wiring is allowed it shall be run parallel to or at right angles to the structure, properly supported and installed in a neat and workmanlike manner.

3.3 WARRANTY

A. Equipment, materials and workmanship incorporated into the work shall be warranted for a period of one year from the time of system acceptance.

B. Within this period, upon notice by the Owner, any defects in the work provided under this section due to faulty materials, methods of installation or workmanship shall be promptly (within 24 hours after receipt of notice) repaired or replaced by this contractor at no expense to the Owner.

3.4 WARRANTY ACCESS

A. The Owner shall grant to this contractor, reasonable access to the TCS and BMS during the warranty period.

B. The Owner may allow the contractor to access the TCS and BMS from a remote location for the purpose of diagnostics and troubleshooting, via the Internet, during the warranty period.

3.5 ACCEPTANCE TESTING

A. Upon completion of the installation, this contractor shall load all system software and start-up the system. This contractor shall perform all necessary calibration, testing and de-bugging and perform all required operational checks to insure that the system is functioning in full accordance with these specifications.

B. This contractor shall perform tests to verify proper performance of components, routines, and points. Repeat tests until proper performance results. This testing shall include a point-by-point log to validate 100% of the input and output points of the DDC system operation.

C. Upon completion of the performance tests described above, repeat these tests, point by point as described in the validation log above in presence of Owner's Representative, as required.

Properly schedule these tests so testing is complete at a time directed by the Owner's Representative. Do not delay tests so as to prevent delay of occupancy permits or building occupancy.

D. System Acceptance: Satisfactory completion is when this contractor and the Division 26 contractor have performed successfully all the required testing to show performance compliance with the requirements of the Contract Documents to the satisfaction of the Owner's Representative. System acceptance shall be contingent upon completion and review of all corrected deficiencies.

3.6 OPERATOR INSTRUCTION, TRAINING

A. During system commissioning and at such time acceptable performance of the TCS and BMS hardware and software has been established this contractor shall provide on-site operator instruction to the Owner's operating personnel. Operator instruction shall be done during normal working hours and shall be performed by a competent representative familiar with the system hardware, software and accessories.

B. This contractor shall provide 40 hours of instruction to the Owner's designated personnel on the operation of the TCS and BMS and describe its intended use with respect to the programmed functions specified. Operator orientation of the systems shall include, but not be limited to; the overall operation program, equipment functions (both individually and as part of the total integrated system), commands, systems generation, advisories, and appropriate operator intervention required in responding to the System's operation.

C. The training shall be in three sessions as follows:
1. Initial Training: One day session (8 hours) after system is started up and at least one week before first acceptance test. O&M manuals shall have been submitted at least two weeks prior to training so that the Owners' personnel can start to familiarize themselves with the system before classroom instruction begins.
2. First Follow-Up Training: Two days (16 hours total) approximately two weeks after initial training, and before Formal Acceptance. These sessions will deal with more advanced topics and answer questions.
3. Warranty Follow Up: Two days (16 hours total) in no less than 4 hour increments, to be scheduled at the request of the Owner during the one year warranty period. These sessions shall cover topics as requested by the Owner such as; how to add additional points, create and gather data for trends, graphic screen generation or modification of control routines.

**END OF SECTION 23 09 23**

# SECTION 23 11 23 - FACILITY NATURAL-GAS PIPING

## PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Pipe and Fittings.
2. Specialty Valves.
3. Gas Cocks.
4. Pressure Regulators.
5. Pipe Wrap Below Ground.
6. Settlement Joints.
7. Gas Vault for Settlement Joint.
8. Pipe Escutcheons.
9. Fire Barrier Penetration Seals.

B. This Contractor must furnish all labor, materials, pipe supports, sheaves, hangers, tools, equipment and perform all work and services necessary for furnishing and installation of a complete, natural gas piping system. Although all Work is not specifically shown or specified, all valves, regulators, appurtenances and devices incidental to or necessary for a sound, secure, complete and compatible installation must be furnished and installed as part of the Work of this Section.

1.2 PROJECT CONDITIONS

A. All natural gas piping where primary gas pressure is greater than 0.5 inches in water column must be welded.

B. All natural gas piping installed on the roof must be hot dip galvanized steel and threaded.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.
1. Product Data for the following:
a. Underground, above ground, and roof mounted pipe, fittings and hangers.
b. UL/FM listed gas valves.
c. Gasket material.
d. Pressure reducing valves. Include pressure rating, capacity, and settings of selected models.
e. Flexible connectors. Include pressure rating, capacity, and settings of selected models.
f. Settlement joints.
g. Gas vault for settlement joints

B. Shop Drawings: For underground and above ground systems. Include plans, elevations, sections, details and attachments to other Work. Show different pressure zones and indicate pressure for each zone.

1. Gas Vault: Contractor must furnish calculations, tie downs and waterproofing details for fully immersed vault for review and approval.

C. Design Calculations: In accordance with the design, loading, and material specifications, submit calculations and supporting drawings showing product geometry, placement and type of reinforcement, location of openings and other special features. Calculations must be supplied by a California registered professional engineer.

D. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

E. Maintenance Data: For natural gas specialties and accessories to include in maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

A. Piping must bear label, stamp or other markings of ANSI/ASME B31.2.

B. All pipe and fittings must be manufactured in the United States.

C. Electrical Components and Devices: Listed and labeled as defined in CEC, Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with the most current edition of NFPA 54, “National Fuel Gas Code,” for gas piping materials and components; installation; inspecting; testing and purging.

E. FM Standard: Provide components listed in FM’s “Fire Protection Approval Guide” if specified to be FM approved.

F. IAS Standard: Provide components listed in IAS’s “Directory of A. G. A. and C. G. A Certified Appliances and Accessories” if specified to be IAS listed.

G. UL Standard: Provide components listed in UL’s “Gas and Oil Equipment Directory” if specified to be UL listed.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and legally dispose of liquids from drips in existing gas piping. Handle cautiously to avoid spillage and ignition. Notify fuel gas supplier. Handle flammable liquids used by Installer with proper precautions and do not leave on premises from end of one day to beginning of next day.

1.6 COORDINATION

A. General: Coordinate inlet locations to all gas-fired equipment with mechanical contractor and kitchen equipment contractor. Coordinate any additional valves, regulators, devices, etc. which may be required for a complete installation.

1.7 TESTING

A. General: Gas piping must be tested and made tight in accordance with CPC and any other governing local gas codes.

B. Records:
   1. Provide record of pipe tests.
   2. Include certificate of all tests in O&M Manual.

1.8 DRAWING SCHEDULE

A. Schedules on Drawings indicate model numbers, symbols and additional information concerning products specified in this Section.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

A. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Corrugated, Stainless-Steel Tubing Systems:
      a. Omega Flex, Inc.
      b. Titeflex Corp.
      c. Tru-Flex Metal Hose Corp.
      d. Ward Manufacturing, Inc.
   2. Appliance Connector Valves:
      a. Conbraco Industries, Inc.; Apollo Div.
      b. Brass Craft Manufacturing Co.
      c. Watts Industries, Inc.; Water Products Div.
   3. Gas Valves, NPS 2 and Smaller: As specified in Section 23 05 23.
   4. Plug Valves, NPS 2-1/2 and Larger: As specified in Section 23 05 23.
   5. Service Pressure Regulators: As specified in Section 23 05 23.
   6. Appliance Pressure Regulators:
      a. Canadian Meter Co., Inc.
      b. Eaton Corp.; Controls Div.
      c. Harper Wyman Co.
      d. Maxitrol Co.
      e. SCP, Inc.

2.2 PIPING MATERIALS

A. General: The application of the following pipe and fitting material and joining methods required for natural gas piping systems are indicated in Part 3 Article “Pipe Fittings and Applications.”

B. Gas Pipe Below Ground: Black steel pipe, ASTM A53; Type E or S, Grade B; Schedule 40, seamless, beveled ends, butt welded. All gas pipe and fittings installed below ground must be provided with a factory applied, corrosion-resistant polyethylene coating. Comply with the requirements of Article 2.7.

C. As an option to black steel pipe use yellow plastic pipe, tubing and fittings conforming to ASTM D 2513, SDR 11. Pipe must bear the stamp marked “Gas” and “ASTM D2513.”

D. Gas Pipe Above Ground (Inside Facility): Black steel pipe, ASTM A53; Type E or S, Grade B; Schedule 40, seamless, beveled ends, butt welded and/or threaded.

E. Gas Pipe Above Ground (Roof): All exposed gas piping on the roof must be hot-dipped galvanized (zinc-coated) steel pipe, ASTM A53; GTC DN; Schedule 40, threaded fitted.

F. Applications of pipe, tube, fitting, and joining materials is indicated in Part 3, Pipe Fittings and Applications Article.

RFI 0592 *SITE - Gas Riser Valve Clarification*

*Gas Pipe outside of building above ground to be painted.*

2.3 PIPES, TUBES, FITTINGS, AND JOINING MATERIALS

A. Below Ground: Black steel pipe, ASTM A53; Type E or S; Grade B; Schedule 40.
1. Steel Welding Fittings: ASME B16.9, wrought steel butt-welded type or ASME B16.11, forged steel. Comply with the requirements of Article 2.7.

B. Below Ground (Option): Yellow plastic pipe, tubing and fittings conforming to ASTM D 2513, SDR 11.
1. Polypipe Pipe Fittings: ASTM D2863, socket type or ASTM D3261, butt type with dimensions matching ASTM D2513, SDR 11, polypipe pipe.

C. Above Ground (Inside Facility): Black steel pipe, ASTM A53; Type E or S, Grade B; Schedule 40, butt welded.
1. Steel Welded Fittings: ASME B16.9 wrought steel butt-welding type or ASME B16.11, forged steel.

D. Above Ground (Roof): Hot-dipped galvanized (zinc-coated) steel pipe, ASTM A53; GTC DN; Schedule 40, threaded fitted, butt welded for gas pressures more than 0.5-inch in the water column.
1. Hot-dipped galvanized (zinc-coated) Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern, with threaded ends according to ASME B1.20.1.
2. Hot-dipped galvanized (zinc-coated) Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends according to ASME B1.20.1.
3. Hot-dipped galvanized (zinc-coated) Steel Threaded Fittings: ASME B16.11, forged steel with threaded ends according to ASME B1.20.1.
4. Joint Compound and Tape: Suitable for natural gas.
5. Gasket Material: Thickness, material, and type suitable for natural gas.

E. Transition Fittings: Type, material, and end connections to match piping being joined.

2.4 PIPING SPECIALTIES

A. Flexible Connectors: ANSI Z21.24, copper alloy.

B. Quick-Disconnect Devices: ANSI Z21.41, convenience outlets and matching plug connector.

2.5 SPECIALTY VALVES

A. Valves, NPS 2 and Smaller: Threaded ends according to ASME B1.20.1 for pipe threads.

B. Valves, NPS 2-1/2 and Larger: Flanged ends according to ASME B16.5 for steel flanges and according to ASME B16.24 for copper and copper-alloy flanges.

C. Appliance Connector Valves: ANSI Z21.15 and IAS listed.

D. Gas Stops: Bronze body with AGA stamp, plug type with bronze plug and flat or square head, ball type with chrome-plated brass ball and lever handle, or butterfly valve with stainless-steel disc and fluorocarbon elastomer seal and lever handle; 2-psig minimum pressure rating.

E. Gas Valves, NPS 2 and Smaller: ASME B16.33 and IAS-listed bronze body and 125-psig pressure rating.
1. Tamperproof Feature: Include design for locking.

F. Plug Valves, NPS 2-1/2 and Larger: ASME B16.38 and MSS SP-78 cast-iron, lubricated plug valves, with 125-psig pressure rating.
1. Tamperproof Feature: Include design for locking.

G. General-Duty Valves, NPS 2-1/2 and Larger: ASME B16.38, cast-iron body, suitable for fuel gas service, with "WOG" indicated on valve body, and 125-psig pressure rating.
1. Gate Valves: MSS SP-70, OS&Y type with solid wedge.
2. Butterfly Valves: MSS SP-67, lug type with lever handle.

H. Automatic Gas Valves: ANSI Z21.21, with mechanical operator for actuation by appliance automatic shutoff device.

I. Electrically Operated Gas Valves: UL 429, bronze, aluminum, or cast-iron body solenoid valve; 120-V ac, 60 Hz, Class B, continuous-duty molded coil. Include NEMA ICS 6, Type 4, coil enclosure and electrically opened and closed dual coils. Valve position must normally be closed.

J. Earthquake Valves: FM approved or listed in IAS Directory as complying with ANSI Z21.70 and UL listed. Include mechanical operator.

## 2.6 GAS COCKS

A. Manufacturers
1. Apollo
2. Crane
3. Lukenbeimer
4. McDonald

B. Up to and including 2 inches: Bronze, square head with wrench, threaded. Similar to Crane, Fig. 250.

C. Over 2 inches: Iron, square head with wrench, flanged. Similar to Crance, Fig. 325.

D. For appliances provides integral lever handle. Similar to Crance, Fig. 298.

E. For laboratory gas cocks provide similar to Chicago Faucet No. 907 ground key outlet with non-removable nozzle, and a No. 980 single outlet turret.

## 2.7 PRESSURE REGULATORS

A. Description: Single stage and suitable for fuel gas service. Include steel jacket and corrosion-resistant components, elevation compensator, and atmospheric vent.
   1. NPS 2 and Smaller: Threaded ends according to ASME B1.20.1 for pipe threads.
   2. NPS 2-1/2 and Larger: Flanged ends according to ASME B16.5 for steel flanges and according to ASME B16.24 for copper and copper-alloy flanges.
   3. Service Pressure Regulators: ANSI Z21.80. Include 100-psig minimum inlet pressure rating.
   4. Line Pressure Regulators: ANSI Z21.80 with 2-psig minimum inlet pressure rating.
   5. Line Pressure Regulators: ANSI Z21.80 with 10-psig inlet pressure rating, unless otherwise indicated.
   6. Appliance Pressure Regulators: ANSI Z21.18. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.

B. Pressure Regulator Vents: Factory- or field-installed, corrosion-resistant screen in opening if not connected to vent piping.

## 2.8 PIPE WRAP BELOW GROUND AND WITHIN GROUT-FILLED BLOCK WALLS

A. General: Provide pipe wrap for all Schedule 40 pipe installed below ground and for all vertical pipe installed inside grout-filled block walls.
   1. Cleaning: Remove loose scale, rust, dirt, oil and grease before wrapping. Wire brush as required; use solvent for removal of oil and grease.
   2. Provide Calpico Inc. pipe wrapping polyvinyl tape, 20 mil thickness with identification per IAPMO-CPC Code for all vertical Schedule 40 piping installed inside grout-filled block walls.
   3. Encase in one (1) layer of an ANSI/AWWA C105 8-mil polyethylene jacket all Schedule 40 steel pipe installed below ground per ANSI/AWWA C105/A21.5. Install jacket.
   4. Encase in two (2) layers of an ANSI/AWWA C105, 8-mil polyethylene jacket all Schedule 40 steel pipe installed below ground. Install jacket per AWWA Standard ANSI/AWWA C105/A21.5..

## 2.9 SETTLEMENT JOINTS

A. General:
   1. Provide settlement joints for natural gas service as shown on the Plumbing Drawings and as listed in the Plumbing Schedule.
   2. Settlement joints must have a total of ±18-inch movement (settlement) with carbon steel Schedule 40 weld ends. Settlement joints must be constructed to CGA/AGA standards but not carry the CGA/AGA sticker. Settlement joints must be manufactured by Metraflex.

## 2.10 PIPE ESCUTCHEONS

A. General: Provide solid (not split-hinged) pipe escutcheons as specified herein with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extension, if any. Furnish pipe escutcheons with nickel or chrome finish for occupied areas, prime paint finish for unoccupied areas. All escutcheons must be vandal proof.

B. Pipe Escutcheons for Moist Areas: For waterproof floors, and areas where water and condensation can be expected to accumulate, provide solid cast brass or sheet brass escutcheons, solid pipe escutcheons.

C. Pipe Escutcheons for Dry Areas: Provide solid sheet metal escutcheons.

D. Manufacturer: Chicago Specialty, Producers Specialty, Sanitary-Dash.

2.11 FIRE BARRIER PENETRATION SEALS

A. Provide seals for opening through fire-rated walls, floors, or ceiling used as passage for mechanical components such as piping or ductwork. Refer to details on Drawings.

**PART 3 - EXECUTION**

3.1 PREPARATION FOR BURIED PIPING

A. Grade trench bottom to provide smooth, firm, stable, and rock-free foundation throughout length of piping.

B. Remove unstable, soft and unsuitable materials at surface on which piping is to be laid and backfill with clean sand or pea gravel to indicated level.

C. Shape bottom of trench to fit bottom of piping. Fill unevenness with tamped-sand backfill. Dig holes at each end of pipe joint to relieve loads and to ensure continuous bearing of pipe barrel on foundation.

3.2 PREPARATION

A. Close equipment shutoff valves before turning off fuel gas to premises or section of piping. Perform leakage test as specified in Part 3, Article Field Quality Control to determine that all equipment is turned off in affected piping section.

B. Comply with NFPA 54.

3.3 SERVICE ENTRANCE PIPING

A. Extend natural gas piping from each building and connect to fuel gas distribution for service entrance to building.
   1. Exterior natural gas distribution system piping will be provided by Civil Site Drawings.
   2. Natural gas distribution system piping, service pressure regulator and service meter are specified in Division 33 Section Natural-Gas Distribution.

B. Install dielectric fitting downstream from and adjacent to each service meter unless meter is supported from service-meter bar with integral dielectric fitting. Install shutoff valve downstream from and adjacent to dielectric fitting.

3.4 PIPE FITTINGS AND APPLICATIONS

A. Flanges, unions, transition, and special fittings with pressure ratings same as or higher than system pressure rating may be used in applications below, unless otherwise indicated.

B. Fuel Gas Piping, 0.5 psig or Less: Use the following:
   1. NPS 1/2 and Smaller: NPS 3/4 steel pipe, malleable-iron threaded fittings, and threaded joints.
   2. NPS 1/2 and Smaller: Hard copper tube, copper fittings, and brazed joints.
      a. Option: Soft copper tube, copper fittings, and brazed joints may be used for runouts at individual appliances.
   3. NPS 1/2 and Smaller: Tin-lined copper tube, copper fittings, and brazed joints.
   4. NPS 1/2 and Smaller: Corrugated, stainless-steel tubing system and threaded joints.
   5. NPS 3/4 and NPS 1 Steel pipe, malleable-iron threaded fittings, and threaded joints.
   6. NPS 3/4 and NPS 1: Hard copper tube, copper fittings, and brazed joints.
      a. Option: Soft copper tube, copper fittings, and brazed joints may be used for runouts at individual appliances.
   7. NPS 3/4 and NPS 1: Corrugated, stainless-steel tubing system and threaded joints.
   8. NPS 1-1/4 to NPS 2: Steel pipe, malleable-iron threaded fittings, and threaded joints.
   9. NPS 1-1/4 to NPS 2: Steel pipe, steel welding fittings, and welded joints.
   10. NPS 2-1/2 to NPS 4: Steel pipe, malleable-iron threaded fittings, and threaded joints.
   11. NPS 2-1/2 to NPS 4: Steel pipe, steel welding fittings, and welded joints.
   12. Larger Than NPS 4: Steel pipe, steel welding fittings, and welded joints.

C. Fuel Gas Piping, 0.5 to 2 psig: Use the following:
   1. NPS 1/2 and Smaller: NPS 3/4 steel pipe, malleable-iron threaded fittings, and threaded joints.
   2. NPS 1/2 and Smaller: Hard copper tube, copper fittings, and brazed joints.
      a. Option: Soft copper tube, copper fittings, and brazed joints may be used for runouts at individual appliances.
   3. NPS 1/2 and Smaller: Tin-lined copper tube, copper fittings, and brazed joints.
   4. NPS 1/2 and Smaller: Corrugated, stainless-steel tubing system and threaded joints.
   5. NPS 3/4 and NPS 1: Steel pipe, malleable-iron threaded fittings, and threaded joints.
   6. NPS 3/4 and NPS 1: Hard copper tube, copper fittings, and brazed joints.
      a. Option: Soft copper tube, copper fittings, and brazed joints may be used for runouts at individual appliances.
   7. NPS 3/4 and NPS 1: Corrugated, stainless-steel tubing system and threaded joints.
   8. NPS 1-1/4 to NPS 2: Steel pipe, malleable-iron threaded fittings, and threaded joints.
   9. NPS 1-1/4 to NPS 2: Steel pipe, steel welding fittings, and welded joints.
   10. NPS 2-1/2 to NPS 4: Steel pipe, malleable-iron threaded fittings, and threaded joints.
   11. NPS 2-1/2 to NPS 4: Steel pipe, steel welding fittings, and welded joints.
   12. Larger Than NPS 4: Steel pipe, steel welding fittings, and welded joints.

D. Fuel Gas Piping 2 to 5 psig: Use the following:
   1. NPS 2 and Smaller: Steel pipe, steel welding fittings, and welded joints.
   2. NPS 2-1/2 to NPS 4: Steel pipe, steel welding fittings, and welded joints.
   3. Larger Than NPS 4: Steel pipe, steel welding fittings, and welded joints.

E. Underground Fuel Gas Piping: Steel pipe, steel welding fittings, and welded joints. Encase in containment conduit.

## 3.5 VALVE APPLICATIONS

A. Appliance Shutoff Valves for Pressure 0.5 psig or Less: Appliance connector valve or gas ball valves (U.L. Listed).

B. Appliance Shutoff Valves for Pressure 0.5 to 2 psig: Gas stop or ball valve (U.L. Listed).

C. Piping Line Valves, NPS 2 and Smaller: Ball valve (U.L. Listed).

D. Piping Line Valves, NPS 2-1/2 and Larger: Plug valve.

3.6 PIPING INSTALLATION

A. Comply with Section 22 05 00 for basic piping installation requirements.

B. Locations: Except as specified below, install concealed gas piping of Schedule 40, seamless, black steel pipe with welded joints. Vent conduit to outside and terminate with screened vent cap.
   1. Above-Ceiling Locations: Gas piping may be installed in accessible spaces, subject to approval of authorities having jurisdiction, whether or not such spaces are used as plenums. Do not locate valves above ceilings.
   2. In Partitions: Do not install concealed piping in solid partitions. Protect tubing from physical damage when installed inside partitions or hollow walls.
      a. Exception: Tubing passing through partitions or walls.
   3. In Walls: Gas piping with welded joints and protective wrapping specified in Article in Part 2 may be installed in masonry walls, subject to approval of authorities having jurisdiction.
   4. Prohibited Locations: Do not install gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
      a. Exception: Accessible above-ceiling space specified above.

C. Drips and Sediment Traps: Install drips at points where condensate may collect. Include outlets of service meters. Locate where readily accessible for cleaning and emptying. Do not install where condensate would be subject to freezing.
   1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use minimum-length nipple of 3 pipe diameters, but not less than 3 inches long, and same size as connected pipe. Install with space between bottom of drip and floor for removal of plug or cap.

D. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels, unless indicated to be exposed to view.

E. Install fuel gas piping at uniform grade of 0.1 percent slope upward toward risers.

F. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

G. Connect branch piping from top or side of horizontal piping.

H. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment, and elsewhere as indicated. Unions are not required on flanged devices.

I. Install corrugated, stainless-steel tubing system according to manufacturer's written instructions. Include striker plates to protect tubing from puncture where tubing is restrained and cannot move.

J. Install strainer on inlet of each line pressure regulator and automatic and electrically operated valve.

K. Install pressure gage upstream and downstream from each line pressure regulator.

L. Install flanges on valves, specialties, and equipment having NPS 2-1/2 and larger connections.

M. Install vent piping for gas pressure regulators and gas trains, extend outside building, and vent to atmosphere. Terminate vents with turned-down, reducing-elbow fittings with corrosion-resistant insect screens in large end.

N. Install containment conduits for gas piping below slabs, within building, in gastight conduits extending minimum of 4 inches outside building, and vented to atmosphere. Terminate vents with turned-down, reducing-elbow fittings with corrosion-resistant insect screens in large end. Prepare and paint outside of conduits with coal-tar, epoxy-polyamide paint according to SSPC-Paint 16.

3.7 JOINT CONSTRUCTION

A. Refer to Division 22 Section Common Work Results for Plumbing for basic piping joint construction.

B. Use materials suitable for fuel gas.
1. Brazed Joints: Make with brazing alloy with melting point greater than 1000 deg F. Brazing alloys containing phosphorus are prohibited.

3.8 HANGER AND SUPPORT INSTALLATION

A. Refer to Section 22 05 29 for pipe hanger and support devices.

B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:
1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
4. NPS 2-1/2 to NPS 3-1/2: Maximum span, 10 feet; minimum rod size, 1/2 inch.
5. NPS 4 and Larger: Maximum span, 10 feet; minimum rod size, 5/8 inch.

C. Install hangers for horizontal hard copper tubing with the following maximum spacing and minimum rod sizes:
1. NPS 3/8: Maximum span, 48 inches; minimum rod size, 3/8 inch.
2. NPS 1/2 and NPS 5/8: Maximum span, 72 inches; minimum rod size, 3/8 inch.
3. NPS 3/4 and NPS 7/8: Maximum span, 84 inches; minimum rod size, 3/8 inch.
4. NPS 1: Maximum span, 96 inches; minimum rod size, 3/8 inch.

D. Install hangers for horizontal corrugated, stainless-steel tubing with the following maximum spacing and minimum rod sizes:
   1. NPS 3/8 and NPS 1/2: Maximum span, 48 inches; minimum rod size, 3/8 inch.
   2. NPS 3/4 and NPS 1: Maximum span, 72 inches; minimum rod size, 3/8 inch.
   3. Option: Support tubing from structure according to manufacturer's written instructions.

3.9 CONNECTIONS

A. Drawings indicate general arrangement of fuel gas piping, fittings, and specialties.

B. Install piping adjacent to appliances to allow service and maintenance.

C. Connect piping to appliances using gas with shutoff valves and unions. Install valve upstream from and within 72 inches of each appliance. Install union downstream from valve.

D. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance using gas.

E. Ground equipment.
   1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in ANSI/UL 486A - 486B.
   2. Do not use gas pipe as grounding electrode.

3.10 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each service meter, pressure regulator, and specialty valve.
   1. Text: In addition to name of identified unit, distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
   2. Comply with Section 22 05 53 for nameplates and signs.

3.11 PAINTING

A. Use materials and procedures in Division 9 Section, Painting and Coating.

3.12 FIELD QUALITY CONTROL

A. Inspect, test, and purge piping according to NFPA 54 and requirements of authorities having jurisdiction.

B. Repair leaks and defects with new materials and retest system until satisfactory results are obtained.

C. Report test results promptly and in writing to the authorities having jurisdiction.

D. Verify capacities and pressure ratings of service meters, pressure regulators, valves, and specialties.

E. Verify correct pressure settings for pressure regulators.

F. Verify that specified piping tests are complete.

3.13 ADJUSTING

A. Adjust controls and safety devices. Replace damaged and malfunctioning controls and safety devices.

**END OF SECTION 23 11 23**

# SECTION 23 23 00 - REFRIGERANT PIPING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
1. Refrigerant pipes and fittings.
2. Refrigerant piping valves and specialties.
3. Refrigerants.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty.
1. Include pressure drop, based on manufacturer's test data, for the following:
a. Thermostatic expansion valves.
b. Solenoid valves.
c. Hot-gas bypass valves.
d. Filter dryers.
e. Strainers.
f. Pressure-regulating valves.

B. Shop Drawings:
1. Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes; flow capacities; valve arrangements and locations; slopes of horizontal runs; oil traps; double risers; wall and floor penetrations; and equipment connection details.
2. Show piping size and piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.
3. Show interface and spatial relationships between piping and equipment.
4. Shop Drawing Scale: 1/4 inch equals 1 foot.

### 1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

### 1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to 2010 ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.6 PRODUCT STORAGE AND HANDLING

A. Store piping with end caps in place to ensure that piping interior and exterior are clean when installed.

## PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-410A:
1. Suction Lines for Air-Conditioning Applications: 300 psig.
2. Suction Lines for Heat-Pump Applications: 535 psig.
3. Hot-Gas and Liquid Lines: 535 psig.

2.2 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 88, Type K or L.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

E. Brazing Filler Metals: AWS A5.8/A5.8M.

F. Flexible Connectors:
1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
2. End Connections: Socket ends.
3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch-long assembly.
4. Working Pressure Rating: Factory test at minimum 500 psig.
5. Maximum Operating Temperature: 250 deg F.

2.3 VALVES AND SPECIALTIES

A. Check Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. Danfoss Inc.
   b. Emerson Climate Technologies.

c. Heldon Products; Henry Technologies.
3. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
4. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
5. Piston: Removable polytetrafluoroethylene seat.
6. Closing Spring: Stainless steel.
7. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
8. End Connections: Socket, union, threaded, or flanged.
9. Maximum Opening Pressure: 0.50 psig.
10. Working Pressure Rating: 500 psig.
11. Maximum Operating Temperature: 275 deg F.

B. Service Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
a. Danfoss Inc.
b. Emerson Climate Technologies.
c. Heldon Products; Henry Technologies.
3. Body: Forged brass with brass cap including key end to remove core.
4. Core: Removable ball-type check valve with stainless-steel spring.
5. Seat: Polytetrafluoroethylene.
6. End Connections: Copper spring.
7. Working Pressure Rating: 500 psig.

C. Solenoid Valves: Comply with AHRI 760 and UL 429; listed and labeled by a National Recognized Testing Laboratory (NRTL).
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
a. Danfoss Inc.
b. Emerson Climate Technologies.
c. Heldon Products; Henry Technologies.
3. Body and Bonnet: Plated steel.
4. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
5. Seat: Polytetrafluoroethylene.
6. End Connections: Threaded.
7. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 24 -V ac coil.
8. Working Pressure Rating: 400 psig.
9. Maximum Operating Temperature: 240 deg F.

D. Safety Relief Valves: Comply with 2010 ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Danfoss Inc.
b. Heldon Products; Henry Technologies.
c. Parker Hannifin Corp.

3. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
4. Piston, Closing Spring, and Seat Insert: Stainless steel.
5. Seat: Polytetrafluoroethylene.
6. End Connections: Threaded.
7. Working Pressure Rating: 400 psig.
8. Maximum Operating Temperature: 240 deg F.

E. Thermostatic Expansion Valves: Comply with AHRI 750.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
a. Danfoss Inc.
b. Emerson Climate Technologies.
c. Heldon Products; Henry Technologies.
3. Body, Bonnet, and Seal Cap: Forged brass or steel.
4. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
5. Packing and Gaskets: Non-asbestos.
6. Capillary and Bulb: Copper tubing filled with refrigerant charge.
7. Suction Temperature: 40 deg F.
8. Superheat: Adjustable.
9. Reverse-flow option (for heat-pump applications).
10. End Connections: Socket, flare, or threaded union.
11. Working Pressure Rating: 700 psig.

F. Hot-Gas Bypass Valves: Comply with UL 429; listed and labeled by an NRTL.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
a. Danfoss Inc.
b. Heldon Products; Henry Technologies.
c. Parker Hannifin Corp.
3. Body, Bonnet, and Seal Cap: Ductile iron or steel.
4. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
5. Packing and Gaskets: Non-asbestos.
6. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
7. Seat: Polytetrafluoroethylene.
8. Equalizer: Internal.
9. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter and 24 -V ac coil.
10. End Connections: Socket.
11. Throttling Range: Maximum 5 psig.
12. Working Pressure Rating: 500 psig.
13. Maximum Operating Temperature: 240 deg F.

G. Angle-Type Strainers:
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. Danfoss Inc.
      b. Heldon Products; Henry Technologies.
      c. Parker Hannifin Corp.
   3. Body: Forged brass or cast bronze.
   4. Drain Plug: Brass hex plug.
   5. Screen: 100-mesh monel.
   6. End Connections: Socket or flare.
   7. Working Pressure Rating: 500 psig.
   8. Maximum Operating Temperature: 275 deg F.

H. Moisture/Liquid Indicators:
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. Danfoss Inc.
      b. Emerson Climate Technologies.
      c. Heldon Products; Henry Technologies.
   3. Body: Forged brass.
   4. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
   5. Indicator: Color coded to show moisture content in parts per million (ppm).
   6. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
   7. End Connections: Socket or flare.
   8. Working Pressure Rating: 500 psig.
   9. Maximum Operating Temperature: 240 deg F.

I. Replaceable-Core Filter Dryers: Comply with AHRI 730.
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. Danfoss Inc.
      b. Emerson Climate Technologies.
      c. Heldon Products; Henry Technologies.
   3. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
   4. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
   5. Desiccant Media: Activated alumina.
   6. Designed for reverse flow (for heat-pump applications).
   7. End Connections: Socket.
   8. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
   9. Maximum Pressure Loss: 2 psig.

10. Working Pressure Rating: 500 psig.
11. Maximum Operating Temperature: 240 deg F.

2.4 REFRIGERANTS

A. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

## PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

A. Suction Lines NPS 1-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed or soldered joints.

B. Suction Lines NPS 3-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with [brazed] [or] [soldered] joints.

C. Suction Lines NPS 4 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with soldered joints.

D. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

E. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type K, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

F. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with 95-5 tin-antimony soldered joints.

G. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with Alloy HB soldered joints.

H. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications:
1. NPS 1-1/4 and Smaller: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with 95-5 tin-antimony soldered joints.

I. Safety-Relief-Valve Discharge Piping: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

J. Safety-Relief-Valve Discharge Piping:
1. NPS 1-1/4 and Smaller: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with 95-5 tin-antimony soldered joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install valves in suction and discharge lines of compressor.

B. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.

C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.

D. Except as otherwise indicated, install valves on inlet and outlet side of filter dryers.

E. Install a full-size, three-valve bypass around filter dryers.

F. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at top.

G. Install thermostatic expansion valves as close as possible to distributors on evaporators.
   1. Install valve so diaphragm case is warmer than bulb.
   2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
   3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

H. Install safety relief valves where required by 2010 ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

J. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for the device being protected:
   1. Solenoid valves.
   2. Thermostatic expansion valves.
   3. Hot-gas bypass valves.
   4. Compressor.

K. Install filter dryers in liquid line between compressor and thermostatic expansion valve, and in the suction line at the compressor.

L. Install receivers sized to accommodate pump-down charge.

M. Install flexible connectors at compressors.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

K. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels if valves or equipment requiring maintenance is concealed behind finished surfaces.

L. Install refrigerant piping in protective conduit where installed belowground.

M. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

N. Slope refrigerant piping as follows:
   1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
   2. Install horizontal suction lines with a uniform slope downward to compressor.
   3. Install traps and double risers to entrain oil in vertical runs.
   4. Liquid lines may be installed level.

O. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

P. Before installation of steel refrigerant piping, clean pipe and fittings using the following procedures:
   1. Shot blast the interior of piping.
   2. Remove coarse particles of dirt and dust by drawing a clean, lintless cloth through tubing by means of a wire or electrician's tape.
   3. Draw a clean, lintless cloth saturated with trichloroethylene through the tube or pipe. Continue this procedure until cloth is not discolored by dirt.

4. Draw a clean, lintless cloth, saturated with compressor oil, squeezed dry, through the tube or pipe to remove remaining lint. Inspect tube or pipe visually for remaining dirt and lint.
5. Finally, draw a clean, dry, lintless cloth through the tube or pipe.
6. Safety-relief-valve discharge piping is not required to be cleaned but is required to be open to allow unrestricted flow.

Q. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

R. Identify refrigerant piping and valves according to Section 230553 "Identification for HVAC Piping and Equipment."

S. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230500 "Common Work Results for HVAC."

T. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230500 "Common Work Results for HVAC."

U. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230500 "Common Work Results for HVAC."

## 3.4 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
1. Use Type BCuP (copper-phosphorus) alloy for joining copper socket fittings with copper pipe.
2. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze or steel.

E. Threaded Joints: Thread steel pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and to restore full ID. Join pipe fittings and valves as follows:
1. Apply appropriate tape or thread compound to external pipe threads unless dry-seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

F. Steel pipe can be threaded, but threaded joints must be seal brazed or seal welded.

G. Welded Joints: Construct joints according to AWS D10.12M/D10.12.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

## 3.5 HANGERS AND SUPPORTS

A. Comply with requirements for pipe hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Install the following pipe attachments:
1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for copper tubing with the following maximum spacing and minimum rod diameters:
1. NPS 1/2: Maximum span, ~~60~~ inches; minimum rod, 1/4 inch.
2. NPS 5/8: Maximum span, ~~60~~ inches; minimum rod, 1/4 inch.
3. NPS 1: Maximum span, ~~72~~ inches; minimum rod, 1/4 inch.
4. NPS 1-1/4: Maximum span, ~~96~~ inches; minimum rod, 3/8 inch.
5. NPS 1-1/2: Maximum span, ~~96~~ inches; minimum rod, 3/8 inch.
6. NPS 2: Maximum span, ~~96~~ inches; minimum rod, 3/8 inch.
7. NPS 2-1/2: Maximum span, ~~108~~ inches; minimum rod, 3/8 inch.
8. NPS 3: Maximum span, ~~10~~ feet; minimum rod, 3/8 inch.
9. NPS 4: Maximum span, ~~12~~ feet; minimum rod, 1/2 inch.

6 ft. spacing max 1

10 ft. spacing max 1

D. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 2: Maximum span, 10 feet; minimum rod, 3/8 inch.
2. NPS 2-1/2: Maximum span, 11 feet; minimum rod, 3/8 inch.
3. NPS 3: Maximum span, 12 feet; minimum rod, 3/8 inch.
4. NPS 4: Maximum span, 14 feet; minimum rod, 1/2 inch.

RFI 0458 — Copper Pipe Hanger Spacing
Revised spacing requirements to reflect Table 313.1 in 2013 CPC 1

E. Support multifloor vertical runs at least at each floor.

## 3.6 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in "Performance Requirements" Article.
   a. Fill system with nitrogen to the required test pressure.

b. System shall maintain test pressure at the manifold gage throughout duration of test.
c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

B. Prepare test and inspection reports.

3.7 SYSTEM CHARGING

A. Charge system using the following procedures:
1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:
1. Open shutoff valves in condenser water circuit.
2. Verify that compressor oil level is correct.
3. Open compressor suction and discharge valves.
4. Open refrigerant valves except bypass valves that are used for other purposes.
5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

**END OF SECTION 23 23 00**

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# SECTION 23 31 13 - METAL DUCTS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
1. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Sheet metal materials.
4. Sealants and gaskets.
5. Hangers and supports.
6. Seismic-restraint devices.

### 1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Duct hangers and supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"
1. Seismic Hazard Level A: Seismic force to weight ratio, 0.48.
2. Seismic Hazard Level B: Seismic force to weight ratio, 0.30.
3. Seismic Hazard Level C: Seismic force to weight ratio, 0.15.

B. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

### 1.4 ACTION SUBMITTALS

A. Product Data: For each type of the following products:
1. Sealants and gaskets.
2. Seismic-restraint devices.

### 1.5 QUALITY ASSURANCE

A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

**PART 2 - PRODUCTS**

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 ROUND DUCTWORK (INCLUDING VEHICULAR EXHAUST)

A. General:
1. Prefabricated spiral lockseam duct.
2. Prefabricated fittings.
   a. Same manufacturer as duct and as detailed.
   b. Continuity welded seams.
   c. Die-stamped elbows for 8-inches or smaller.
   d. Mitered elbows larger than 8-inches.
      1) 2 Gores: less than 35 degrees.
      2) 3 Gores: 36 degrees through 71 degrees.
      3) 5 Gores: over 71 degrees.
3. Not Acceptable:
   a. Corrugated or flexible metal duct.
   b. Shop fabricated circular duct, except above maximum factory-fabricated size.
   c. Fiberglass ductwork.
4. Galvanized steel with stainless steel clamps.
5. Provide ducts with gauges meeting CMC and NFPA 90A, whichever is more strict.

B. Round Duct and Fittings:
1. Duct Construction:

| Duct Diameter (in) | Spiral Duct Gage | Clamp Gage |
|---|---|---|
| 3-14 | 22 | 20 |

2. Similar to United Sheet Metal “Uniseal” with “Uniform” fittings.

C. Accessories: Factory fabricated.
1. Couplings.
2. Volume dampers.
3. Bellmouth fittings.
4. End caps.
5. Fire damper access section.
6. Angle rings.
7. Insulation Ends: Connections of double to single wall ducts.

2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
1. Galvanized Coating Designation: G60

C. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.4 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

2.5 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

E. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

2.6 SEISMIC-RESTRAINT DEVICES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Cooper B-Line, Inc.; a division of Cooper Industries.
2. Hilti Inc.
3. Mason Industries, Inc.
4. Unistrut; an Atkore International company.

B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an agency acceptable to authorities having jurisdiction.
1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.

C. Channel Support System: Shop- or field-fabricated support assembly made of slotted steel channels rated in tension, compression, and torsion forces and with accessories for attachment to braced component at one end and to building structure at the other end. Include matching components and corrosion-resistant coating.

D. Restraint Cables: ASTM A 603, galvanized steel cables with end connections made of cadmium-plated steel assemblies with brackets, swivel, and bolts designed for restraining cable service; and with an automatic-locking and clamping device or double-cable clips.

E. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.

F. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

**PART 3 - EXECUTION**

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install ducts with fewest possible joints.

D. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

E. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

G. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

H. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

I. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

J. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 23 33 00 "Air Duct Accessories" for fire and smoke dampers.

K. Protect duct interiors from moisture, construction debris and dust, and other foreign materials.

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
   1. Where practical, install concrete inserts before placing concrete.
   2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
   3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
   4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
   5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 SEISMIC-RESTRAINT-DEVICE INSTALLATION

A. Install ducts with hangers and braces designed to support the duct and to restrain against seismic forces required by applicable building codes. Comply with SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."
   1. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
   2. Brace a change of direction longer than 12 feet.

B. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. Install cable restraints on ducts that are suspended with vibration isolators.

E. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction.

F. Attachment to Structure: If specific attachment is not indicated, anchor bracing and restraints to structure, to flanges of beams, to upper truss chords of bar joists, or to concrete members.

G. Drilling for and Setting Anchors:
1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify the Architect if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior applications and stainless-steel anchors for applications exposed to weather.

3.6 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.7 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

3.8 DUCT CLEANING

A. Clean new duct system(s) before testing, adjusting, and balancing.

B. Use service openings for entry and inspection.
1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 233300 "Air Duct Accessories" for access panels and doors.
2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling to gain access during the cleaning process.

C. Particulate Collection and Odor Control:
1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:
1. Air outlets and inlets (registers, grilles, and diffusers).

2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:
1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.

3.9 START UP

A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

**END OF SECTION 23 31 13**

# SECTION 23 33 00 - AIR DUCT ACCESSORIES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes
1. Volume control dampers.
2. Backdraft dampers.

### 1.2 SUBMITTALS

A. Submit under provisions of Division 01.

B. Product Data: For the Following:
1. Backdraft dampers.
2. Volume dampers.
3. Motorized control dampers.

C. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
1. Special fittings.
2. Manual-volume damper installations.
3. Motorized-control damper installations.
4. Wiring Diagrams: Power, signal and control wiring.

D. Quality Control Submittals.
1. Coordination Drawings: Reflected ceiling plans, drawn to scale and coordinating penetrations and ceiling-mounting items. Show ceiling-mounting items. Show ceiling-mounting access panels and access doors required for access to duct accessories.

### 1.3 QUALITY ASSURANCE

A. Comply with NFPA 90A, Installation of Air Conditioning and Ventilating Systems, and NFPA 90B, Installation of Warm Air Heating and Air Conditioning Systems.

### 1.4 MAINTENANCE

A. Extra Materials
1. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
a. Fusible Links: Furnish quantity equal to 10-percent of amount installed.

## PART 2 - PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

A. Multiblade Volume Dampers:

1. Ruskin Manufacturing Company.
2. Air Balance Inc.
3. American Warming and Ventilating Inc.

B. Backdraft Dampers:
1. Air Balance, Inc.
2. American Warming and Ventilating Inc.
3. Ruskin Manufacturing Company.

C. Damper Hardware:
1. Ventfabrics, Inc.
2. Duro Dyne Corporation.
3. Young Regulator Company.

2.2 VOLUME CONTROL DAMPERS.

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards, and as indicated.

B. Fabricate splitter dampers of material same gage as duct to 24-inches size in either direction, and two gages heavier for sizes over 24-inches.

C. Fabricate splitter dampers of double thickness sheet metal to streamline shape. Secure blade with continuous hinge or rod. Operate with minimum ¼-inch diameter rod in self aligning, universal joint action flanged bushing with set screw.

D. Fabricate single blade dampers for duct sizes to 12 x 48-inch.

E. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes 12 by 72-inch (300 x 1825 mm). Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

F. Except in round ductwork 12-inches (300 mm) and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.

G. Provide locking, indicating quadrant regulators on single and multi-blade dampers. Where rod lengths exceed 30-inches (750 mm) provide regulator at both ends.

H. Single Blade Dampers:
1. Galvanized Steel Ductwork: 16-gauge galvanized steel, except as noted.
2. Low Pressure Systems: SMACNA HVAC Duct Construction Standards, except as noted.
    a. Bearing at one end of damper rod: Similar to Ventlok No. 60 or Ruskin.
    b. Accessible quadrant at other end of damper rod:
        1) With lever and lockscrew, similar to Ventlok No. 635. or Ruskin.
        2) Insulated Ducts: Quadrants mounted on bracket to clear insulation; similar to Ventlok Nos. 637, 638, or 639. Selection based on insulation thickness.
    c. For Inaccessible Dampers in Ceiling Spaces: Provide metered gear assembly with concealed ceiling regulator at other end of damper rod.
        1) With end bearing at the other end of damper rod, similar to Ventlock No. 607.
        2) With metered gears, similar to Ventlock No. 680 or Ruskin.

3) With concealed damper regulator, similar to Ventlock No. 677 or Ruskin. One with 2-5/8-inch diameter paintable coverplate provided with an additional set of security screws.
4) Required interconnecting hardware and set of regulator wrenches.

d. Self-locking Splitter Damper Assembly with Accessible Quadrant: With a damper blade bracket, a double lead threaded rod, a universal joint, a lever and lockscrew, similar to Ventlock No. 690 or Ruskin.

e. Abbreviated Self-locking Splitter Damper Assembly for Inaccessible Ceiling:
1) With damper blade bracket, a double lead threaded rod and an extended shaft universal joint, similar to Ventlock No. 691 or Ruskin.
2) Provide required hardware as specified under For Inaccessible Damper above.

I. Multiblade Dampers for Low Pressure Systems:
1. Opposed blade damper. Maximum 8-inches wide for ducts over 14-inches.
2. Rated at 10 cfm per sq. foot at 4-inches differential pressure.
3. Similar to Ruskin Model CD454.

2.3 BACKDRAFT DAMPERS

A. Description:
1. Extruded aluminum construction.
2. Vinyl blade edge seals.
3. Blade ends overlapping frame.
4. Similar to Air Balance Inc., Series 700 or Ruskin.

## PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions. Manufacturers' installation instructions shall be made available to the Owner's Representative and inspecting authorities.

B. Provide balancing dampers at points on low pressure supply, return, and exhaust systems at the following locations:
1. In all duct splits and branches of supply, return and exhaust systems.
2. In duct serving single outlets.
3. At open return duct above ceilings.
4. At duct splits above 36-inches deep.
5. In duct connected to common plenum.
6. Where shown on drawings.
7. Install balancing dampers at the split or branch take-off.
8. Dampers at air outlets and inlets cannot be used in lieu of balancing dampers.

C. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

D. The construction and installations for damper openings in wall and ceilings shall conform to Chapter C, CBC, and the manufacturer's approved installation instructions.

**END OF SECTION 23 33 00**

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# SECTION 23 37 13 - DIFFUSERS, REGISTERS, AND GRILLES

## PART 1 -GENERAL

### 1.1 SUMMARY

A. Section Includes
1. Ceiling Diffusers.
2. Grilles.

### 1.2 SUBMITTALS

A. Product Data: For each product indicated, include the following:
1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate Drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Coordination Drawings: Reflected ceiling plans, drawing to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved.
1. Ceiling suspension assembly members.
2. Method of attaching hangers to building structure.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, and sprinklers, whether existing or new.

C. Review requirements of outlets and inlets as to size, finish, and type of mounting prior to submitting product data and schedules of outlets and inlets.

D. Manufacturer’s Installation Instructions.

### 1.3 QUALITY ASSURANCE

A. Test and rate performance of air outlets and inlets in accordance with ADC Equipment Test Code 1062 and ASHRAE 70.

B. Test and rate performance of louvers in accordance with:
1. AMCA 500.

C. Acoustical Criteria:
1. Air Distribution System Equipment: Maximum permissible sound-power levels in octave bands of airborne transmissions through combination of grilles, registers and diffusers when operated in installed condition per plans and specifications:

D. Maximum PWL re 10 to the minus 12 Watts

| Octave Bands | NC-30 | NC-35 | NC-40 | NC-45 | NC-50 |
|---|---|---|---|---|---|
| 1 | 60 | 62 | 66 | 68 | 7 |
| 2 | 53 | 56 | 63 | 66 | 68 |
| 3 | 45 | 49 | 54 | 58 | 62 |
| 4 | 41 | 46 | 51 | 56 | 61 |
| 5 | 38 | 43 | 48 | 53 | 58 |
| 6 | 37 | 42 | 47 | 52 | 57 |
| 7 | 36 | 41 | 46 | 51 | 56 |
| 8 | 37 | 42 | 47 | 52 | 57 |

E. Except as noted, maximum permissible NC levels shall be as follows:
   1. NC-35: Libraries.
   2. NC-50: Kitchens, toilets, storage rooms.

1.4 REGULATORY REQUIREMENTS

A. Conform to California Mechanical Code.

**PART 2 - PRODUCTS**

2.1 AIR OUTLETS AND INLETS

A. Manufacturers
   1. Titus.
   2. Price.
   3. Krueger.
   4. or equal.

B. General:
   1. Manufacturer shall examine application of each outlet and guarantee that each will provide comfort space conditions without drafts at noted capaOwner.
   2. Noise level at noted capacities: Not to exceed criteria specified in Part 1.
   3. Suitable for operation at 10-percent excess and 25-percent less than noted capaOwner.
   4. Ceiling diffusers and registers shall be supplied with volume damper adjustable from face except as noted. May be omitted when a single outlet is installed on branch with volume damper.
   5. Finish matching color sample as selected by the Owner Representative.
      a. Other special materials and finishes as indicated in schedule on drawings.
      b. Other outlets, standard finish for field painting.
   6. Provide gaskets at supply outlet flanges.

2.2 CEILING DIFFUSERS

A. Supply Air Diffusers: Modular core with adjustable 4-way pattern.

B. Diffusers In Same Room: Same size and type, except as otherwise indicated.

C. Diffusers suitable for ceiling construction in which installed.

D. Drop collar as indicated.

E. Outside may be steel or aluminum unless indicated otherwise.

2.3 GRILLES

A. Grilles:
1. Material: Steel
2. Finish: Baked enamel, white, Baked enamel, color selected by the Owner Representative where called out by drawings.
3. Face Blade Arrangement: Eggcrate type, ½ x ½ x ½ inch core.
4. Frame: 1-inch wide.
5. Mounting Frame: See air distribution schedule.
6. Mounting: Lay-in, border type.

**PART 3 - EXECUTION**

3.1 INSTALLATION

A. Install items in accordance with manufacturers' instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement. Refer to Division 09.

C. Install diffusers to ductwork with air tight connection.

D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, regardless of whether dampers are specified as part of the diffuser, or grille and register assembly.

E. Ceiling Diffusers:
1. Attach removable cores with security screws to diffuser body.
2. Touch up paint screw heads with matching color supplied by diffuser manufacturer.

F. Refer to reflected ceiling plans for exact location of ceiling air outlets.

G. Install inclined blade return and exhaust grilles and registers so that blades obstruct vision by inclining blades as follows:
1. Ceiling Outlets: Incline toward nearest wall.

H. On grilles utilizing a plenum box, provide box fabricated of 0.034-inch/22-gauge thick, galvanized steel with internal surface internally lined with minimum ½-inch thick duct liner as specified in this Section.

**END OF SECTION 23 37 13**

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# SECTION 23 81 26.01 VARIABLE REFRIGERANT FLOW SYSTEM

RFI 0436
GEN - Factory-Authorized Inspection Eliminations
Factory Witness Test Done by Cert. factory start-up rep

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Division 23 Specification Sections, and Common Work Requirements for HVAC apply to the work specified in this Section.

### 1.2 SUMMARY

A. This Section includes 2-pipe split multi-system heat pump units consisting of multiple evaporator-fan and single variable speed compressor-condenser components. Evaporator units are designed for concealed mounting, and may be connected to ducts. Condensing units are designed for exterior mounting. Each system shall be capable of heating or cooling at each individual evaporator at all times. 3-pipe systems are not acceptable.

### 1.3 SUBMITTALS

A. Product Data: Include rated capacities, dimensions, connections for piping and electric, furnished specialties, and accessories for each type of product indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

E. Warranty: Special warranty specified in this Section.

### 1.4 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of split-system units and are based on the specific system indicated.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. ASHRAE Compliance: Applicable requirements in the latest edition of ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

D. ASHRAE/IESNA 90.1 Latest Edition Compliance: Applicable requirements in the latest edition of ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air- Conditioning."

E. Standards: Title 24, California Mechanical Code.

1.5 COORDINATION

A. Coordinate size and location of concrete bases for units. Cast anchor-bolt inserts into bases.

B. Coordinate size, location, and connection details with roof curbs, equipment supports, and roof penetrations.

1.6 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within one year warranty period (parts and labor). Compressor shall be warranted for a period of five years.
   1. Special Warranty: Provide and alternate price for an extended warranty for all parts and components for five years from date of Substantial Completion (parts and labor).

1.7 DELIVERY AND STORAGE

A. Deliver products to site and store and protect products until installation.

B. Protect finished cabinets from physical damage by leaving factory packing cases in place before installation and by providing temporary covers after installation.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Filters: One set of filters for each unit.
   2. Fan Belts: One set of belts for each unit.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

A. Manufacturers:
   1. Mitsubishi Electronics America, Inc.; HVAC Division.
   2. Or equal.

2.2 SYSTEM DESCRIPTION

A. The variable capacity, heat pump heat recovery air conditioning system shall be a Mitsubishi Electric CITY MULTI VRFZ (Variable Refrigerant Flow Zoning). The CITY MULTI VRFZ systems shall be the R2-Series (simultaneous cooling and heating) split system heat pump and the Y-Series (cool/heat) split system heat pump.

B. The R2-Series system shall consist of a PURY outdoor unit, BC (Branch Circuit) Controller, multiple indoor units (-E models), and M-NET DDC (Direct Digital Controls). Each indoor unit or group of indoor units shall be capable of operating in any mode independently of other

indoor units or groups. System shall be capable of changing mode (cooling to heating, heating to cooling) with no interruption to system operation. To ensure owner comfort, each indoor unit or group of indoor units shall be independently controlled and capable of changing mode automatically when zone temperature strays 1.8 degrees F from set point for ten minutes. The sum of connected capacity of all indoor air handlers shall range from 50% to 150% of outdoor rated capacity.

C. The Y-Series system shall consist of PUHY outdoor unit, multiple indoor units (-E models), and M-NET DDC (Direct Digital Controls). The sum of connected capacity of all indoor air handlers shall range from 50% to 130% of outdoor rated capacity.

2.3 QUALITY ASSURANCE

A. The units shall be listed by Electrical Testing Laboratories (ETL) and bear the ETL label.

B. All wiring shall be in accordance with the National Electrical Code (N.E.C.).

C. The units shall be manufactured in a facility registered to ISO 9001 and ISO14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).

D. All units must meet or exceed the 2010 Federal minimum efficiency requirements and the proposed ASHRAE 90.1 efficiency requirements for VRF systems. Efficiency shall be published in accordance with the DOE alternative test procedure, which is based on the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Standards 340/360, 1230 and ISO Standard 13256-1.

E. A full charge of R-410A for the condensing unit only shall be provided in the condensing unit.

2.4 Delivery, Storage and Handling

A. Unit shall be stored and handled according to the manufacturer's recommendation.

B. The units shall be covered by the manufacturer's limited warranty for a period of one (1) year from date of installation.
If the systems are:
1. designed by a certified CITY MULTI Diamond Designer,
2. installed by a contractor that has successfully completed the Mitsubishi Electric three day service course, AND
3. verified with a completed commissioning report submitted to and approved by the Mitsubishi Electric Service Department, then the units shall be covered by an extended manufacturer's limited warranty for a period of five (5) years from date of installation.
4. In addition the compressor shall have a manufacturer's limited warranty for a period of seven (7) years from date of installation.
5. If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer.
6. This warranty shall not include labor.

C. Manufacturer shall have a minimum of twenty-nine years of HVAC experience in the U.S.

market.

D. All manufacturer technical and service manuals must be readily available for download by any local contractor should emergency service be required. Registering and sign-in requirements which may delay emergency service reference are not allowed.

E. The CITY MULTI VRFZ system shall be installed by a contractor with extensive CITY MULTI install and service training. The mandatory contractor service and install training should be performed by the manufacturer.

2.5 Y-SERIES OUTDOOR UNIT

A. The Y-Series PUHY outdoor unit shall be specifically used with CITY MULTI VRFZ components. The PUHY outdoor units shall be equipped with multiple circuit boards that interface to the M-NET controls system and shall perform all functions necessary for operation. Each outdoor unit module shall be completely factory assembled, piped, wired and run tested at the factory.

1. The model nomenclature and unit requirements are shown below. All units requiring a factory supplied twinning kit shall be piped together in the field, without the need for equalizing line(s). If an alternate manufacturer is selected, any additional material, cost, and labor to install additional lines shall be incurred by the contractor.

| Outdoor Unit Model Nomenclature | | | | | |
|---|---|---|---|---|---|
| 208/230 Volt | | Twinning Kit | 460 Volt | | Twinning Kit |
| Model Number | Units | | Model Number | Units | |
| PUHY-P72TJMU | (1) PUHY-P72TJMU | None | PUHY-P72YJMU | (1) PUHY-P72YJMU | None |
| PUHY-P96TJMU | (1) PUHY-P96TJMU | None | PUHY-P96YJMU | (1) PUHY-P96YJMU | None |
| PUHY-P120TJMU | (1) PUHY-P120TJMU | None | PUHY-P120YJMU | (1) PUHY-P120YJMU | None |
| PUHY-P144TJMU | (1) PUHY-P144TJMU | None | PUHY-P144YJMU | (1) PUHY-P144YJMU | None |
| PUHY-P168TSJMU | (1) PUHY-P96TJMU<br>(1) PUHY-P72TJMU | CMY-Y100VBK | PUHY-P168YSJMU | (1) PUHY-P96YJMU<br>(1) PUHY-P72YJMU | CMY-Y100VBK |
| PUHY-P192TSJMU | (1) PUHY-P72TJMU<br>(1) PUHY-P120TJMU | CMY-Y100VBK | PUHY-P192YSJMU | (2) PUHY-P96YJMU | CMY-Y100VBK |
| PUHY-P216TSJMU | (1) PUHY-P96TJMU<br>(1) PUHY-P120TJMU | CMY-Y100VBK | PUHY-P216YSJMU | (1) PUHY-P96YJMU<br>(1) PUHY-P120YJMU | CMY-Y100VBK |
| PUHY-P240TSJMU | (2) PUHY-P120TJMU | CMY-Y100VBK | PUHY-P240YSJMU | (2) PUHY-P120YJMU | CMY-Y100VBK |
| PUHY-P264TSJMU | (1) PUHY-P120TJMU<br>(1) PUHY-P144TJMU | CMY-Y200VBK2 | PUHY-P264YSJMU | (1) PUHY-P120YJMU<br>(1) PUHY-P144YJMU | CMY-Y200VBK2 |
| PUHY-P288TSJMU | (2) PUHY-P144TJMU | CMY-Y200VBK2 | PUHY-P288YSJMU | (2) PUHY-P144YJMU | CMY-Y200VBK2 |
| PUHY-P312TSJMU | (1) PUHY-P72TJMU<br>(2) PUHY-P120TJMU | CMY-Y300VBK2 | PUHY-P312YSJMU | (1) PUHY-P72YJMU<br>(2) PUHY-P120YJMU | CMY-Y300VBK2 |
| PUHY-P338TSJMU | (1) PUHY-P96TJMU<br>(2) PUHY-P120TJMU | CMY-Y300VBK2 | PUHY-P338YSJMU | (1) PUHY-P96YJMU<br>(2) PUHY-P120YJMU | CMY-Y300VBK2 |
| PUHY-P360TJMU | (1) PUHY-P96TJMU<br>(1) PUHY-P120TJMU<br>(1) PUHY-P144TJMU | CMY-Y300VBK2 | PUHY-P360YJMU | (1) PUHY-P96YJMU<br>(1) PUHY-P120YJMU<br>(1) PUHY-P144YJMU | CMY-Y300VBK2 |

2. Outdoor unit shall have a sound rating no higher than 60 dB(A) individually or 65 dB(A) twinned. Units shall have a sound rating no higher than 50 dB(A) individually or 55 dB(A) twinned while in night mode operation. If an alternate manufacturer is selected, any additional material, cost, and labor to meet published sound levels shall be incurred by the contractor.
3. Outdoor unit shall be able to connect to up to 50 indoor units depending upon model.
4. Both refrigerant lines from the outdoor unit to indoor units shall be insulated.
5. The outdoor unit shall have an accumulator with refrigerant level sensors and controls.
6. The outdoor unit shall have a high pressure safety switch, over-current protection and DC bus protection.
7. The outdoor unit shall have the ability to operate with a maximum height difference of 164 feet (294 feet optional) and have a total refrigerant tubing length of 3280 feet. The greatest length is not to exceed 541 feet between the outdoor unit and the indoor units without the need for line size changes or traps.
8. The outdoor unit shall be capable of operating in heating mode down to -4□F ambient temperature or cooling mode down to 23□F ambient temperature, without additional low ambient controls. If an alternate manufacturer is selected, any additional material, cost, and labor to meet low ambient operating condition and performance shall be incurred by the contractor.
9. The outdoor unit shall be capable of operating in cooling mode down to -10□F with optional manufacturer supplied low ambient kit.
10. The outdoor unit shall be provided with a manufacturer supplied 20 gauge hot dipped galvanized snow /hail guard. The snow/hail guard protects the outdoor coil surfaces from hail damage and snow build-up in severe climates.
11. The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained.

B. Unit Cabinet:
1. The casing(s) shall be fabricated of galvanized steel, bonderized and finished. Units cabinets shall be able to withstand 960 hours per ASTM B117 criteria for seacoast protected models (–BS models).

C. Fan:
1. Each outdoor unit module shall be furnished with one direct drive, variable speed propeller type fan.
2. The fan motor shall have inherent protection, have permanently lubricated bearings, and be completely variable speed. The fan shall be factory set for operation under 0 in. WG external static pressure, but capable of normal operation under a maximum of 0,24 in. WG external static pressure via dipswitch.
3. The fan motor shall be mounted for quiet operation.
4. The fan shall be provided with a raised guard to prevent contact with moving parts.
5. The outdoor unit shall have vertical discharge airflow.

D. Refrigerant
1. R410A refrigerant shall be required for PUHY-T/Y(S)JMU-A outdoor unit systems.
2. Polyolester (POE) oil shall be required. Prior to bidding, manufacturers using alternate oil types shall submit material safety data sheets (MSDS) and comparison of hygroscopic properties for alternate oil with list of local suppliers stocking alternate oil for approval at least two weeks prior to bidding.

E. Coil:
1. The outdoor coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.
2. The coil fins shall have a factory applied corrosion resistant blue-fin finish.
3. The coil shall be protected with an integral metal guard.
4. Refrigerant flow from the outdoor unit shall be controlled by means of an inverter driven compressor.
5. The outdoor coil shall include 4 circuits with two position valves for each circuit, except for the last stage.

F. Compressor:
1. Each outdoor unit module shall be equipped with one inverter driven scroll hermetic compressor. Non inverter-driven compressors, which cause inrush current (demand charges) and require larger wire sizing, shall not be allowed.
2. A crankcase heater(s) shall be factory mounted on the compressor(s).
3. The outdoor unit compressor shall have an inverter to modulate capacity. The capacity shall be completely variable with a turndown of 18%-4% of rated capacity, depending upon unit size
4. The compressor shall be equipped with an internal thermal overload.
5. The compressor shall be mounted to avoid the transmission of vibration.

G. Electrical:
1. The outdoor unit electrical power shall be 208/230 or 460 volts, 3-phase, 60 hertz.
2. The unit shall be capable of satisfactory operation within voltage limitations of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz) or 414-506V (460V/60Hz).
3. The outdoor unit shall be controlled by integral microprocessors.
4. The control circuit between the indoor units and the outdoor unit shall be 24VDC completed using a 2-conductor, non-polar twisted pair shielded cable to provide total integration of the system.

2.6 PLFY-P**NCMU-E (4-WAY CEILING-RECESSED CASSETTE WITH GRILLE) INDOOR UNIT

A. General:
1. The PLFY-P**NCMU-E shall be a four-way cassette style indoor unit that recesses into the ceiling with a ceiling grille. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

B. Unit Cabinet:
1. The cabinet shall be a compact 22-7/16” wide x 22-7/16” deep so it will fit within a standard 24” square suspended ceiling grid.
2. The cabinet panel shall have provisions for a field installed filtered outside air intake.
3. Four-way grille shall be fixed to bottom of cabinet allowing two, three or four-way blow.

C. Fan:

1. The indoor fan shall be an assembly with a turbo fan direct driven by a single motor.
2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
3. The indoor fan shall consist of three (3) speeds, Low, Mid, and High.
4. The indoor unit shall have an adjustable air outlet system offering 4-way airflow, 3-way airflow, or 2-way airflow.
5. The auto air swing vanes shall be capable of automatically swinging up and down for uniform air distribution.

D. Filter:
1. Return air shall be filtered by means of a long-life washable filter.

E. Coil:
1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. All tube joints shall be brazed with phos-copper or silver alloy.
4. The coils shall be pressure tested at the factory.
5. A condensate pan and drain shall be provided under the coil.
6. The unit shall be provided with an integral condensate lift mechanism that will be able to raise drain water 19-3/4” inches above the condensate pan.
7. Both refrigerant lines to the PLFY indoor units shall be insulated.

F. Electrical:
1. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

G. Controls:
1. This unit shall use controls provided by Mitsubishi Electric to perform functions necessary to operate the system.
2. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.
3. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8 degree F deadband from set point.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Install units level and plumb. Coordinate installation of units with architectural, mechanical and electrical work.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install compressor-condenser components on equipment supports as detailed on Mechanical plans. Anchor units to supports with removable, cadmium-plated fasteners.

D. Install seismic restraints.

E. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
1. Connect refrigerant pipes with all accessories listed above. Comply with requirements in Division 23 Section "Refrigerant Piping and Specialties.

B. Install piping adjacent to unit to allow service and maintenance.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Electrical Connections: Comply with requirements in Division 26 Sections for power wiring, switches, and motor controls.

E. The control circuit between the indoor units and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system. All wiring exposed or installed within walls shall be in conduit.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:
1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.
1. Complete installation and startup checks according to manufacturer's written instructions.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

**END OF SECTION 23 81 26**

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# SECTION 23 81 27 - SPLIT-SYSTEM AIR-CONDITIONERS

RFI 0436 GEN - Factory-Authorized Inspection Eliminations
Factory Witness Test Done by Cert. factory start-up rep

## PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Division 23 Specification Sections, and Common Work Requirements for HVAC apply to the work specified in this Section.

1.2 SUMMARY

A. This Section includes 2-pipe split multi-system heat pump units consisting of Aevaporator-fan and single variable speed compressor-condenser components. Evaporator units are designed for concealed WALL. Condensing units are designed for exterior mounting. Each system shall be capable of cooling at each individual evaporator at all times. 3-pipe systems are not acceptable.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, dimensions, connections for piping and electric, furnished specialties, and accessories for each type of product indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

E. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of split-system units and are based on the specific system indicated.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. ASHRAE Compliance: Applicable requirements in the latest edition of ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

D. ASHRAE/IESNA 90.1 Latest Edition Compliance: Applicable requirements in the latest edition of ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air- Conditioning."

E. Standards: Title 24, California Mechanical Code.

1.5 COORDINATION

A. Coordinate size and location of concrete bases for units. Cast anchor-bolt inserts into bases.

B. Coordinate size, location, and connection details with roof curbs, equipment supports, and roof penetrations.

1.6 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within one year warranty period (parts and labor). Compressor shall be warranted for a period of five years.

1. Special Warranty: Provide and alternate price for an extended warranty for all parts and components for five years from date of Substantial Completion (parts and labor).

1.7 DELIVERY AND STORAGE

A. Deliver products to site and store and protect products until installation.

B. Protect finished cabinets from physical damage by leaving factory packing cases in place before installation and by providing temporary covers after installation.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Filters: One set of filters for each unit.
2. Fan Belts: One set of belts for each unit.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

A. Manufacturers:
1. Mitsubishi Electronics America, Inc.; HVAC Division.
2. Or equal.

2.2 EVAPORATOR-FAN COMPONENTS

A. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel. Low profile or horizontal type as noted.
1. Insulation: Faced, glass-fiber duct liner.
2. Drain Pans: Galvanized steel, with connection for drain; insulated and complying with the latest edition of ASHRAE 62.1.
3. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in the latest edition of ASHRAE 62.1.

B. Refrigerant Coil: Staggered copper tubing, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.

C. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.

D. Fan Motors: Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
   1. Special Motor Features: Multi tapped, multispeed with internal thermal protection and permanent lubrication.

E. Disposable Filters: 1 inch (25 mm) thick, in fiberboard frames with ASHRAE 52.2 MERV rating of 6 or higher.

F. Wiring Terminations: Connect motor to chassis wiring with plug connection.

G. Electronic valve control with computerized PID control to maintain space temperatures.

2.3 AIR-COOLED, COMPRESSOR-CONDENSER COMPONENTS

A. Casing: Galvanized steel, finished with corrosion inhibiting baked enamel in color, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.

B. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current-sensitive overload devices, inverter overload protection and fusible plugs.
   1. Inverter Drive, hermetic.
   2. Variable-speed compressor motor with inverter control and manual-reset high-pressure switch and automatic-reset low-pressure switch.
   3. Refrigerant: R-410A.
   4. Crankcase heater shall be factory mounted on compressor.
   5. Outdoor unit compressor shall have an inverter to modulate capacity. Capacity shall be completely variable with a turndown of 19-8% of rated capacity.
   6. Compressor shall be equipped with internal thermal overloads.
   7. Compressor shall be mounted on vibration isolators to avoid transmission of vibration.

C. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid sub cooler.
   1. Outdoor coil fins shall have a factory applied corrosion resistant finish.
   2. Outdoor coil shall be protected by an integral metal guard.
   3. Outdoor coil shall include 4 circuits with two position valves for all circuits except the last stage.

D. Fan: Variable Speed Aluminum-propeller type, directly connected to motor.

E. Motor: Permanently lubricated, with integral thermal-overload protection. Provided with heavy gauge wire fan guards.

F. Minimum Energy Efficiency: Comply with the latest edition of ASHRAE/IESNA 90.1, "Energy Standard for Buildings except Low-Rise Residential Buildings."

2.4 ACCESSORIES

A. Oil recovery system.

B. Central remote controller to allow temperature setting, on/off and indication of operating condition:
   1. Compressor time delay.
   2. 24-hour time control of system stop and start.
   3. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
   4. Fan-speed selection, including auto setting.

C. Schedule timer to set individual operation schedules for indoor units.

D. Isolation valves for cool fan coil and condensing unit.

2.5 LOCAL REMOTE CONTROLLERS

A. Controls up to 16 indoor units as a single group.

B. Allow users to set on/off, operation mode (cool, heat, fan or auto)

C. Allow users to set temperature and fan speed.

D. Seven day time clock operation.

E. Function lock out.

F. Diagnostic display.

G. Similar to Mitsubishi Deluxe MA Controller.

## PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb. Coordinate installation of units with architectural, mechanical and electrical work.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install roof-mounting compressor-condenser components on equipment supports as detailed on Mechanical plans. Anchor units to supports with removable, cadmium-plated fasteners.

D. Install seismic restraints.

E. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
   1. Connect refrigerant pipes with all accessories listed above. Comply with requirements in Division 23 Section "Refrigerant Piping." Refrigerant piping is limited to 2-300 ft.

B. Install piping adjacent to unit to allow service and maintenance.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Electrical Connections: Comply with requirements in Division 26 Sections for power wiring, switches, and motor controls.

E. The control circuit between the indoor units and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system. All wiring exposed or installed within walls shall be in conduit.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:
1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.
1. Complete installation and startup checks according to manufacturer's written instructions.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

**END OF SECTION 23 81 27**

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# SECTION 23 82 39 - UNIT HEATERS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes
   1. Gas unit heaters.

### 1.2 SUBMITTALS

A. Submit under provisions of Division 01.

B. Shop drawings indicating cross section of cabinets, grille, bracing and reinforcing, and typical elevation.

C. Product data indicating typical catalog of information including arrangements.

D. Indicate mechanical and electrical service locations and requirements, specifically indicating deviations from indicated products.

E. Manufacturer’s installation instructions.

F. Operation and maintenance data.

G. Include manufacturer’s descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

### 1.3 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three years documented experience.

### 1.4 REGULATORY REQUIREMENTS

A. Conform to applicable code for internal wiring of factory wired equipment.

### 1.5 DELIVERY, STORAGE AND HANDLING

A. Protect units from physical damage by storing in protected areas and leaving factory covers in place.

## PART 2 - PRODUCTS

### 2.1 GAS-FIRED UNIT HEATERS

A. Manufacturers
   1. Reznor or approved equal.

B. Gas-Fired Unit Heaters
   1. Description: Factory assembled, piped, and wired, and complying with ANSI Z83.8/CSA 2.6.
   2. Fuel Type: Design burner for natural gas having characteristics same as those of gas available at Project site.
   3. Type of Venting: Gravity vented.
   4. Output Rating: BTUH and cubic feet per minute as indicated.
   5. Housing: Steel, with integral draft hood and inserts for suspension mounting rods.
   6. External Casings and Cabinets: Baked enamel over corrosion-resistant-treated surface.
   7. Suspension Attachments: Reinforce suspension attachments at connection to fuel-fired unit heaters.
   8. Provide line voltage disconnect switch for each input circuit.
   9. Provide hinged and latched or captive-screw held panel for electrical connection and control compartment.
   10. Provide internal shroud around heating elements to assure uniform air flow and delivery temperature across heater face.
   11. Contactor: Provide contactor control for unit.
   12. Assembly: UL listed and labeled assembly with terminal box and cover, and controls.
   13. Cabinet: 18 gauge steel with easily removed front panel with integral air outlet and inlet grilles.
   14. Fan: Direct drive propeller type, statically and dynamically balanced, with fan guard.
   15. Motor: Totally enclosed with internal thermal-overload protection.
   16. Control: Regulated redundant gas valve containing pilot solenoid valve, electric gas valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff all in one body.
   17. Gas Control Valve: Modulating.
   18. Ignition: Electronically controlled electric spark with flame sensor.
   19. Thermostat: Provide integral low-voltage thermostat to control contactor.
   20. Provide low voltage control transformer.
   21. Operating Stages: One.
   22. Provide terminal blocks for power and control wiring connections.
   23. Louver: Provide discharge louver with individually adjustable blades.

## PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that required utilities are available, in proper location, and ready for use.

3.2 INSTALLATION

A. Install in accordance with manufacturer’s instructions.

B. Install unit with sufficient clearance from adjacent construction, piping, ductwork, and other obstructions to allow access for service and maintenance.

C. Support unit heaters from structure using construction details shown on Drawings.

D. Hang unit heaters from building structure, with pipe hangers anchored to building, not from piping. Mount as high as possible to maintain greatest headroom unless otherwise indicated.

E. Protect units with protective covers during balance of construction.

F. Install and connect gas-fired unit heaters and associated fuel and vent features and systems according to NFPA 54, applicable local codes and regulations, and manufacturer's written installation instructions.

3.3 CLEANING

A. Clean work under provisions of Division 01.

B. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.

C. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

3.4 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Division 01.

B. Verify operation of each electric heating unit by measuring input voltage and current simultaneously for period of ten minutes of continuous operation.

3.5 TEST AND STARTUP

A. Refer to Section 23 05 00.

3.6 DEMONSTRATION AND PERSONNEL INSTRUCTION

A. Instruct Owner personnel under provisions of Division 01.

B. Demonstrate unit and instruct Owner personnel in operation, repair, and maintenance of the work of this section.

C. Demonstrate location of circuit breakers and switches serving electric heating branch circuits, and location and setting procedures for thermostats and other heating controls.

**END OF SECTION 23 82 39**

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# SECTION 26 05 00 - COMMON WORK RESULTS FOR ELECTRICAL

## PART 1 GENERAL

### 1.1 SUMMARY

A. Section Includes:
1. Basic Electrical Requirements, materials and methods common to multiple electrical systems, specifically applicable to all Sections in Division 26.

B. Related Sections:
1. Section 26 08 13 - Acceptance Testing.

### 1.2 REFERENCES

A. CEC - California Electrical Code, Part 3, CCR Title 24 and 2013 California Fire Code, Part 9, CCR Title 24.

B. NEMA ICS-6 - Industrial Control and Systems: Enclosures.

### 1.3 DEFINITIONS

A. The meaning of words must be as defined in the CEC Article 100, Definitions, unless defined otherwise in an individual section.

B. The following specification development organizations are referenced throughout the various specification sections of Division 26:
1. AASHTO - American Association of State Highway and Transportation Officials.
2. ADAAG - Americans with Disabilities Act Accessibility Guidelines
3. Imperial County Air Pollution Control District
4. ANSI - American National Standards Institute
5. AQMD - Air Quality Management District
6. APCD - Air Pollution Control District
7. ASME - American Society of Mechanical Engineers
8. ASTM - American Society for Testing and Materials
9. CBC - California Building Code
10. CCR - California Code of Regulations Title 24. State Chapters.
11. CEC - California Electrical Code
12. CFC - California Fire Code
13. CMC - California Mechanical Code
14. CSA - Canadian Standards Association
15. EIA - Electronic Industries Association
16. FCC - Federal Communications Commission.
17. FM - Factory Mutual.
18. FS - Federal Specifications
19. ICEA - Insulated Cable Engineers Association
20. IEC - International Electrotechnical Commission
21. IEEE - Institute of Electrical and Electronic Engineers
22. IETA - International Electrical Testing Association

23. ISA - Instrument Society of America
24. ISO - International Organization for Standardization
25. MIL - Military Specifications
26. NACE - National Association of Corrosion Engineers
27. NECA - National Electrical Contractor's Association
28. NEMA - National Electrical Manufacturing Association
29. NETA - International Electrical Testing Association
30. NFPA - National Fire Protection Association
31. NIST - National Institute of Standards and Technology
32. OSHA - Occupational Safety and Health Administration
33. SMACNA - Sheet Metal and Air Conditioning Contractors National Association, Inc.
34. UL - Underwriters Laboratories

1.4 SYSTEM DESCRIPTION

A. Performance Requirements
1. Furnish and install all materials to provide functioning systems in compliance with performance requirements specified, and any modifications required by reviewed shop drawings and field coordinated drawings.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data
1. Submit product data grouped to include complete submittals of related systems, products, and accessories in a single submittal.

C. Shop Drawings
1. Submit shop drawings grouped to include complete submittals of related systems, products, and accessories in a single submittal.
2. Corrections or comments made on the shop drawings during review do not relieve the Contractor from compliance with requirements of the drawings and specifications. Shop drawing checking by the Engineer is only for review of general conformance with the design concept of the project and general compliance with the information given in the contract documents. The Contractor is responsible for:
   a. Confirming and correlating all quantities and dimensions.
   b. Selecting fabrication processes and techniques of construction.
   c. Coordinating his work with all other trades.
   d. Performing his work in a safe and satisfactory manner.
   e. Provide equipment that can be installed in the available space with all code clearances. This must be coordinated prior to ordering any equipment.

D. Samples
1. Submit as directed by the architect and as required in each specification section.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements
1. Conform to CEC.

2. Furnish products listed and classified by UL or other independent laboratory acceptable to Engineer as suitable for purpose specified and shown when a listing is available for the type of product.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle and protect products under provisions of Section 01 65 00.

B. Maintain material control records for all products for traceability to manufacturer and order number. Have records available for inspection.

C. Store material and equipment in an environment similar to the final installation environment.

D. Store and handle material and equipment in accordance with manufacturers' recommendations.

1.8 PROJECT CONDITIONS

A. Electrical plan drawings show only general locations of equipment, devices, and raceway, unless specifically dimensioned.

B. Install Work in locations shown on Drawings, unless prevented by Project conditions.

C. Prepare and submit drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Engineer before proceeding.

1.9 SEQUENCING AND SCHEDULING

A. Sequence work under provisions of Section 01 31 13.

1.10 SHORT CIRCUIT AND PROTECTIVE DEVICE COORDINATION STUDY

A. Provide a short circuit and protective device coordination study and arc flash study to the Engineer for review and approval. Provide all short circuit characteristic information on electrical equipment based on Utility short circuit data. Provide time current curves for all circuit breakers in the submittal. Set and adjust all devices in accordance with the results of this study before energizing equipment.

1.11 SPARE PARTS

A. Spare parts must be provided and maintained by Contractor to support the maintenance response requirements defined in this document.

B. The spare parts inventory may be comprised of Contractor furnished, Contractor maintained parts.

C. Contractor must maintain a spare parts inventory as he deems necessary to support the maintenance and service requirements of this section.

D. During the maintenance and service period, Contractor must maintain a log of all component failures and parts replaced.

## PART 2 - PRODUCTS

2.1 EQUIPMENT

A. Weather Proof Equipment
1. Where weatherproof (WP) equipment is indicated, use NEMA 3R or NEMA 4 cast metal or stainless steel enclosures where applicable unless otherwise specified or indicated.

B. Outdoor Equipment
1. Equipment and devices to be installed outdoors or in unheated enclosures must be capable of continuous operation within an ambient temperature range of 0 degrees F. to 120 degrees F.

## PART 3 - EXECUTION

3.1 INSTALLATION

A. Install equipment to permit easy access for normal operation and maintenance to switches, motors, drives, pull boxes and receptacles in accordance with CEC Article 110, Requirements for Electrical Installation.

B. Coordinate electrical work with work of other trades to avoid conflicts, errors, delays, and unnecessary interference.

C. Check and coordinate the approximate locations of electrical stub-ins, light fixtures, electrical outlets, equipment, and other electrical system components shown on Drawings for conflicts with openings, structural members, and components of other systems and equipment having fixed locations. In the event of conflicts, notify the Owner's Representative in writing. Make modifications and changes required to correct conflicts.

3.2 HOUSEKEEPING PADS AND FOUNDATIONS

A. Concrete work required for housekeeping pads and foundations must be provided by General Construction Work.

B. Furnish required dimensional drawings and specify locations. Minimum height of housekeeping pads must be 4 inches and must extend out 6 inches from the footprint of the equipment.

C. Furnish anchor bolts and sleeves, and verify accuracy of installation.

D. Provide for:
1. Switchboards.
2. Distribution panels.
3. Floor mounted transformers.
4. Other items as required.

3.3 SITE TESTS

A. Test under provisions of Section 26 08 13.

1. At completion of installation, test for operation, panel load balance, short circuits, and ground.
2. Each building service and separately derived system to have neutral bonding jumper opened and neutral and ground buses to be tested for infinite resistance.

3.4 ADJUSTING

A. Adjust work under provisions of Section 26 08 13.

B. Inspect all equipment and put in good working order.

3.5 CLEANING

A. Clean all items.

3.6 PROTECTION

A. Protect finished installation under provisions of Section 01 35 43.

B. Prior to installation, store items in clean, dry, indoor locations. Store in clean, dry, indoor, heated locations items subject to corrosion under damp conditions, and items containing electrical insulation, such as transformers, conductors, motors, and controls. Energize all space heaters furnished with equipment. Provide temporary heating, sufficient to prevent condensation, in transformers, switchgear, switchboards, motors, and motor control centers which do not have space heaters.

C. Following installation, protect materials and equipment from corrosion, physical damage, and the effects of moisture on insulation. When equipment intended for indoor installation is installed at the Contractor’s convenience in areas where it is subject to dampness, moisture, dirt, or other adverse atmosphere until completion of construction, ensure that adequate protection from these atmospheres is provided. Cap conduit runs during construction with manufactured seals. Keep openings in boxes or equipment closed during construction. Energize all space heaters furnished with equipment.

3.7 FINAL CONNECTION

A. Make final connection to the power distribution system at the building service point.

3.8 PUTTING SYSTEMS IN OPERATION - START UP

A. Operate all systems in good working order for a period of 5 consecutive days prior to inspection.

**END OF SECTION 26 05 00**

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# SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
   1. Building wires and cables rated 2000 V and less.

### 1.3 DEFINITIONS

A. PV: Photovoltaic.

B. VFC: Variable-frequency controller.

### 1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

### 1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

### 1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA.
   1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

### 1.7 CLOSEOUT SUBMITTALS

A. Test Reports.

## PART 2 - PRODUCTS

### 2.1 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Alpha Wire Company.
   2. American Bare Conductor.

3. Belden Inc.
4. Cerro Wire LLC.
5. Encore Wire Corporation.
6. General Cable Technologies Corporation.
7. Service Wire Co.
8. Southwire Company.
9. WESCO.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

E. Conductors: Copper, complying with NEMA WC 70/ICEA S-95-658.
1. Lead Content: Less than 300 parts per million.
2. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN/THWN-2 .
3. PV Conductor Insulation: Comply with UL 4703.

**PART 3 - EXECUTION**

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Feeders: Copper . Conductors shall be solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

C. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

D. Branch Circuits: Copper. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.

E. PV Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.

B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway .

C. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.

D. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Joint Firestopping."

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections:
   1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
   2. Perform each of the following visual and electrical tests:
      a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
      b. Test bolted connections for high resistance using one of the following:
         1) A low-resistance ohmmeter.
         2) Calibrated torque wrench.
         3) Thermographic survey.
      c. Inspect compression applied connectors for correct cable match and indentation.
      d. Inspect for correct identification.
      e. Inspect cable jacket and condition.
      f. Insulation-resistance test on each conductor with respect to ground and adjacent conductors. Apply a potential of 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable for a one-minute duration.
      g. Continuity test on each conductor and cable.
      h. Uniform resistance of parallel conductors.

D. Prepare test and inspection reports to record the following:
   1. Procedures used.
   2. Results that comply with requirements.
   3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

**END OF SECTION 26 05 19**

# SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section includes grounding and bonding systems and equipment.

B. Section includes grounding and bonding systems and equipment, plus the following special applications:
   1. Foundation steel electrodes.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

### 1.4 INFORMATIONAL SUBMITTALS

A. As-Built Data: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:
   1. Ground rods.
   2. Ground rings.
   3. Grounding arrangements and connections for separately derived systems.

B. Qualification Data: For testing agency and testing agency's field supervisor.

### 1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:
   1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
      a. Instructions for periodic testing and inspection of grounding features at grounding connections for separately derived systems based on NFPA 70B.
         1) Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
         2) Include recommended testing intervals.
         3) Test reports.

### 1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.
   1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with UL 467 for grounding and bonding materials and equipment.

## PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Burndy; Part of Hubbell Electrical Systems.
2. ERICO International Corporation.
3. ILSCO.
4. O-Z/Gedney; A Brand of the EGS Electrical Group.

2.2 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.3 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:
1. Stranded Conductors: ASTM B 8.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inchesin cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.4 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression -type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.5 GROUNDING ELECTRODES

A. Ground Rods: Zinc-coated steel; 5/8 by 96 inches.

**PART 3 - EXECUTION**

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 Insert number AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor, No. 3/0 AWG minimum.
1. Bury at least 24 inches below grade.
2. Duct-Bank Grounding Conductor: Bury 12 inches above duct bank when indicated as part of duct-bank installation.

C. Grounding Bus: Install in electrical equipment rooms, and elsewhere as indicated.
1. Install bus horizontally, on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

D. Conductor Terminations and Connections:
1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING SEPARATELY DERIVED SYSTEMS

A. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

3.3 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Pad-Mounted Transformers and Switches: Install ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Bury ground ring not less than 6 inches from the foundation.

3.4 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

C. Metallic Fences: Comply with requirements of IEEE C2.

1. Grounding Conductor: Bare copper, not less than No. 8 AWG.
2. Gates: Shall be bonded to the grounding conductor with a flexible bonding jumper.
3. Barbed Wire: Strands shall be bonded to the grounding conductor.

3.5 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
   1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
   2. For grounding electrode system, install at least 4 rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
   1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
   2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
   3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

D. Grounding and Bonding for Piping:

   1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

E. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; use a minimum of 20 feet of bare copper conductor.
   1. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
   2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal[, at ground test wells][, and at individual ground rods]. Make tests at ground rods before any conductors are connected.
   a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
   b. Perform tests by fall-of-potential method according to IEEE 81.
4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed the following values:
   1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
   2. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).
   3. Substations and Pad-Mounted Equipment: 5 ohms.
   4. Insert application and maximum ground-resistance value ohms.

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

**END OF SECTION 26 05 26**

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# SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
   1. Hangers and supports for electrical equipment and systems.
   2. Construction requirements for concrete bases.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
      a. Hangers.
      b. Steel slotted support systems.
      c. Nonmetallic support systems.
      d. Trapeze hangers.
      e. Clamps.
      f. Turnbuckles.
      g. Sockets.
      h. Eye nuts.
      i. Saddles.
      j. Brackets.
   2. Include rated capacities and furnished specialties and accessories.

B. Shop Drawings: For fabrication and installation details for electrical hangers and support systems.
   1. Trapeze hangers. Include product data for components.
   2. Steel slotted-channel systems.
   3. Nonmetallic slotted-channel systems.
   4. Equipment supports.
   5. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Hangers and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the supported equipment and systems will remain in place without separation of any parts when subjected to the seismic forces specified.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4 factory-fabricated components for field assembly.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Allied Tube & Conduit.
      b. Cooper B-Line, Inc.; a division of Cooper Industries.
      c. Flex-Strut Inc.
      d. Thomas & Betts Corporation; a member of the ABB Group.
      e. Unistrut; an Atkore International company.
   2. Material: Galvanized steel.
   3. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

C. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
   1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
      a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
         1) Hilti, Inc.
   2. Mechanical-Expansion Anchors: Insert-wedge-type, [zinc-coated steel] [stainless steel], for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
      a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
         1) Cooper B-Line, Inc.; a division of Cooper Industries.
         2) Hilti, Inc.
   3. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Section 05 50 00 "Metal Fabrications" for steel shapes and plates.

## PART 3 - EXECUTION

### 3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems unless requirements in this Section are stricter.

B. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

C. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMTs, IMCs, and RMCs as scheduled in NECA 1, where its Table 1 lists maximum spacings that are less than those stated in NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

D. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
   1. Secure raceways and cables to these supports with two-bolt conduit clamps.

E. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

### 3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMTs, IMCs, and RMCs may be supported by openings through structure members, according to NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb .

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
   1. To Wood: Fasten with lag screws or through bolts.
   2. To New Concrete: Bolt to concrete inserts.
   3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
   4. To Existing Concrete: Expansion anchor fasteners.
   5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
   6. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
   7. To Light Steel: Sheet metal screws.

8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that comply with seismic-restraint strength and anchorage requirements.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi , 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 033000 "Cast-in-Place Concrete."

C. Anchor equipment to concrete base as follows:
1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils .

B. Touchup: Comply with requirements in Section 09 91 13 "Exterior Painting" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

**END OF SECTION 26 05 29**

# SECTION 26 05 33 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Boxes, enclosures, and cabinets.
5. Handholes and boxes for exterior underground cabling.

B. Related Requirements:
1. Section 270528 "Pathways for Communications Systems" for conduits, wireways, surface pathways, innerduct, boxes, faceplate adapters, enclosures, cabinets, and handholes serving communications systems.

1.3 DEFINITIONS

A. GRC: Galvanized rigid steel conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

## PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Allied Tube & Conduit.
2. Thomas & Betts Corporation.
3. Western Tube and Conduit Corporation.
4. Wheatland Tube Company.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. EMT: Comply with ANSI C80.3 and UL 797.

E. FMC: Comply with UL 1; zinc-coated steel.

F. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

G. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
   1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
   2. Fittings for EMT:
      a. Material: Steel.
      b. Type: compression.
   3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
   4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

H. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

## 2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. CANTEX Inc.
   2. Kraloy.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

D. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

## 2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Cooper B-Line, Inc.
   2. Hoffman.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 3R unless otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged type unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.4 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Erickson Electrical Equipment Company.
2. Hoffman.
3. RACO; Hubbell.
4. Thomas & Betts Corporation.
5. Wiremold / Legrand.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

F. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

G. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

2.5 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:
1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. Armorcast Products Company.
   b. NewBasis.
   c. Oldcastle Precast, Inc.
3. Standard: Comply with SCTE 77.
4. Configuration: Designed for flush burial with open closed bottom unless otherwise indicated.
5. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
6. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
7. Cover Legend: Molded lettering, "ELECTRIC." Insert legend.
8. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

2.6 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
   1. Tests of materials shall be performed by an independent testing agency.
   2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
   3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

**PART 3 - EXECUTION**

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
   1. Exposed Conduit: GRC.
   2. Concealed Conduit, Aboveground: EMT .
   3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried concrete encased.
   4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFNC.
   5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:
   1. Exposed, Not Subject to Physical Damage: EMT.
   2. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:
      a. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
      b. Vocational bays below 8'-0" above floor..
   3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
   4. Damp or Wet Locations: GRC.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.
   1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
   2. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.
   3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

G. Install surface raceways only where indicated on Drawings.

H. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inchesof enclosures to which attached.

I. Raceways Embedded in Slabs:
   1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-footintervals.
   2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.

3. Arrange raceways to keep a minimum of 1 inch of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.

J. Stub-ups to Above Recessed Ceilings:
1. Use EMT, IMC, or RMC for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

L. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

M. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

N. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

O. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

P. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

Q. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

R. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

S. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

T. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Where otherwise required by NFPA 70.

U. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

V. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for [recessed and semirecessed luminaires, ]equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
   1. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

W. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to top bottom of box unless otherwise indicated.

X. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

Y. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

Z. Locate boxes so that cover or plate will not span different building finishes.

AA. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

## 3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:
   1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches in nominal diameter.
   2. Install backfill as specified in Section 312000 "Earth Moving."
   3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
   4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
   5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
      a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
      b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

6. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.

D. Install handholes with bottom below frost line, below grade.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.

F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.6 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.
1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

**END OF SECTION 26 05 33**

# SECTION 26 05 39 - UNDERFLOOR RACEWAYS

## PART 1 - GENERAL

### 1.1 CONDITIONS AND REQUIREMENTS

A. The General Conditions, Supplementary Conditions, and Division 01 – General Requirements apply.

### 1.2 RELATED SECTIONS

A. Division 26 - Electrical: Electrical systems and components.

B. Division 27 - Communications: Communications systems and components.

### 1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Submit for underfloor duct and components.

C. Shop Drawings: For underfloor duct and system components. Include plans, elevations, sections, details, and attachments to other work.

### 1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firms regularly engaged in manufacture of underfloor duct and system components of the types and sizes required, whose products have been in satisfactory use in similar service for not less than 10 years. Provide underfloor ducts and components produced by a manufacturer listed in this section.

B. Electrical Raceways and Components: Comply with requirements of applicable local codes, NEC, UL, and NEMA Standards pertaining to underfloor raceways and components. Comply with UL 884 "Standard for Underfloor Raceways and Fittings." Listed and labeled in accordance with NFPA 70, Article 390.

### 1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver underfloor ducts and associated components in factory labeled packages.

B. Store and handle in strict compliance with manufacturer’s written instructions and recommendations.

C. Protect from damage due to weather, excessive temperature, and construction operations.

## PART 2 - PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURER

A. Basis-of-Design Product: The design for underfloor ducts and associated components is based on the Walkerduct Pro Series Underfloor Duct System manufactured by legrand/Wiremold, 60 Woodlawn Street, West Hartford, CT 06110; toll-free 800-621-0049, telephone 860-233-6251, fax 860-232-2062; Web Site: www.legrand.us/wiremold.

B. Substitutions will be considered under provisions of Section 01 25 13.

2.2 UNDERFLOOR DUCT SYSTEM COMPONENTS

A. Underfloor duct system shall provide full capability to install Category 6, 53 and fiber optic cabling and connections in a flush service fitting. Preset provides maximum cable performance and cable loop storage. Flush service fittings also provide bend radius features at workstation. Factory installed presets permits conduit, partition, and other feeds directly out of preset.

B. Ducts No. 4 duct with outside dimensions of 6-1/2" wide x 1-1/2" deep with an interior cross sectional area of 8.72 sq in. Manufacture duct from one-piece continuous welded 16 gage galvannealed steel. Continuous weld shall be on the side of the duct so as not to impede drilling for aftersets. Standard length of duct is 10 feet.

C. Presets: Pro Series Presets provide large access area into duct; zinc die cast components mounted 12 inches or 24 inches on center of the duct as standard. Other preset spacing shall be available from the manufacturer. A minimum 1-1/2 inch preset is required to support standard duplex receptacles and communication devices when using flush activations. Seal presets with recessed removable mudcaps to receive concrete. Preset dimensions are 4-1/8" wide x 4-13/16" long. The preset base is expanded into the duct to form a continuous passageway.
   1. Preset Extensions: Die-cast construction; attaches to presets with push on metal sleeves; factory or field installed; one (1) inch size is stackable; 1/2-inch size cannot be stacked with another extension on top.

D. Mudcaps: Steel replacement cap for preset; recessed to hold 3/8-inch of concrete.

E. Marker Caps: Replaces mudcap on preset to indicate location of last insert in each run. Red or green color as suitable for type of service to be run in duct.

F. Aftersets: Installed either before or after concrete pour to create activation from duct. Provide 6-1/2" core drilled hole in concrete and 2-1/2" diameter hole in duct to accept afterset. Grout fill around afterset to fill voids in 6-1/2" hole. Attaches to duct with locking tabs. Height can be increased by the use of extensions. Aftersets are gangable and include alignment clips and mudcaps. Aftersets accept all Pro Series activations. A minimum 1-1/2 inch afterset is required to support standard duplex receptacles and communication devices when using flush activations. Aftersets shall be a minimum of 1-inch over the top of the duct for pedestal style fittings or when cabling is to be pulled through activation point.

G. Duct Conduit Hub: 12-inch section of duct with one (1) inch preset for rigid or PVC conduit. Provides feed to isolated outlets; maintains 24-inch spacing of presets. One (1) inch height. Additional extensions provided if higher preset is required.

H. Adjustable Duct Supports with Built-In Couplings: Steel construction; provided with leveling screws for adjustment of height. Different leg heights available. Used to support, couple, and hold duct in place before and during concrete pour. Supports can be fastened to form or to slab

through holes in feet. Top members maintain one (1) inch spacing between ducts. Locate duct supports on approximately five (5) feet intervals.

I. Hold-Down Straps: Duct strap for No. 4 duct is 1-1/2" high. Straps have a maximum width of 1-1/4".

J. Single Level Junction Boxes: Provided with openings on four (4) sides for duct connections and on four (4) corners for conduit adapters. Completely ground all duct and conduit connections. Junction boxes shall provide for 1-1/4 inch bend radius of cables inside box. Provide parts required to extend height of each junction box as required by floor treatments. Junction boxes shall have a square access opening. Access cover plates shall be 1/4-inch thick. Boxes shall withstand a minimum 300 lb concentrated load as required by UL 884.

K. Activations: Pro Series, Flush Mounted, brushed brass. Supply activations in quantities equal to 15 percent of the supplied presets unless specified otherwise.

L. Provide other system components including duct closures, adapters, elbows and offsets as required. Elbows shall provide two (2) inches minimum bend radius.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine conditions under which boxes and fittings are to be installed and substrate that will support boxes. Notify the Architect/Engineer in writing of conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

A. Strictly comply with manufacturer's installation instructions and recommendations and approved shop drawings. Coordinate installation with adjacent work to ensure proper clearances and to prevent electrical hazards. Locate duct in strict accordance with Drawings in order to maintain electrical module spacing. Remove any burrs or sharp edges on material.

B. Place duct on supports and align presets, attach couplings and duct supports to duct. Securely ground all joints with grounding screws or clips. Adjust duct supports and duct distribution system so the top of the presets are 1/8-inch to 3/8-inch below the screed line.

C. Permanently fasten duct supports to supporting framework. Spacing between supports shall not exceed five (5) feet. The raceway supports shall provide for 1-1/4 inch adjustment.

D. Use marker screw caps in place of the standard preset mudcaps in each preset adjacent to a junction box, on each side of a permanent wall, in the final preset of each duct run and on both sides of a change in direction of duct.

E. Perform a final inspection of the entire duct system prior to concrete placement. Seal any gaps in the system with sealing compound recommended by duct manufacturer or duct tape to prevent mortar or concrete from entering system. Level junction box cover plates flush with finished concrete floor.

F. After placement of concrete fill and before wiring is installed, remove debris and other foreign matter from duct system. Install service fittings after installation of floor finishes. Cut floor as necessary, following duct manufacturer's recommendations. If moisture is present, remove cover plates from junction boxes as necessary to allow air circulation. Pull wire and cable from outlet insert toward junction boxes.

G. Do not use installed duct system as a working platform or walkway.

H. Concrete topping shall be as indicated on Drawings and as specified in Section 03 30 00. Do not use concrete containing chlorides from any source over the top of the duct system. Design reinforced concrete in accordance with ACI 318. Concrete placement shall follow proper and accepted industry practice and be in accordance with ACI 304.

I. Vibrate concrete at all headers, junction boxes and duct to insure that the concrete completely fills underneath the duct system. Do not over vibrate the concrete. Shrinkage and temperature reinforcement above the duct system shall be in accordance with ACI 318. Take care during concrete placement and, in particular, during concrete vibration to prevent rising of top reinforcement within the slab. Hand finish concrete within a minimum distance of 24 inches adjacent to junction box access openings so that the top of finished concrete and junction box access openings are flush with each other.

J. Mechanical Security: Underfloor duct systems shall be mechanically continuous and connected to all electrical outlets, boxes, device mounting brackets, and cabinets, in accordance with manufacturer's installation sheets.

K. Accessories: Provide accessories as required for a complete installation, including insulated bushings and inserts where required by manufacturer.

L. Unused Openings: Close unused box openings using manufacturers recommended accessories.

## 3.3 FIELD QUALITY CONTROL

A. Perform field testing and inspection in accordance with Section 26 27 26. The installed duct system shall be UL Listed under Standard 884 and comply with Article 390 of the NEC.

## 3.4 CLEANING AND PROTECTION

A. Clean exposed surfaces using non-abrasive materials and methods recommended by manufacturer.

B. Protect Infloor components from damage until acceptance. Do not permit equipment or heavy traffic over duct during construction without first installing ramps over the duct. Design ramps so that imposed loads are not transferred to the duct. Replace duct system components which are damaged during construction.

**END OF SECTION 26 05 39**

# SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels, including arc-flash warning labels.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for electrical identification products.
2. Provide physical samples for review.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

A. Comply with ASME A13.1.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

### 2.2 COLOR AND LEGEND REQUIREMENTS

A. Raceways and Cables Carrying Circuits at 600 V or Less:
1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

B. Raceways and Cables Carrying Circuits at More Than 600 V:

1. Black letters on an orange field.
2. Legend: "DANGER - CONCEALED HIGH VOLTAGE WIRING."

C. Warning labels and signs shall include, but are not limited to, the following legends:
1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES ."

2.3 LABELS

A. Self-Adhesive Labels:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. A'n D Cable Products.
   b. Brady Corporation.
   c. Brother International Corporation.
   d. Emedco.
   e. Ideal Industries, Inc.
   f. Panduit Corp.
3. Preprinted, 3-mil- thick, vinyl flexible label with acrylic pressure-sensitive adhesive.
4. Vinyl, thermal, transfer-printed, 3-mil- thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

2.4 BANDS AND TUBES:

A. Snap-Around, Color-Coding Bands for Raceways and Cables: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches long, with diameters sized to suit diameters of raceways or cables they identify, and that stay in place by gripping action.
1. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. Brady Corporation.
   b. Marking Services, Inc.
   c. Panduit Corp.

B. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameters of and shrunk to fit firmly around cables they identify. Full shrink recovery occurs at a maximum of 200 deg F . Comply with UL 224.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. Brady Corporation.

b. Panduit Corp.

2.5 TAPES AND STENCILS:

A. Floor Marking Tape: 2-inch- wide, 5-mil pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
a. Carlton Industries, LP.
b. Seton Identification Products.

B. Underground-Line Warning Tape
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
a. Brady Corporation.
b. Ideal Industries, Inc.
c. LEM Products Inc.

2.6 Signs

A. Baked-Enamel Signs:
1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal Size: 7 by 10 inches .
4. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
5. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
a. Carlton Industries, LP.
b. Champion America.
c. Emedco.

B. Laminated Acrylic or Melamine Plastic Signs:
1. Engraved legend.
2. Thickness:
a. For signs up to 20 sq. inches , minimum 1/16-inch- .
b. For signs larger than 20 sq. inches , 1/8 inch thick.
c. Engraved legend with black letters on white face.
d. Self-adhesive.
e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
4. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. Brady Corporation.
   b. Carlton Industries, LP.
   c. Emedco.

2.7 CABLE TIES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Ideal Industries, Inc.
   2. Marking Services, Inc.
   3. Panduit Corp.

C. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, Type 6/6 nylon.
   1. Minimum Width: 3/16 inch .
   2. Tensile Strength at 73 deg F according to ASTM D 638: 12,000 psi .
   3. Temperature Range: Minus 40 to plus 185 deg F.

**PART 3 - EXECUTION**

3.1 PREPARATION

A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

G. Attach plastic raceway and cable labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.

H. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
   1. Outdoors: UV-stabilized nylon.
   2. In Spaces Handling Environmental Air: Plenum rated.

I. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

J. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

K. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.

## 3.3 IDENTIFICATION SCHEDULE

A. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
   1. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded feeder and branch-circuit conductors.
      a. Color shall be factory applied[ or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit].
      b. Colors for 208/120-V Circuits:
         1) Phase A: Black.
         2) Phase B: Red.
         3) Phase C: Blue.
      c. Colors for 480/277-V Circuits:
         1) Phase A: Brown.
         2) Phase B: Orange.
         3) Phase C: Yellow.

B. Arc Flash Warning Labeling: Self-adhesive thermal transfer vinyl labels.
   1. Comply with NFPA 70E and ANSI Z535.4.
   2. Comply with CEC requirements for arc-flash warning labels.

C. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm unless equipment is provided with its own identification.

1. Equipment To Be Labeled:
    a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of a engraved, laminated acrylic or melamine label.
    b. Switchboards.
    c. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
    d. Enclosed switches.
    e. Push-button stations.
    f. Power-transfer equipment.
    g. Power-generating units.

**END OF SECTION 26 05 53**

# SECTION 26 08 13 – ACCEPTANCE TESTING

## PART 1 GENERAL

### 1.1 SUMMARY

A. Section Includes:
   1. Quality assurance.
   2. Field quality control.

B. Related Sections:
   1. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
   1. Section 26 24 13 – Switchboards
   2. Section 26 24 26 – Panelboards
   3. Section 26 22 00 – Low-Voltage Transformer

### 1.2 REFERENCES

A. Refer to requirements of Section 26 05 00.

B. International Electrical Testing Association (NETA)
   1. ATS - Acceptance Testing Associations for Electrical Power Distribution Equipment and Systems.

### 1.3 SYSTEM DESCRIPTION

A. Performance Requirements
   1. Inspections and tests must be performed in accordance with applicable codes and standards including CEC, ANSI, IEEE, NFPA, and NEMA as referenced in the related Sections.

### 1.4 SUBMITTALS

A. Submit under provisions of 01 33 00.

B. Quality Assurance/Control Submittals
   1. Test Reports: Certified test reports must be submitted at the completion of the project. The final report must be signed and include the following information:
      a. Summary of the project.
      b. Description of the equipment tested.
      c. Visual inspection report.
      d. Description of the tests.
      e. Test results.
      f. Conclusions and recommendations.
      g. Appendix including appropriate test forms.
      h. Identification of the test equipment used.
      i. Name of Company & individual conducting tests.
   2. After the evaluation of the system and equipment has been made, the testing organization must submit for approval an acceptance test procedure for each item of electrical distribution equipment to be tested on this project. Test procedures must

include the proposed system function test. No testing must be performed unless the test procedures have been approved.

C. Qualification Statements: The qualifications of the testing organization and field engineer responsible for the testing must be submitted for approval prior to the start of the testing.

1.5 QUALITY ASSURANCE

A. Qualifications
1. The Contractor must engage the services of a qualified testing organization to provide final inspection, testing, calibration and adjusting on the electrical system as defined in this Contract. The testing organization must have been engaged in full practice for a minimum of five years.
2. The testing organization must have a calibration program with accuracy traceable every six months, and in an unbroken chain, the National Institute of Standards and Technology (N.I.S.T.).
3. Testing, inspection and calibration must be performed by an Engineering Technician, certified by a national organization with a minimum of 5 years experience inspecting, testing and calibrating electrical distribution equipment, systems and devices. Information substantiating the qualifications of the Certified Engineering Technician must be submitted for approval prior to the start of work.
4. The Contractor must supply to the testing organization complete sets of approved shop drawings, coordination study, settings of all adjustable devices and other information necessary for an accurate inspection and evaluation of the system prior to the performance of any tests.
5. Membership in the International Electrical Testing Association or equivalent organization.

## PART 2 PRODUCTS

2.1 MATERIALS

A. Provide materials and equipment necessary to perform the inspection and tests.

## PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

A. Site Tests
1. Test under provisions of Section 01 45 00.
2. Perform tests in accordance with the latest edition of ATS.
3. Field Acceptance Testing must be accomplished on each item of electrical equipment installed or connected to a part of this Contract. This must include:
   a. Grounding System: Perform inspection and testing as required in Section 26 05 26 and ATS.
   b. Switchboards: Perform inspection and testing as required in Section 26 24 13 and ATS.
   c. Dry Tape Transformers: Perform inspection and testing as required in Section 26 22 00 and ATS.

d. Over Current Protective Device: Perform primary injection test to prove circuit breakers rated 400-amps and above.
e. Meters and Associated Instrument Transformers: Perform inspection and testing described in ATS.
f. Short-Circuit Analysis and Coordination Study: Perform inspection, setting, testing and calibration of applicable devices as described in ATS.
g. Battery System: Perform inspection and testing as described in ATS.

4. All interlocks, safety devices, fail-safe functions, and design functions must be tested.
5. Each system covered by this Section must be function tested to ensure total system operation.
6. Upon satisfactory completion of equipment acceptance tests, the system functional tests must be performed. Prove proper interaction of sensing, processing and action devices to effect the designed end product and results.
7. System must be energized or otherwise placed in service only after completion of all required tests and an evaluation of the test results has been completed.

B. Inspection
1. Visual inspection of installed equipment must be performed by the testing organization to verify that the equipment installed and to be tested is the equipment denoted on the approved shop drawings. The inspection must check the equipment designations, device characteristics, special installation requirements, applicable codes and standards.
2. After completion of the visual inspection, a report must be developed stating any discrepancies that may have been found. Discrepancies must be corrected before proceeding further with testing unless allowed in writing by the Owner's Representative.

3.2 ADJUSTING

A. Adjust work under provisions of Section 01 45 00.

B. Deficiencies found must be rectified, and work affected by such deficiencies must be completely retested. Final acceptance of the electrical power system is contingent upon satisfactory completion of the acceptance and system function tests.

**END OF SECTION 26 08 13**

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# SECTION 26 09 13 ELECTRICAL POWER MONITORING

## PART 1 - GENERAL

### 1.1 DOCUMENTS

A. Please note: that this section of the Specifications forms part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts listed by the appropriate parties below.

### 1.2 SYSTEM DESCRIPTION

A. The products specified herein are intended to provide a complete sub-metering solution. This solution shall be utilized to measure and monitor owner provided utilities including, but not limited to, electricity. System will also allow for compliance with national and local energy codes and provide equipment needed to meet specific LEED M&V credits.

### 1.3 SECTION INCLUDES

A. Electrical sub-metering equipment, data collection systems, and data management software systems including:
   1. Advanced single point kWh electrical sub-meters
   2. Data collection hubs
   3. High density pulse modules
   4. Open protocol data communication network
   5. Energy monitoring software

### 1.4 STANDARDS

A. Provide equipment of this Section in full compliance with the following applicable portions of the latest revisions of the following standards:
   1. ANSI C12.1 & C12.20 at 0.5 Accuracy Class
   2. UL Certified to IEC/EN/UL/CSA 61010-1 2nd Edition.
   3. UL916:
      a. These requirements cover energy management equipment and associated sensing devices rated 600 volts or less and intended for installation in accordance with the National Electrical Code, NFPA 70.

### 1.5 SUBMITTALS

A. Installation and Shop Drawings to include the following:
   1. Manufacturer’s literature and specification
   2. Component connection wiring diagrams
   3. Communications system specification

1.6 CLOSEOUT SUBMITTALS

A. Submit installation, operation, and maintenance manuals for the electrical sub-metering system data collection system, and data management software.

1.7 TECHNICAL PERFORMANCE

A. Minimum measured technical performance of each piece of installed equipment shall meet the specifications published by the manufacturer.

B. Optimize technical performance of all systems to produce the highest achievable technical performance to the satisfaction of consultant and/or client.

C. Any deficiencies in the system, particularly information communication errors or operational deficiencies, shall be cause for rejection. Rectify any such deficiencies prior to calling for substantial completion review.

1.8 WARRANTY

A. Manufacturer shall provide a comprehensive warranty for all products.

B. All electrical sub-meters included in this specification to be free from defects in materials and workmanship from the date of substantial completion for a period of 10 Years.

C. All data collection system components included in this specification to be free from defects in materials and workmanship from the date of substantial completion for a period of 2 Years.

**PART 2 – PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

A. Acceptable Manufacturer: Leviton Manufacturing Co. Inc.

B. Basis of Design: Leviton VerifEye metering system.

C. Substitutions:
1. Provide Manufacturer’s reference list.
2. Clearly delineate all propose substitutions as such and submit in writing for approval by the engineer a minimum of 10 working days prior to the bid date
3. Prior to rough-in, provide complete engineered shop drawings, including power wiring, with deviations for the original design highlighted in an alternate color, to the engineer for review and approval.
4. By using pre-approved substitutions, the contractor accepts responsibility and associated costs for all required modifications to circuitry, devices, and wiring.

2.2 METERS AND CURRENT TRANSFORMERS

A. Standard single point metering devices: Leviton Mini-Meters, Series 1000, and Series 2000

B. Advanced single point metering devices: Leviton 3300 and 3500 Series

C. Leviton solid or split core current transformers with full scale output of 0.1A

D. Solid Core current transformers available for 100-400A and split core current transformers available from 100-5,000A.

E. Current transformer secondaries can be extended up to 500 feet.

2.3 SYSTEM DESCRIPTION – SINGLE POINT METERING DEVICES

A. Provide single point metering devices capable of metering 1PH/2W, 2PH/3W, 3PH/3W, and/or 3PH/4W loads.

B. Meters must be capable of directly metering North American 120/208/240v and 277/480V.

C. Metering units must be capable of metering loads between 100A and 5000A. Provide meters specific to each project as indicated on construction drawings.

D. Metering Units must have the capability of paralleling up to 3 (three) sets of CTs per phase.

E. Must meet all ISO 9001 standards for quality control where all meters test to a minimum of +/- 0.5% accuracy.

F. The system shall be as described below:
   1. To consist of electronic meters with embedded communications capability, and solid or split-core current transformer technology. The current transformers shall have a full scale output of 0.1A outputs and secondary voltage clamps for safety purposes.
   2. Meters to be used for Energy Monitoring and Tenant Billing applications
   3. The meters will be capable of remote communication from each metering device.
   4. Standard meters shall have isolated pulse output with output ranges from 10Wh to 1kWh.
   5. Advanced meters shall transmit data via one of the following communication protocols:
      a. Standard Ethernet interface
   6. Systems to have backup storage power to key components so no data is lost during power outages. Device must be capable of holding 2 years of interval data for a 20 year period. The system shall continue to function after resumption of power.
   7. Failure of the building electrical normal power system shall not result in loss of data and will not require manual restarting of the metering system

G. The electronic energy monitoring system shall be fully automated microprocessor-based electrical energy measurement system for Measurement and Verification and Tenant Billing purposes. The system shall incorporate complete metering, communications, reporting functions, energy monitoring and threshold limit capabilities.

2.4 SYSTEM MEASUREMENTS – SINGLE POINT METERING DEVICES

A. Meters to be complete with a Liquid Crystal Display (LCD) to access all energy measurements and phase diagnostics when needed

B. Standard Meter Energy Parameters:
1. kWh real consumption
2. kW peak resettable kW peak (optional)

C. Advanced Meter Energy Parameters:
1. kWh real consumption
2. kW peak resettable kW peak
3. kW instantaneous consumption
4. kVAh apparent energy consumption
5. kVA total apparent power
6. kVARh reactive consumption
7. kVAR total reactive power
8. PF power Factor Total
9. Maximum kW peak demand with time and date stamp
10. Line Frequency Hz

D. Advanced Meter Phase Diagnostics: Parameters to be displayed for each individual phase of each metered load:
1. Voltage Phase to neutral or phase to phase
2. Amps Instantaneous amperage for each phase
3. kW Instantaneous real energy
4. PF Power factor
5. kVA Instantaneous apparent energy
6. KVAR Instantaneous reactive energy

2.5 METERS DATA COLLECTION AND COMMUNICATION

A. Data acquisition sever: Leviton Energy Monitoring Hub and Hub Lite

2.6 SYSTEM DESCRIPTION METER COMMUNICATIONS AND DATA COLLECTION

A. The system shall be as described below:
1. Data collection system shall be all non-proprietary and compatible with industry standard M&V software applications. Open protocols such as Modbus, pulse outputs, analog, resistive inputs, etc. shall be utilized. No manufacture specific protocols between meter and data collectors shall be accepted.

2.7 PRODUCT REQUIREMENTS – HIGH DENSITY PULSE MODULES

A. Provide high density pulse module for collection and distribution of pulse output data generated by electric, gas, water, steam, BTU meters, and environmental sensors (humidity, temperature, etc.).

B. Module shall have on-board, adjustable Modbus addressing via dip switches with addresses from 1-128.

C. Module shall comply with the following codes and standards:
   1. FCC CFR 47 Part 15, Class A emissions standard.

D. Module shall be equipped with an ARM7 I/O processor with field-upgradable firmware.

E. Module shall communicate over a Modbus / RTU RS-485, two wire network with the following network speeds
   1. 19200 Baud
   2. 9600 Baud

F. Module shall operate under the following conditions
   1. -22°F to 158°F (-30°C to 70°C), 0-90% RH, non-condensing

G. Module shall have a 32-bit pulse counter which rolls over at 4.295 billion pulses per channel and store pulse data in a non-volatile memory. Pulse rate shall be user selectable.

H. Module shall have the following input and output connections
   1. Input
      a. Non isolated pulse and power inputs
      b. Modbus RS485 connection
      c. Twenty-three (23) independent pulse count inputs designed for use with dry contact outputs. The pulse rate shall be user selectable between the following:
         i. 10Hz: Minimum pulse width to be 50ms
         ii. 50Hz: Minimum pulse width to be 10ms
         iii. 100Hz

2.8 METER SOFTWARE

A. Enterprise Energy Management Software: Leviton Energy Manager

2.9 PRODUCT REQUIREMENTS – ENTERPRISE ENERGY MANAGEMENT SOFTWARE

A. Provide a web hosted software platform which is fully functional without software other than standard web browsers including, but not limited to, Microsoft Internet Explorer and Mozilla Firefox.

B. Software shall be used for the collection, analysis, and reporting of energy data from sub-metering equipment used to capture measurements from utilities that include, but are not limited to, electrical, gas, water, and steam.

C. Software shall collect and report data in intervals from one (1) to sixty (60) minutes and illustrate information in real time.

D. Software shall produce customized reports and display data for all energy management components including cost, kW, kVA, kVAR, and power factor

E. Software shall include an automatic reporting system and instant alarm notification system.

**PART 3 – EXECUTION**

3.1 WIRING AND CONNECTIONS

A. All wiring must meet and or exceed local electrical code.

B. Metering points show on submitted drawings only to be connected or installed

C. Install all wiring in conduit.

D. Provide a non-dedicated or Ethernet drop for remote meter reading and diagnostics of the system

E. Perform all necessary system calibration, testing, commissioning, and demonstrations as required

F. Prepare and submit record drawings and installation, operation and maintenance manuals for the energy management system as required.

3.2 TESTING AND COMMISSIONING

A. Perform final testing, adjustment, and commissioning of the systems, report results to the Consultant, and include the results in the installation, operation, and maintenance manuals. Provide qualified technicians for testing and commissioning.

B. Perform sufficient technical and operational tests to ensure the technical performance of the system meets the intent of the Contract Documents. Typical testing to include but not be limited to:
   1. Verification of meter readings and proper installation of meter equipment
   2. Communication system connectivity
   3. Meter communication with all software platforms

C. Provide functional testing including verification that all meters are operating properly.

D. Test every device and control equipment after programming and submit a signed commissioning certificate and report to the Consultant and to the Client.

E. Demonstrate the operation of the system to the Owner at a time suitable to them. Such demonstration to include product training on how to program the monitoring system.

3.3 FIELD VERIFICATION, ACCEPTANCE, AND TRAINING

A. Provide all “AS BUILT” DRAWINGS and data showing each meter, serial number, address, cross reference, load and CT ratio prior to field verification.

B. Manufacturer's representative shall verify, adjust and test the system. Verification of the energy monitoring system is to be carried out with the assistance of an electrical contractor at all times. Upon completion, the manufacturer shall issue a "CERTIFICATE OF ACCEPTANCE" to the owner, electrical consultant, contractor and client.

C. Manufacturer's representative shall demonstrate operation of the system as follows:
1. Local and remote meter readings
2. Phase diagnostics
3. Provide manual of the installed system

D. Setup of system software as directed by client.

E. Provide training and software manual for owner's staff to review.

## 3.4 FIELD QUALITY CONTROL

A. Submit a detailed testing and commissioning procedure to the Consultant and Client for review and approval prior to undertaking this Work. The procedure shall indicate all test equipment required and acceptance criteria.

B. Upon completion of all testing and commissioning, submit a copy of the test results and certify the system as acceptable for revenue metering purposes.

C. Undertake the testing and commissioning Work with the manufacturer's factory representative(s).

## 3.5 INSTRUCTION TO STAFF

A. Upon completion of the installation, a competent instructor representing the system manufacturer shall provide a lecture to the operating and maintenance staff concerning the intent, use, and operation and maintenance of the system

B. Staff training shall include a minimum of four hours per shift and training sessions shall be videotaped and turned over to the Owner. Allow for two shifts of staff training.

**END OF SECTION 26 09 13**

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# SECTION 26 09 43 – NETWORK LIGHTING CONTROLS

## PART 1 – GENERAL

### 1.1 SECTION INCLUDES

A. Network lighting control system and components:
1. Touch panel controls
2. Lighting management panels
3. Lighting management modules
4. Low voltage wall stations
5. Power interfaces
6. Wired sensors

### 1.2 RELATED DOCUMENTS

A. Section 262726 Wiring Devices

### 1.3 SUMMARY

A. The lighting control system specified in this section shall provide time-based, sensor-based (both occupancy and daylight), and manual lighting control.

B. The system shall be capable of turning lighting loads on/off as well as dimming lights (if lighting load is capable of being dimmed). Specific dimmers will be capable of "dimming lights to off."

C. All system devices shall be networked together, enabling digital communication between devices, and shall be individually addressed.

D. The system architecture shall be capable of enabling stand-alone groups (rooms) of devices to function in some default capacity, even if network connectivity to the greater system is lost.

E. The system architecture shall facilitate remote operation via a computer connection.

F. The system shall not require any centrally hardwired switching equipment.

G. The system shall be capable of wireless, wired, or hybrid wireless/wired architectures.

### 1.4 SUBMITTALS

A. Product Datasheets (general device descriptions, dimensions, electrical specifications, wiring details, nomenclature).

B. Riser Diagrams – typical per room type (detailed drawings showing device interconnectivity of devices).

C. Other Diagrams – as needed for special operation or interaction with other system(s).

D. Example Contractor Startup/Commissioning Worksheet – must be completed prior to factory start-up.

E. Hardware and Software Operation Manuals.

F. Other operational descriptions as needed.

1.5 PROJECT CLOSEOUT DOCUMENTATION

A. Provide a factory published manual
   1. Warranty
   2. Technical support contact

1.6 QUALITY ASSURANCE

A. All steps in sensor manufacturing process shall occur in North America; including population of all electronic components on circuit boards, soldering, programming, wiring, and housing.

B. All components and the manufacturing facility where product was manufactured must be RoHS compliant.

C. In high humidity or cold environments, the sensors shall be conformably coated and rated for condensing humidity and -40 degree Fahrenheit (and Celsius) operation.

D. All applicable products must be UL Listed or other acceptable national testing organization.

1.7 PROJECT CONDITIONS

A. Only install equipment after the following site conditions are maintained:
   1. Ambient Temperature 14 to 105 degrees F (-10 to 40 degrees C)
   2. Relative Humidity less than 90% non-condensing.

B. Standard electrical enclosures are permanently installed.

C. Equipment is protected from dust, debris and moisture.

1.8 WARRANTY

A. Five (5) year 100% parts replacement

1.9 MAINTENANCE AND SUSTAINABILITY

A. Provide new parts, upgrades, and/or replacements available for a minimum of 5 years available to the end user.

B. Provide free telephone technical support.

**PART 2 – PRODUCTS**

2.1 MANUFACTURERS

A. Acceptable: Acuity Brands Lighting, Inc. – System: Light by Acuity Controls

B. Basis of controls design Manufacturer: Acuity Brands, One Lithonia Way, Conyers GA 30012, www.acuitycontrols.com

C. Substitutions: Under Division 1:
   1. All substitutions must be submitted in writing for approval at least 14 days prior to bid date.
   2. Proposed substitute products must be documented with a line by line compliance review.

2.2 SYSTEM REQUIREMENTS

A. System shall have an architecture that is based upon three main concepts; 1) intelligent lighting control devices 2) standalone lighting control zones 3) network backbone for remote or time based operation.

B. Intelligent lighting control devices shall consist of one or more basic lighting control components; occupancy sensors, photocell sensors, relays, dimming outputs, manual switch stations, and manual dimming stations. Combining one or more of these components into a single device enclosure should be permissible so as to minimize overall device count of system.

C. System must interface directly with intelligent LED luminaires such that only CAT-5 cabling is required to interconnect luminaires with control components such as sensors and switches.

D. Intelligent lighting control devices shall communicate digitally, require <7 mA of current to function (Graphic wall stations excluded), and possess RJ-45 style connectors.

E. Lighting control zones shall consist of one or more intelligent lighting control components, be capable of stand-alone operation, and be capable of being connected to a higher level network backbone.

F. Devices within a lighting control zone shall be connected with CAT-5e low voltage cabling in any order.

G. Lighting control zone shall be capable of automatically configuring itself for default operation without any start-up labor required.

H. Individual lighting zones must continue to provide a user defined default level of lighting control in the event of a system communication failure with the backbone network or the management software becoming unavailable.

I. Power for devices within a lighting control zone shall come from either resident devices already present for switching (relay device) or dimming purposes, controls enabled luminaires, or from the network backbone. Standalone “bus power supplies” shall not be required in all cases.

J. All switching and dimming for a specific lighting zone shall take place within the devices located in the zone itself (i.e. not in remotely located devices such as panels) to facilitate system robustness and minimize wiring requirements. Specific applications that require centralized or remote switching shall be capable of being accommodated.

K. System shall have one or more primary wall mounted network control “gateway” devices that are capable of accessing and controlling connected system devices and linking into an Ethernet LAN.

L. System shall use “bridge” devices that route communication and distribute power for up to 8 directly connected lighting zones together for purposes of decreasing system wiring requirements.

M. System shall have a web-based software management program that enables remote system control, status monitoring, and creation of lighting control schedules and profiles.

N. Individual lighting zones shall be capable of being segmented into several “local” channels of occupancy, photocell, and switch functionality for more advanced configurations and sequences of operation.

O. Devices located in different lighting zones shall be able to communicate occupancy, photocell (non-dimming), and switch information via wired backbone.

P. System shall be capable of operating a lighting control zone according to several sequences of operation. System shall be able to change a spaces sequence of operation according to a time schedule so as to enable customized time-of-day, day-of-week, utilization of a space. Note: Operating modes should be utilized only in manners consistent with local energy codes.

Q. A taskbar style desktop application shall be available for personal lighting control.

R. An application that runs on “smart” handheld devices (such as an Apple® IPhone®) shall be available for personal lighting control.

S. Control software shall enable integration with a BMS via BACnet IP, although a hardware BACnet IP integration solution is also available.

T. System shall provide the option of having pre-terminated plenum rated CAT-5e cabling supplied with hardware.

## 2.3 INDIVIDUAL DEVICE SPECIFICATIONS

A. Control module (gateway)
1. Control module shall be a device that facilitates communication and time-based control of downstream network devices and linking into an Ethernet network.
2. Devices shall have a user interface that is capable of wall mounting, powered by low voltage, and have a touch screen.
3. Control device shall have three RJ-45 ports for connection to the graphic touch screen, other backbone devices bridges) or directly to lighting control devices(up to 128 per port).
4. Device shall automatically detect all devices downstream of it.
5. Device shall have a standard and astronomical internal time clock.
6. Device shall have one RJ-45 10/100 BaseT Ethernet connection.
7. Device shall have a USB port
8. Each control gateway device shall be capable of linking 1500 devices to the management software, with reduced memory version capable of support up to 400 devices.
9. Device shall be capable of using a dedicated static or DHCP assigned IP address.
10. Network Control Gateway device shall be the following nLight model Series: **nGWY2**

B. Networked system occupancy sensors

1. Occupancy sensors shall sense the presence of human activity within the desired space and fully control the on/off function of the lights.
2. Sensors shall utilize passive infrared (PIR) technology, which detects occupant motion, to initially turn lights on from an off state, thus preventing false on conditions. Ultrasonic or Microwave based sensing technologies shall not be accepted.
3. For applications where a second method of sensing is necessary to adequately detect maintained occupancy (such as in rooms with obstructions), a sensor with an additional "dual" technology shall be used.
4. Dual technology sensors shall have one of its two technologies not require motion to detect occupancy. Acceptable dual technology includes PIR/Microphonics (also known as Passive Dual Technology or PDT) which both looks for occupant motion and listens for sounds indicating occupants. Sensors where both technologies detect motion (PIR/Ultrasonic) shall not be acceptable.
5. All sensing technologies shall be acoustically passive, meaning they do not transmit sounds waves of any frequency (for example in the Ultrasonic range), as these technologies have the potential for interference with other electronic devices within the space (such as electronic white board readers). Acceptable detection technologies include Passive Infrared (PIR), and/or Microphonics technology. Ultrasonic or Microwave based sensing technologies shall not be accepted.
6. Sensors shall be available with zero or one integrated dry contact switching relays, capable of switching 1 amp at 24 VAC/VDC (resistive only).
7. Sensors shall be available with one or two occupancy "poles", each of which provides a programmable time delay.
8. Sensors shall be available in multiple lens options which are customized for specific applications.
9. Communication and Class 2 low voltage power shall be delivered to each device via standard CAT-5 low voltage cabling with RJ-45 connectors.
10. All sensors shall have two RJ-45 ports or capable of utilizing a splitter.
11. All sensors shall have the ability to detect when it is not receiving valid communication (via CAT-5 connections) and blink its LED in a pattern to visually indicate of a potential wiring issue
12. Every sensor parameter shall be available and configurable remotely from the software and locally via the device push-button.
13. Sensors shall be able to function together with other sensors in order to provide expanded coverage areas by simply daisy-chain wiring together the units with CAT-5 cabling.
14. Sensors shall be equipped with an automatic override for 100 hour burn-in of lamps. This feature must be available at any time for lamp replacements.
15. Wall switch sensors shall recess into single-gang switch box and fit a standard GFI opening.
16. Wall switch sensors must meet NEC grounding requirements by providing a dedicated ground connection and grounding to mounting strap. Line and load wire connections shall be interchangeable. Sensor shall not allow current to pass to the load when sensor is in the unoccupied (Off) condition.
17. Wall switch sensors shall have optional features for photocell/daylight override, and low temperature/high humidity operation.
18. Wall switch sensors shall be available in four standard colors (Ivory, White, Light Almond, Gray)
19. Wall switch sensors shall be available with optional raise/lower dimming adjustment controls.
20. Wall switch sensors shall be the following nLight model numbers, with device color and optional features as specified:
    a. **nWSX** (PIR, 1 Relay)

b. **nWSX PDT** (Dual Tech, 1 Relay)
c. **nWSX LV** (PIR, No Relay)
d. **nWSX PDT LV** (Dual Tech, No Relay)
e. **nWSX LV NL** (PIR w/ Night Light, No Relay)
f. **nWSX PDT LV NL** (Dual Tech w/ Night Light, No Relay)
g. **nWSX LV DX** (PIR, No Relay, Raise/Lower Dim Ctrl)
h. **nWSX PDT LV DX** (Dual Tech, No Relay,Raise/Lower Dim Ctrl)

21. Network system shall have sensors that can be embedded into luminaire such that only the lens shows on luminaire face.
22. Embedded sensors shall be capable of both PIR and Dual Technology occupancy detection
23. Embedded sensors shall have an optional photocell
24. Embedded sensors shall be the following nLight model number:
    a. **nES 7** (PIR, No Relay)
    b. **nES 7 ADCX** (PIR w/ Photocell, No Relay)
    c. **nES PDT 7** (Dual Technology, No Relay)
    d. **nES PDT 7 ADCX** (Dual Technology w/ Photocell, No Relay)
25. Network system shall also have ceiling, fixture, recessed, & corner mounted sensors available.
26. Sensors shall have optional features for photocell/daylight override, dimming control, and low temperature/high humidity operation.
27. Sensors shall be the following nLight model numbers, with device options as specified:

| Model # Series | Occupancy Poles | # of Relays | Lens Type | Detection Technology |
|---|---|---|---|---|
| **nCM(B) 9** | 1 | - | Standard | PIR |
| **nCM(B) 9 2P** | 2 | - | Standard | PIR |
| **nCM 9 RJB** | 1 | - | Standard | PIR |
| **nCM 9 2P RJB** | 2 | - | Standard | PIR |
| **nCM(B) PDT 9** | 1 | - | Standard | Dual |
| **nCM(B) PDT 9 2P** | 2 | - | Standard | Dual |
| **nCM PDT 9 RJB** | 1 | - | Standard | Dual |
| **nCM PDT 9 2P RJB** | 2 | - | Standard | Dual |
| **nCM(B) 10** | 1 | - | Extended | PIR |
| **nCM(B) 10 2P** | 2 | - | Extended | PIR |
| **nCM 10 RJB** | 1 | - | Extended | PIR |
| **nCM 10 2P RJB** | 2 | - | Extended | PIR |
| **nCM(B) PDT 10** | 1 | - | Extended | Dual |
| **nCM(B) PDT 10 2P** | 2 | - | Extended | Dual |
| **nCM PDT 10 RJB** | 1 | - | Extended | Dual |
| **nCM PDT 10 2P RJB** | 2 | - | Extended | Dual |
| **nRM 9** | 1 | - | Standard | PIR |
| **nRM PDT 9** | 1 | - | Standard | Dual |
| **nRM 10** | 1 | - | Extended | PIR |
| **nRM PDT 10** | 1 | - | Extended | Dual |
| **nRM 6** | 1 | - | High Bay | PIR |
| **nRM 50** | 1 | - | Aisle Way | PIR |
| **nWV 16** | 1 | - | Wide View | PIR |
| **nWV PDT 16** | 1 | - | Wide View | Dual |
| **nHW13** | 1 | - | Hallway | PIR |
| **nCM(B) 6** | 1 | - | High Bay | PIR |
| **nCM 6 RJB** | 1 | - | High Bay | PIR |

C. Networked system daylight (photocell and/or dimming) sensors

1. Photocell shall provide for an on/off set-point, and a deadband to prevent the artificial light from cycling. Delay shall be incorporated into the photocell to prevent rapid response to passing clouds.
2. Photocell and dimming sensor's set-point and deadband shall be automatically calibrated through the sensor's microprocessor by initiating an "Automatic Set-point Programming" procedure. Min and max dim settings as well as set-point may be manually entered.
3. Deadband setting shall be verified and modified by the sensor automatically every time the lights cycle to accommodate physical changes in the space (i.e., furniture layouts, lamp depreciation, or lamp outages).
4. Photocell and dimming sensors shall be equipped with an automatic override for100 hour burn-in of lamps. This feature must be available at any time for lamp replacements. (Note: This function should be performed prior to any dimming of the lamps including the "auto set-point" setting.)
5. Combination units that have all features of on/off photocell and dimming sensors shall also be available.
6. A dual zone option shall be available for On/Off Photocell, Automatic Dimming Control Photocell, or Combination units. The second zone shall be capable of being controlled as an "offset" from the primary zone.
7. Sensor shall be the following nLight model numbers, with device options as specified:
    a. **nCM(B) PC (RJB)** (on/off)
    b. **nCM(B) PC DZ (RJB)** (on/off control, dual zone)
    c. **nCM(B) ADCX (RJB)** (remote automatic dimming control photocell)
    d. **nCM(B) ADCX DZ (RJB)** (remote automatic dimming control photocell, dual zone)
    e. **nRM PC** (on/off)
    f. **nRM PC DZ** (on/off, dual zone)
    g. **nRM ADCX** (remote automatic dimming control photocell)
    h. **nRM ADCX DZ** (remote automatic dimming control photocell, dual zone)
8. Network system shall have dimming photocells that can be embedded into luminaire such that only the lens shows on luminaire face.
9. Embedded sensors shall be the following nLight model number:
    a. **nES ADCX** (Dimming Photocell)

D. Networked System Power (Relay) Packs

1. Power Packs shall incorporate one Class 1 relay, a 0-10 VDC dimming output, and contribute low voltage power to the rest of the system. Secondary Packs shall incorporate the relay and 0-10 VDC or line voltage dimming output, but shall not be required to contribute system power. Power Supplies shall provide system power only, but are not required to switch line voltage circuit. Auxiliary Relay Packs shall switch low voltage circuits only.
2. Power Packs shall accept 120 or 277 VAC (or optionally 347 VAC), be plenum rated, and provide Class 2 power to the system.
3. All devices shall have two RJ-45 ports.
4. Every Power Pack parameter shall be available and configurable remotely from the software and locally via the device push-button.
5. Power Pack shall securely mount to junction location through a threaded ½ inch chase nipple or be capable of being secured within a luminaire ballast channel. Plastic clips into junction box shall not be accepted. All Class 1 wiring shall pass through chase nipple into

adjacent junction box without any exposure of wire leads. Note: UL Listing under Energy Management or Industrial Control Equipment automatically meets this requirement, whereas Appliance Control Listing does not meet this safety requirement.

6. When required by local code, Power Pack must install inside standard electrical enclosure and provide UL recognized support to junction box. All Class 1 wiring is to pass through chase nipple into adjacent junction box without any exposure of wire leads.
7. Power Packs and Power Supplies shall be available that are WiFi enabled.
8. Power Packs (Secondary) shall be available that provide up to 16 Amp switching of all lighting load types.
9. Power Packs shall be available that provide up to 5 Amps switching of all lighting load types as well as 0-10 VDC dimming or fluorescent ballasts/LED drivers.
10. Specific Secondary Packs shall be available that provide up to 5 Amps of switching and can dim 120 VAC incandescent lighting loads or 120/277 VAC line voltage dimmable fluorescent ballasts (2-wire and 3-wire versions).
11. Specific Secondary Packs shall be available that provide up to 5 Amps of switching and can dim 120/277 VAC magnetic low voltage transformers.
12. Specific Secondary Packs shall be available that provide up to 4 Amps of switching and can dim 120 VAC electronic low voltage transformers.
13. Specific Power/Secondary Packs shall be available that are UL924 listed for switching of Emergency Power circuits.
14. Specific Secondary Packs shall be available that control louver/damper motors for skylights.
15. Specific Secondary Packs shall be available that provide a pulse on/pulse off signal for purposes of controlling shade systems via relay inputs.
16. Power (Secondary) Packs shall be available that provide up to 20 Amps switching of general purposed receptacle (plug-load) control.
17. Power (Relay) Packs and Supplies shall be the following nLight model numbers:
    a. **nPP16** (Power Pack w/ 16A relay)
    b. **nPP16 D** (Power Pack w/ 16A relay and 0-10VDC dimming output)
    c. **nPP16 WIFI** (Power Pack w/ 16A relay, WIFI enabled)
    d. **nEPP5 D** (Power Pack w/ 5A relay and 0-10VDC dimming output)
    e. **nSP16** (Secondary Pack w/ 16A relay)
    f. **nPP16 ER** (UL924 Listed Secondary Pack w/ 16A relay for switching emergency power circuits)
    g. **nPP16 D ER** UL924 Listed Secondary Pack w/ 16A relay and 0-10VDC dimming output for switching/dimming emergency power circuits)
    h. **nSP5 PCD 2W** (Secondary Pack w/ 5A relay and incandescent dimming or 2-wire line voltage fluorescent dimming output)
    **i.** **nSP5 PCD 3W** (Secondary Pack w/ 5A relay and 3-wire line voltage fluorescent dimming output)
    j. **nSP5 PCD MLV** (Secondary Pack w/ 5A relay and magnetic low voltage dimming output)
    k. **nSP5 PCD ELV 120** (Secondary Pack w/ 4A relay and electronic low voltage dimming output)
    l. **nSP5 2P LVR** (Louver/Damper Control Pack
    m. **nSHADE** (Pulse On/Off Control Pack
    n. **nPP20 PL** (Secondary Pack w/ 20A relay for general purpose receptacle load)
    o. **nPS 80** (Auxiliary Bus Power Supply)
    p. **nPS 80 WIFI** (Auxiliary Bus Power Supply, WiFi enabled)
    q. **nAR 40** (Low voltage auxiliary relay pack)

E. Networked System Relay & Dimming Panels

1. Panel shall incorporate up to 4 normally closed latching relays capable of switching 120/277 VAC or up to 2 Dual Phase relays capable of switching 208/240/480 VAC loads.
2. Relays shall be rated to switch up to a 30A ballast load at 277 VAC.
3. Panel shall provide one 0-10VDC dimming output paired with each relay.
4. Panel shall power itself from an integrated 120/277 VAC supply.
5. Panel shall be capable of operating as either two networked devices or as one.
6. Panel shall supply current limited low voltage power to other networked devices connected via CAT-5.
7. Panel shall provide auxiliary low voltage device power connected wired directly to a dedicated terminal connection.
8. Power (Relay) Packs and Supplies shall be the following nLight model numbers:
   a. **nPANEL 4** (Panel w/ four 120/277 VAC relays and four 0-10 VDC dimming outputs)
   b. **nPANEL 2 480** (Panel w/ two dual phase relays (208/240/480 VAC) and two 0-10 VDC dimming outputs)

F. Networked Auxiliary Input / Output (I/O) Devices
1. Devices shall be plenum rated and be inline wired, screw mountable, or have an extended chase nipple for mounting to a ½" knockout.
2. Devices shall have two RJ-45 ports
3. Communication and low voltage power shall be delivered to each device via standard CAT-5 low voltage cabling with RJ-45 connectors.
4. Specific I/O devices shall have a dimming control output that can control 0-10 VDC dimmable ballasts or LED drivers by sinking up to 20 mA of current.
5. Specific I/O devices shall have an input that reads a 0-10 VDC signal from an external device.
6. Specific I/O devices shall have a switch input that can interface with either a maintained or momentary switch and run a switch event (toggle the lighting load) or run a local/remote control profile.
7. Specific I/O devices shall sense state of low voltage outdoor photocells.
8. Specific I/O devices shall enable RS-232 communication between lighting control system and Touch Screen based A/V control systems.
9. Specific I/O devices shall sense momentary and maintained contact closures, and either toggle a connected load after a momentary contact or ramp the load high/low during a maintained contact (stopping when the contact releases).
10. Auxiliary Input/Output Devices shall be the following nLight model numbers:
    a. **nIO D** (I/O device with 0-10 dimming output)
    b. **nIO 1S** or **nIO RLX** (I/O device with contact closure or 0-10VDC dimming input)
    c. **nIO NLI** (Input device for detecting state of low voltage outdoor photocell; sold in **nIO PC KIT** only)
    d. **nIO X** (Interface device for communicating with RS-232 enabled AV Touch Screens

G. Networked LED Luminaires
1. Networked LED luminaire shall have a mechanically integrated control device
2. Networked LED luminaire shall have two RJ-45 ports available (via control device directly or incorporated RJ-45 splitter)
3. Networked LED luminaire shall be able to digitally network directly to other network control devices (sensors, photocells, switches, dimmers)
4. Networked LED luminaire shall provide low voltage power to other networked control devices (excluding EMG versions)
5. System shall be able to turn on/off specific LED luminaires without using a relay, if LED driver supports "sleep mode"

6. System shall be able to maintain constant lumen output over the specified life of the LED luminaire (also called lumen compensation) by varying the input control power (and thus saving up to 20% power usage).
7. System shall indicate (via a blink warning) when the LED luminaire has reached its expected life (in hrs).
8. Integrated control devices shall be the following nLight model series:
   a. **nIO LEDG (ER)**
   b. **nIO EZ PH (ER)**
   c. **nPS 80 EZ (ER)**
   d. **nEPS 60 IO EZ**
   e. **nEIO EZ LC (ER)**
9. LED Luminaires shall be the following Acuity Brands LED fixtures, which come factory enabled with nLight devices:
   a. Lithonia model families:
      i. **RTL(X)**
      ii. **TL(X)**
      iii. **VTL(X)**
      iv. **FSL(X)**
      v. **ACL(X)**
      vi. **ALL(S)**
      vii. **AVL**
      viii. **BZL**
      ix. **GTL**
      x. **SBS**
      xi. **IBL/IBH**
      xii. **PTN**
      xiii. **LDN**
      xiv. **DOM**
      xv. **WL**
      xvi. **STL**

H. Networked System Wall Switches & Dimmers
1. Devices shall recess into single-gang switch box and fit a standard GFI opening.
2. Communication and low voltage power shall be delivered to each device via standard CAT-5 low voltage cabling with RJ-45 connectors.
3. All devices shall have two RJ-45 ports.
4. All devices shall provide toggle switch control. Dimming control and low temperature/high humidity operation are available options.
5. Devices shall be available in four colors (Ivory, White, Light Almond, Gray).
6. Devices with mechanical push-buttons shall provide tactile and LED user feedback.
7. Devices with mechanical push-buttons shall be made available with custom button labeling
8. Devices with a single “on” button shall be capable of selecting all possible lighting combinations for a bi-level lighting zone such that the user confusion as to which of two buttons (as is present in multi-button scenarios) controls which load is eliminated.
9. Wall switches & dimmers shall be the following nLight model numbers, with device options as specified:
   a. **nPODM** (single on/off, push-buttons, LED user feedback)
   b. **nPODM DX** (single on/off, single dimming raise/lower, push-buttons, LED user feedback)
   c. **nPODM 2P** (dual on/off, push-buttons, LED user feedback)

d. **nPODM 2P DX** (dual on/off, dual dimming raise/lower, push-buttons, LED user feedback)
e. **nPODM 4P** (quad on/off, push-buttons, LED user feedback)
f. **nPODM 4P DX** (quad on/off, quad dimming raise-lower, push-buttons, LED user feedback)

I. Networked System Graphic Wall Station
1. Device shall have a 3.5" full color touch screen for selecting up to 16 programmable lighting control preset scenes or acting as up to 16 on/off/dim control switches.
2. Devices shall be available in four colors (Ivory, White, Light Almond, Gray).
3. Device shall enable configuration of all switches, dimmers, and lighting preset scenes via password protected setup screens.
4. Device shall enable user supplied .jpg screen saver image to be uploaded.
5. Device shall surface mount to single-gang switch box.
6. Device shall be powered with Class 2 low voltage supplied locally via a directly wired power supply.
7. Device shall have a micro-USB style connector for local computer connectivity.
8. Device shall have two RJ-45 ports for communication
9. Device shall be the following nLight model number:
   a. **nPOD GFX**

J. Networked System Scene Controllers
1. Device shall have two, three, four, or eight buttons for selecting programmable lighting control profiles or acting as on/off switches.
2. Devices shall be available in four colors (Ivory, White, Light Almond, Gray).
3. Device shall recess into single-gang switch box and fit a standard GFI opening.
4. Devices shall provide LED user feedback.
5. Communication and Class 2 low voltage power shall be delivered to each device via standard CAT-5 low voltage cabling with RJ-45 connectors.
6. All devices shall have two RJ-45 ports.
7. Device shall be capable of reprogramming other devices in its zone so as to implement user selected lighting scene.
8. Device shall be capable of selecting a lighting profile be run by the system's upstream Gateway so as to implement selected lighting profile across multiple zones (and not just its local zone).
9. Device shall have LEDs indicating current selection.
10. Scene Selector device shall be the following nLight model number:
    a. **nPODM 2S** (2 Scene, push-button)
    b. **nPODM 4S** (4 Scene, push-button)
    c. **nPODM 4S DX** (4 Scene, push-button, On/Off/Raise/Lower)
    d. **nPODM 2L** (2 Adjustable Preset Levels, push-button, On/Off)
    e. **nPODM 2L AB** (2 Scene, push-button, On/Off/High/Low)
    f. **nPODM 4L DX** (4 Adjustable Preset Levels, push-button, On/Off/Raise/Lower)

K. Communication Bridges
1. Device shall surface mount to a standard 4" x 4" square junction box.
2. Device shall have 8 RJ-45 ports.
3. Device shall be capable of aggregating communication from multiple lighting control zones for purposes of minimizing backbone wiring requirements back to Control Gateway.

4. Device shall be powered with Class 2 low voltage supplied locally via a directly wired power supply or delivered via a CAT-5 cabled connection.
5. Device shall be capable of redistributing power from its local supply and connect lighting control zones with excess power to lighting control zones with insufficient local power. This architecture also enables loss of power to a particular area to be less impactful on network lighting control system.
6. Communication Bridge devices shall be the following nLight model numbers:
   a. **nBRG 8** (8 Ports)

2.4 LIGHTING CONTROL PROFILES

A. Changes to the operation of the system shall be capable of being made in real-time or scheduled via lighting control profiles. These profiles are outlines of settings that direct how a collection of devices function for a defined time period.

B. Lighting control profiles shall be capable of being created and applied to a single device, zone of devices, or customized group of zones.

C. All relays and dimming outputs shall be capable of being scheduled to track or ignore information regarding occupancy, daylight, and local user switches via lighting control profiles.

D. Specific device parameters (e.g. sensor time delay and photocell set-point) shall be configurable via a lighting control profile.

E. All lighting control profiles shall be stored on the network control gateway device, with a system backup on the software's host server.

F. Lighting control profiles shall be capable of being scheduled to run according to the following calendar options: start date/hour/minute, end date/hour/minute, and sunrise/sunset +/- timed offsets.

G. Sunrise/sunset times shall be automatically derived from location information using an astronomical clock.

H. Daylight savings time adjustments shall be capable of being performed automatically, if desired.

I. Lighting control profile schedules shall be capable of being given the following recurrence settings: daily, weekday, weekend, weekly, monthly, and yearly.

J. Software shall provide a graphical tool for easily viewing scheduled lighting control profiles.

2.5 MANAGEMENT SOFTWARE

A. Every device parameter (e.g. sensor time delay and photocell set-point) shall be available and configurable remotely from the software.

B. The following status monitoring information shall be made available from the software for all devices for which it is applicable: current occupancy status, current PIR Status, current Microphonics Status, remaining occupancy time delay(s), current photocell reading, current

photocell inhibiting state, photocell transitions time remaining, current dim level, device temperature, and device relay state(s).

C. The following device identification information shall be made available from the software: model number, model description, serial number, manufacturing date code, custom label(s), and parent network device.

D. A printable network inventory report shall be available via the software.

E. A printable report detailing all system profiles shall be available via the software.

F. Software shall require all users to login with a User Name and Password.

G. Software shall provide at least three permission levels for users.

H. All sensitive stored information and privileged communication by the software shall be encrypted.

I. All device firmware and system software updates must be available for automatic download and installation via the internet.

J. Software shall be capable of managing systems interconnected via a WAN (wide area network)

## 2.6 BMS COMPATIBILITY

A. System shall provide a BACnet IP gateway as a downloadable software plug-in to its management software.

B. BACnet IP connection shall also be available utilizing JACE-600 hardware unit.

C. BACnet IP hardware shall be capable of supporting up to 1500 total devices across up to 5 total Gateways

D. BACnet IP connection shall communicate information gathered by networked system to other building management systems.

E. BACnet IP connection shall translate and forward lighting relay and other select control commands from BMS system to networked control devices via profiles stored in the system Gateway. All system devices shall be available for polling for devices status.

F. BACnet IP hardware device shall be the following nLight model name:
1. **nBACnet**

## 2.7 SYSTEM ENERGY ANALYSIS AND REPORTING SOFTWARE

A. System shall be capable of reporting lighting system events and performance data back to the management software for display and analysis.

B. Intuitive graphical screens shall be displayed in order to facilitate simple viewing of system energy performance.

C. An "Energy Scorecard" shall be display that shows calculated energy savings in dollars, KWHr, or CO2.

D. Software shall calculate the allocation of energy savings to different control measures (occupancy sensors, photocells, manual switching, etc).

E. Energy savings data shall be calculated for the system as a whole or for individual zones.

F. A time scaled graph showing all relay transitions shall be presented.

G. A time scaled graph showing a zones occupancy time delay shall be presented

H. A time scaled graph showing the total light level shall be presented.

I. User shall be able to customize the baseline run-time hours for a space.

J. User shall be able to customize up to four time-of-day billing rates and schedules.

2.8 START-UP AMD SUPPORT FEATURES

A. To facilitate start-up, all devices daisy-chained together (using CAT-5) shall automatically be grouped together into a functional lighting control zone.

B. All lighting control zones shall be able to function according to default settings once adequate power is applied and before any system software is installed.

C. Once software is installed, system shall be able to auto-discover all system devices without requiring any commissioning.

D. All system devices shall be capable of being given user defined names.

E. All devices within the network shall be able to have their firmware upgraded remotely and without being physically uninstalled for purposes of upgrading functionality at a later date.

F. All sensor devices shall have the ability to detect improper communication wiring and blink it's LED in a specific cadence as to alert installation/startup personnel.

**END OF SECTION 26 09 43**

# SECTION 26 22 00 - LOW-VOLTAGE TRANSFORMERS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes: Dry-type transformers rated 600 V and less, with capacities up to 1500 kVA.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type and size of transformer.
   2. Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer.

B. Shop Drawings:
   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment.
   3. Include diagrams for power, signal, and control wiring.

### 1.4 DELIVERY, STORAGE, AND HANDLING

A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

### 1.5 CLOSEOUT SUBMITTALS

A. Operations and Maintenance Data:
   1. In additions to items specified in Section 01 77 00 “Contract Closeout Procedures,” include the following:
      a. Routine maintenance requirements for transformers
      b. Test reports.

## PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Eaton Corporation; Electrical Sector; Cutler-Hammer Products.
2. General Electric Company.
3. Siemens Industry, Inc.
4. Square D; a brand of Schneider Electric.

C. Source Limitations: Obtain each transformer type from single source from single manufacturer.

2.2 GENERAL TRANSFORMER REQUIREMENTS

A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Transformers Rated 15 kVA and Larger: Comply with DOE 2016 energy-efficiency standards.

D. Cores: Electrical grade, non-aging silicon steel with high permeability and low hysteresis losses.

E. Coils: Continuous windings without splices except for taps.
1. Internal Coil Connections: Brazed or pressure type.
2. Coil Material: Copper.

F. Encapsulation: Transformers smaller than 30 kVA shall have core and coils completely resin encapsulated.

G. Shipping Restraints: Paint or otherwise color code bolts, wedges, blocks, and other restraints that are to be removed after installation and before energizing. Use fluorescent colors that are easily identifiable inside the transformer enclosure.

2.3 DISTRIBUTION TRANSFORMERS

A. Comply with NFPA 70, and list and label as complying with UL 1561.

B. Provide transformers that are constructed to withstand seismic forces.

C. Cores: One leg per phase.

D. Enclosure: Ventilated.

1. NEMA 250, Type 2: Core and coil shall be encapsulated within resin compound utilizing a vacuum pressure impregnation process to seal out moisture and air.
2. KVA Ratings: Based on convection cooling only and not relying on auxiliary fans.

E. Transformer Enclosure Finish: Comply with NEMA 250.
1. Finish Color: Gray.

F. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.

G. Insulation Class, 30 kVA and Larger: 220 deg C, UL-component-recognized insulation system with a maximum of 115 -deg C rise above 40-deg C ambient temperature.

2.4 IDENTIFICATION DEVICES

A. Nameplates: Engraved, laminated-plastic or metal nameplate for each distribution transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 260553 "Identification for Electrical Systems."

## PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.

B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.

C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.

D. Verify that ground connections are in place and requirements in Section 260526 "Grounding and Bonding for Electrical Systems" have been met.

E. Environment: Enclosures shall be rated for the environment in which they are located.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install transformers level and plumb on a concrete base with vibration-dampening supports. Locate transformers away from corners and not parallel to adjacent wall surface.

B. Construct concrete bases according to Section 033000 "Cast-in-Place Concrete" and anchor floor-mounted transformers according to manufacturer's written instructions, seismic codes applicable to Project, and requirements in Section 260529 "Hangers and Supports for Electrical Systems."
1. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

C. Secure transformer to concrete base according to manufacturer's written instructions.

D. Secure covers to enclosure and tighten all bolts to manufacturer-recommended torques to reduce noise generation.

E. Remove shipping bolts, blocking, and wedges.

3.3 CONNECTIONS

A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

D. Provide flexible connections at all conduit and conductor terminations and supports to eliminate sound and vibration transmission to the building structure.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Tests and Inspections:
1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS for dry-type, air-cooled, low-voltage transformers. Certify compliance with test parameters.

C. Remove and replace units that do not pass tests or inspections and retest as specified above.

D. Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

3.5 ADJUSTING

A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 5 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.

**END OF SECTION 26 22 00**

# SECTION 26 24 13 - SWITCHBOARDS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
1. Service and distribution switchboards rated 600 V and less.
2. Surge protection devices.
3. Disconnecting and overcurrent protective devices.
4. Identification.
5. Mimic bus.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each switchboard, overcurrent protective device, surge protection device, ground-fault protector, accessory, and component.
1. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

B. Shop Drawings: For each switchboard and related equipment.
1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Detail short-circuit current rating of switchboards and overcurrent protective devices.
5. Include descriptive documentation of optional barriers specified for electrical insulation and isolation.
6. Detail utility company's metering provisions with indication of approval by utility company.
7. Include evidence of NRTL listing for series rating of installed devices.
8. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
9. Include time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.
10. Include diagram and details of proposed mimic bus.
11. Include schematic and wiring diagrams for power, signal, and control wiring.

C. Samples: Representative portion of mimic bus with specified material and finish, for color selection.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For switchboards and components to include in emergency, operation, and maintenance manuals.
   1. Include the following:
      a. Routine maintenance requirements for switchboards and all installed components.
      b. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
      c. Time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.
      d. Test reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.
   1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver switchboards in sections or lengths that can be moved past obstructions in delivery path.

B. Remove loose packing and flammable materials from inside switchboards and connect factory-installed space heaters to temporary electrical service to prevent condensation.

C. Handle and prepare switchboards for installation according to NECA 400.

1.7 FIELD CONDITIONS

A. Installation Pathway: Remove and replace access fencing, doors, lift-out panels, and structures to provide pathway for moving switchboards into place.

B. Environmental Limitations:
   1. Do not deliver or install switchboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above switchboards is complete, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
   2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
      a. Ambient Temperature: Not exceeding 115 deg F.

C. Unusual Service Conditions: NEMA PB 2, as follows:
   1. Ambient temperatures within limits specified.

D. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
   1. Notify Owner no fewer than  days in advance of proposed interruption of electric service.
   2. Indicate method of providing temporary electric service.

3. Do not proceed with interruption of electric service without Owner's written permission.
4. Comply with NFPA 70E.

1.8 COORDINATION

A. Coordinate layout and installation of switchboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.9 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace switchboard enclosures, buswork, overcurrent protective devices, accessories, and factory installed interconnection wiring that fail in materials or workmanship within specified warranty period.
1. Warranty Period: Three years from date of Substantial Completion.

**PART 2 - PRODUCTS**

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Switchboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation. Shake-table testing shall comply with ICC-ES AC156.
2. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2.2 SWITCHBOARDS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Eaton Corporation; Electrical Sector; Cutler-Hammer Products.
2. General Electric Company; GE Energy - Industrial Solutions; Electrical Distribution and Control Products.
3. Siemens Industry, Inc.
4. Square D; a Brand of Schneider Electric.

C. Source Limitations: Obtain switchboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

D. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboards including clearances between switchboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. Comply with NEMA PB 2.

G. Comply with NFPA 70.

H. Comply with UL 891.

I. Front-Connected, Front-Accessible Switchboards:
   1. Main Devices: Fixed, individually mounted.
   2. Branch Devices: Panel mounted.
   3. Sections front and rear aligned.

J. Nominal System Voltage: 480Y/277 V.

K. Main-Bus Continuous: 1200 A.

L. Seismic Requirements: Fabricate and test switchboards according to IEEE 344 to withstand seismic forces.
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation. Shake-table testing shall comply with ICC-ES AC156.
      a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
      b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

M. Outdoor Enclosures: Type 3R.
   1. Finish: Factory-applied finish in manufacturer's standard color; undersurfaces treated with corrosion-resistant undercoating.
   2. Enclosure: Downward, rearward sloping roof; bolt-on rear covers for each section, with provisions for padlocking.
   3. Power for Space Heaters, Ventilation, Lighting, and Receptacle: Include a control-power transformer, with spare capacity of 25 percent, within the switchboard. Supply voltage shall be 120 V ac.

N. Barriers: Between adjacent switchboard sections.

O. Insulation and isolation for main bus of main section and main and vertical buses of feeder sections.

P. Space Heaters: Factory-installed electric space heaters of sufficient wattage in each vertical section to maintain enclosure temperature above expected dew point.
   1. Space-Heater Control: Thermostats to maintain temperature of each section above expected dew point.
   2. Space-Heater Power Source: Transformer, factory installed in switchboard.

Q. Service Entrance Rating: Switchboards intended for use as service entrance equipment shall contain from one to six service disconnecting means with overcurrent protection, a neutral bus with disconnecting link, a grounding electrode conductor terminal, and a main bonding jumper.

R. Utility Metering Compartment: Barrier compartment and section complying with utility company's requirements; hinged sealable door; buses provisioned for mounting utility company's current transformers and potential transformers or potential taps as required by utility company. If separate vertical section is required for utility metering, match and align with basic switchboard. Provide service entrance label and necessary applicable service entrance features.

S. Customer Metering Compartment: A separate customer metering compartment and section with front hinged door, for indicated metering, and current transformers for each meter. Current transformer secondary wiring shall be terminated on shorting-type terminal blocks. Include potential transformers having primary and secondary fuses with disconnecting means and secondary wiring terminated on terminal blocks.

T. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.

U. Buses and Connections: Three phase, four wire unless otherwise indicated.
   1. Provide phase bus arrangement A, B, C from front to back, top to bottom, and left to right when viewed from the front of the switchboard.
   2. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent conductivity.
   3. Copper feeder circuit-breaker line connections.
   4. Tin-plated aluminum feeder circuit-breaker line connections.
   5. Load Terminals: Insulated, rigidly braced, runback bus extensions, of same material as through buses, equipped with compression connectors for outgoing circuit conductors. Provide load terminals for future circuit-breaker positions at full-ampere rating of circuit-breaker position.
   6. Ground Bus: 1/4-by-2-inch- hard-drawn copper of 98 percent conductivity, equipped with compression connectors for feeder and branch-circuit ground conductors.
   7. Main-Phase Buses and Equipment-Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections. Provide for future extensions from both ends.
   8. Disconnect Links:
      a. Isolate neutral bus from incoming neutral conductors.
      b. Bond neutral bus to equipment-ground bus for switchboards utilized as service equipment or separately derived systems.
   9. Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with compression connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.
   10. Isolation Barrier Access Provisions: Permit checking of bus-bolt tightness.

V. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.

2.3 SURGE PROTECTION DEVICES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Advanced Protection Technologies, Inc.
2. Eaton Corporation; Electrical Sector; Cutler-Hammer Products.
3. General Electric Company; GE Energy - Industrial Solutions; Electrical Distribution and Control Products.
4. Siemens Industry, Inc.
5. Square D; a Brand of Schneider Electric.

C. SPDs: Comply with UL 1449.

D. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 200 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

E. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V, three-phase, four-wire circuits shall not exceed the following:
1. Line to Neutral: 1200 V for 480Y/277 V.
2. Line to Ground: 1200 V for 480Y/277 V.
3. Line to Line: 2000 V for 480Y/277 V.

F. SCCR: Equal or exceed 100 kA.

G. Nominal Rating: 20 kA.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
1. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:
   a. Instantaneous trip.
   b. Long- and short-time pickup levels.
   c. Long and short time adjustments.
   d. Ground-fault pickup level, time delay, and I2t response.
2. MCCB Features and Accessories:
   a. Standard frame sizes, trip ratings, and number of poles.
   b. Lugs: Compression style, suitable for number, size, trip ratings, and conductor material.
   c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.

d. Ground-Fault Protection: relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
e. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.
f. Communication Capability: Integral communication module with functions and features compatible with power monitoring and control system specified in Section 260913 "Electrical Power Monitoring and Control."
g. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
h. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
i. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.

2.5 IDENTIFICATION

A. Mimic Bus: Entire single-line switchboard bus work, as depicted on factory record drawing, on an engraved laminated-plastic (Gravoply) nameplate.
1. Nameplate: At least 0.0625-inch- thick laminated plastic (Gravoply), located at eye level on front cover of the switchboard incoming service section.

B. Coordinate mimic-bus segments with devices in switchboard sections to which they are applied. Produce a concise visual presentation of principal switchboard components and connections.

C. Presentation Media: Painted graphics in color contrasting with background color to represent bus and components, complete with lettered designations.

D. Service Equipment Label: NRTL labeled for use as service equipment for switchboards with one or more service disconnecting and overcurrent protective devices.

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Receive, inspect, handle, and store switchboards according to NECA 400.
1. Lift or move panelboards with spreader bars and manufacturer-supplied lifting straps following manufacturer's instructions.
2. Use rollers, slings, or other manufacturer-approved methods if lifting straps are not furnished.
3. Protect from moisture, dust, dirt, and debris during storage and installation.
4. Install temporary heating during storage per manufacturer's instructions.

B. Examine switchboards before installation. Reject switchboards that are moisture damaged or physically damaged.

C. Examine elements and surfaces to receive switchboards for compliance with installation tolerances and other conditions affecting performance of the Work or that affect the performance of the equipment.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install switchboards and accessories according to NECA 400.

B. Equipment Mounting: Install switchboards on concrete base, 4-inch nominal thickness. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."
   1. Install conduits entering underneath the switchboard, entering under the vertical section where the conductors will terminate. Install with couplings flush with the concrete base. Extend 2 inches above concrete base after switchboard is anchored in place.
   2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
   3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
   4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   5. Install anchor bolts to elevations required for proper attachment to switchboards.
   6. Anchor switchboard to building structure at the top of the switchboard if required or recommended by the manufacturer.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, straps and brackets, and temporary blocking of moving parts from switchboard units and components.

D. Comply with mounting and anchoring requirements specified in Structural Drawings.

E. Operating Instructions: Frame and mount the printed basic operating instructions for switchboards, including control and key interlocking sequences and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of switchboards.

F. Install filler plates in unused spaces of panel-mounted sections.

G. Install overcurrent protective devices, surge protection devices, and instrumentation.
   1. Set field-adjustable switches and circuit-breaker trip ranges.

H. Comply with NECA 1.

3.3 CONNECTIONS

A. Bond conduits entering underneath the switchboard to the equipment ground bus with a bonding conductor sized per NFPA 70.

B. Support and secure conductors within the switchboard according to NFPA 70.

C. Extend insulated equipment grounding cable to busway ground connection and support cable at intervals in vertical run.

3.4 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs and Arc Flash labeling complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Switchboard Nameplates: Label each switchboard compartment with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

C. Device Nameplates: Label each disconnecting and overcurrent protective device and each meter and control device mounted in compartment doors with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Switchboard will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports, including a certified report that identifies switchboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as indicated.

3.7 PROTECTION

A. Temporary Heating: Apply temporary heat, to maintain temperature according to manufacturer's written instructions, until switchboard is ready to be energized and placed into service.

3.8 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain switchboards, overcurrent protective devices, instrumentation, and accessories.

**END OF SECTION 26 24 13**

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# SECTION 26 24 16 - PANELBOARDS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
   1. Lighting and appliance branch-circuit panelboards.

### 1.3 DEFINITIONS

A. ATS: Acceptance testing specification.

B. GFCI: Ground-fault circuit interrupter.

C. GFEP: Ground-fault equipment protection.

D. HID: High-intensity discharge.

E. MCCB: Molded-case circuit breaker.

F. SPD: Surge protective device.

G. VPR: Voltage protection rating.

### 1.4 ACTION SUBMITTALS

A. Product Data: For each type of panelboard.
   1. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.
   2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.
   1. Include dimensioned plans, elevations, sections, and details.
   2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.
   3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
   4. Detail bus configuration, current, and voltage ratings.
   5. Short-circuit current rating of panelboards and overcurrent protective devices.
   6. Include evidence of NRTL listing for series rating of installed devices.
   7. Include evidence of NRTL listing for SPD as installed in panelboard.
   8. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

9. Include wiring diagrams for power, signal, and control wiring.
10. Key interlock scheme drawing and sequence of operations.
11. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device. Include an Internet link for electronic access to downloadable PDF of the coordination curves.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
   1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
   2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

B. Test reports.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation according to NECA 407.

1.7 FIELD CONDITIONS

A. Environmental Limitations:
   1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
   2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
      a. Ambient Temperature: Not exceeding minus 22 deg F to plus 104 deg F.

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
   1. Ambient temperatures within limits specified.

1.8 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.
   1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

## PART 2 - PRODUCTS

2.1 PANELBOARDS REQUIREMENTS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70.

F. Enclosures: Surface-mounted, dead-front cabinets.
   1. Rated for environmental conditions at installed location.
      a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
      b. Outdoor Locations: NEMA 250, Type 3R.
   2. Height: 84 inches maximum.
   3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.
   4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
   5. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
   6. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
   7. Finishes:
      a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
      b. Back Boxes: Same finish as panels and trim.
      c. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components.

G. Incoming Mains:
   1. Location: Convertible between top and bottom.
   2. Main Breaker: Main lug interiors up to 400 amperes shall be field convertible to main breaker.

H. Phase, Neutral, and Ground Buses:
   1. Material: Hard-drawn copper, 98 percent conductivity.
      a. Plating shall run entire length of bus.
      b. Bus shall be fully rated the entire length.
   2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.

3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
4. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.
5. Insert optional features.

I. Conductor Connectors: Suitable for use with conductor material and sizes.
1. Material: Hard-drawn copper, 98 percent conductivity.
2. Terminations shall allow use of 75 deg C rated conductors without derating.
3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
4. Main and Neutral Lugs: Compression type, with a lug on the neutral bar for each pole in the panelboard.
5. Ground Lugs and Bus-Configured Terminators: Compression type, with a lug on the bar for each pole in the panelboard.
6. Feed-Through Lugs: Compression type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
7. Subfeed (Double) Lugs: Compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
8. Insert optional features.

J. NRTL Label: Panelboards shall be labeled by an NRTL acceptable to authority having jurisdiction.

K. Future Devices: Panelboards shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
1. Percentage of Future Space Capacity: Ten percent.

L. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.
1. Panelboards and overcurrent protective devices rated 240 V or less shall have short-circuit ratings as shown on drawings, but not less than as required by short circuit study.
2. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V shall have short-circuit ratings as shown on drawings, but not less than as required by short circuit study.

## 2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

B. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 1.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Eaton Electrical Sector; Eaton Corporation.
   2. General Electric Company; GE Energy Management - Electrical Distribution.
   3. Siemens Energy.
   4. Square D; by Schneider Electric.

C. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

D. Mains: Circuit breaker or lugs only.

E. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

F. Doors: Door-in-door construction with concealed hinges; secured with multipoint latch with tumbler lock; keyed alike. Outer door shall permit full access to the panel interior. Inner door shall permit access to breaker operating handles and labeling, but current carrying terminals and bus shall remain concealed.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Eaton Electrical Sector; Eaton Corporation.
   2. General Electric Company; GE Energy Management - Electrical Distribution.
   3. Siemens Energy.
   4. Square D; by Schneider Electric.

C. MCCB: Comply with UL 489, with series-connected rating to meet available fault currents.
   1. Thermal-Magnetic Circuit Breakers:
      a. Inverse time-current element for low-level overloads.
      b. Instantaneous magnetic trip element for short circuits.
      c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
   2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
   3. Subfeed Circuit Breakers: Vertically mounted.
   4. MCCB Features and Accessories:
      a. Standard frame sizes, trip ratings, and number of poles.
      b. Breaker handle indicates tripped status.
      c. Lugs: Compression style, suitable for number, size, trip ratings, and conductor materials.

d. Rating Plugs: Three-pole breakers with ampere ratings greater than 150 amperes shall have interchangeable rating plugs or electronic adjustable trip units.

2.5 IDENTIFICATION

A. Panelboard Label: Arc Flash Label, manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.

B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.

C. Circuit Directory: Directory card inside panelboard door, mounted in transparent card holder.
1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

D. Circuit Directory: Computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.
1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.

B. Receive, inspect, handle, and store panelboards according to NECA 407.

C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.

D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Comply with NECA 1.

C. Install panelboards and accessories according to NECA 407.

D. Equipment Mounting:
   1. Attach panelboard to the vertical finished or structural surface behind the panelboard.
   2. Comply with requirements for seismic control devices specified in Section 260548.16 "Seismic Controls for Electrical Systems."

E. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

F. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."

G. Mount top of trim 90 inches above finished floor unless otherwise indicated.

H. Mount panelboard cabinet plumb and rigid without distortion of box.

I. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

J. Mounting panelboards with space behind is recommended for damp, wet, or dirty locations. The steel slotted supports in the following paragraph provide an even mounting surface and the recommended space behind to prevent moisture or dirt collection.

K. Mount surface-mounted panelboards to steel slotted supports 5/8 inch in depth. Orient steel slotted supports vertically.

L. Install overcurrent protective devices and controllers not already factory installed.
   1. Set field-adjustable, circuit-breaker trip ranges.
   2. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.

M. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.

N. Install filler plates in unused spaces.

O. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

## 3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

E. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

## 3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Acceptance Testing Preparation:
   1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.

C. Tests and Inspections:
   1. Perform visual inspection for low-voltage air circuit breakers stated in NETA ATS, Paragraph 7.6 Circuit Breakers. Optional tests. Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

## 3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as indicated

C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes. Prior to making circuit changes to achieve load balancing, inform Architect of effect on phase color coding.
   1. Measure loads during period of normal facility operations.
   2. Perform circuit changes to achieve load balancing outside normal facility operation schedule or at times directed by the Architect. Avoid disrupting services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
   3. After changing circuits to achieve load balancing, recheck loads during normal facility operations. Record load readings before and after changing circuits to achieve load balancing.

4. Tolerance: Maximum difference between phase loads, within a panelboard, shall not exceed 20 percent.

3.6 PROTECTION

A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature according to manufacturer's written instructions.

**END OF SECTION 26 24 16**

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# SECTION 26 27 13 - ELECTRICITY METERING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section includes equipment for electricity metering by utility company .

### 1.3 DEFINITIONS

A. KY Pulse: Term used by the metering industry to describe a method of measuring consumption of electricity that is based on a relay opening and closing in response to the rotation of the disk in the meter.

B. PC: Personal computer.

### 1.4 COORDINATION

A. Electrical Service Connections: Coordinate with utility companies and components they furnish as follows:
   1. Comply with requirements of utilities providing electrical power services.
   2. Coordinate installation and connection of utilities and services, including provision for electricity-metering components.

## PART 2 - PRODUCTS

### 2.1 EQUIPMENT FOR ELECTRICITY METERING BY UTILITY COMPANY

A. Meters will be furnished by utility company.

B. Current-Transformer Cabinets: Comply with requirements of electrical-power utility company.

C. Meter Sockets: Comply with requirements of electrical-power utility company.

D. Meter Sockets: Steady-state and short-circuit current ratings shall meet indicated circuit ratings.

## PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with equipment installation requirements in NECA 1.

3.2 IDENTIFICATION

A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
   1. Series Combination Warning Label: Self-adhesive type, with text as required by NFPA 70.
   2. Equipment Identification Labels: Adhesive film labels with clear protective overlay. For residential meters, provide an additional card holder suitable for printed, weather-resistant card with occupant's name.

**END OF SECTION 26 27 13**

# SECTION 26 27 26 - WIRING DEVICES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
1. Straight-blade convenience and tamper-resistant receptacles.
2. USB charger devices.
3. GFCI receptacles.
4. Hazardous (classified) location receptacles.
5. Cord and plug sets.
6. Toggle switches.
7. Decorator-style convenience.
8. Wall plates.

### 1.3 DEFINITIONS

A. Abbreviations of Manufacturers' Names:
1. Cooper: Cooper Wiring Devices; Division of Cooper Industries, Inc.
2. Hubbell: Hubbell Incorporated: Wiring Devices-Kellems.
3. Leviton: Leviton Mfg. Company, Inc.
4. Pass & Seymour: Pass& Seymour/Legrand.

B. BAS: Building automation system.

C. EMI: Electromagnetic interference.

D. GFCI: Ground-fault circuit interrupter.

E. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

F. RFI: Radio-frequency interference.

G. SPD: Surge protective device.

H. UTP: Unshielded twisted pair.

### 1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

**PART 2 - PRODUCTS**

2.1 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
2. Devices shall comply with the requirements in this Section.

D. Devices for Owner-Furnished Equipment:
1. Receptacles: Match plug configurations.
2. Cord and Plug Sets: Match equipment requirements.

E. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 STRAIGHT-BLADE RECEPTACLES

A. Duplex Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.; Commercial Grade Receptacles 20A-125V NEMA 5-20R - BR20Industrial Grade Receptacles 20A-125V NEMA 5-20R - 5352, 5352__M, 5342, 5351Weather Resistant Commercial Grade Receptacles 20A-125V NEMA 5-20R - WRBR20.
b. Leviton Manufacturing Co., Inc.; 5891 (single), 5352 (duplex).
c. Pass & Seymour/Legrand (Pass & Seymour); 5361 (single), 5362 (duplex).

2.3 GFCI RECEPTACLES

A. General Description:
1. 125 V, 20 A, straight blade, non-feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 943 Class A, and FS W-C-596.

3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles:
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.; .
b. Hubbell Incorporated; Wiring Device-Kellems; .
c. Leviton Manufacturing Co., Inc.; 7590.

## 2.4 CORD AND PLUG SETS

A. Description:
1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

## 2.5 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:
1. Single Pole:
a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
1) Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.; AH1221 AC Quiet Toggle Switches.
2) Hubbell Incorporated; Wiring Device-Kellems; HBL1221.
3) Leviton Manufacturing Co., Inc.; 1221-2.
2. Three Way:
a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
1) Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.; AH1223.
2) Hubbell Incorporated; Wiring Device-Kellems; HBL1223.
3) Leviton Manufacturing Co., Inc.; 1223-2.

## 2.6 DECORATOR-STYLE DEVICES

A. Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.; Decorator Commercial Grade Receptacles 15A-125V NEMA 5-15R - 6252, 6250Decorator Receptacles - 1107.
b. Leviton Manufacturing Co., Inc.; 16252.

B. Toggle Switches: Square Face, 120/277 V, 15 A; comply with NEMA WD 1, UL 20, and FS W-S-896.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.; 7621 (single pole), 7623 (three way).
      b. Hubbell Incorporated; Wiring Device-Kellems; DS120.
      c. Leviton Manufacturing Co., Inc.; 5621-2 (single pole), 5623-2 (three way).

2.7 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.
   1. Plate-Securing Screws: Metal with head color to match plate finish.
   2. Material for Finished Spaces: Steel with white baked enamel, suitable for field painting.
   3. Material for Unfinished Spaces: Galvanized steel.
   4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

RFI 0546 — *Wiring Device Covers and Labeling*

*See RFI 0546 for specific wiring device covers and labeling.*

2.8 FINISHES

A. Device Color:
   1. Wiring Devices Connected to Normal Power System: White unless otherwise indicated or required by NFPA 70 or device listing.
   2. Wiring Devices Connected to UPS Power System: Red.

B. Wall Plate Color: For plastic covers, match device color.

C. Labels: Receptacles and switches coverplates shall be labeled with engraved etching indicating circuit # and panel name.

**PART 3 - EXECUTION**

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:
   1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
   2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
   3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
   4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:
   1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
   2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
   3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
   4. Existing Conductors:
      a. Cut back and pigtail, or replace all damaged conductors.
      b. Straighten conductors that remain and remove corrosion and foreign matter.
      c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:
   1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
   2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
   3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
   4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
   5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
   6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
   7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
   8. Tighten unused terminal screws on the device.
   9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:
   1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

H. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

A. Comply with Section 260553 "Identification for Electrical Systems."

B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black -filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.4 FIELD QUALITY CONTROL

A. Test Instruments: Use instruments that comply with UL 1436.

B. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

C. Perform the following tests and inspections:
1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

D. Tests for Convenience Receptacles:
1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

E. Wiring device will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

**END OF SECTION 26 27 26**

# SECTION 26 28 16 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
1. Fusible switches.
2. Nonfusible switches.
3. Enclosures.

### 1.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

### 1.4 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Include evidence of NRTL listing for series rating of installed devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
1. Wiring Diagrams: For power, signal, and control wiring.

### 1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.
1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
   1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.

1.7 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

**PART 2 - PRODUCTS**

2.1 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
   2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
   3. Siemens Energy & Automation, Inc.
   4. Square D; a brand of Schneider Electric.

C. Type GD, General Duty, Single Throw, 240-V ac, 800 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with cartridge fuse interiors to accommodate indicated fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

D. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

E. Accessories:
   1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.

2.2 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
   2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.

3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

C. Type GD, General Duty, Single Throw, 600 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

D. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

E. Accessories:
1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.

2.3 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7.

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

C. Install fuses in fusible devices.

D. Comply with NECA 1.

3.3 IDENTIFICATION

A. Comply with requirements in Section 260553 "Identification for Electrical Systems."
1. Identify field-installed conductors, interconnecting wiring, and components; provide arc flash warning signs.

2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Acceptance Testing Preparation:
1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:
1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

**END OF SECTION 26 28 16**

# SECTION 26 51 19 - LED INTERIOR LIGHTING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
1. Interior solid-state luminaires that use LED technology.
2. Lighting fixture supports.

B. Related Requirements:
1. Section 260943 "Network Lighting Controls" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

### 1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. LED: Light-emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

### 1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaires.
4. Include emergency lighting units, including batteries and chargers.
5. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
6. Photometric data and adjustment factors based on laboratory tests IES LM-79.
   a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

B. Shop Drawings: For nonstandard or custom luminaires.
1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Sample warranty.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Lamps: Ten for every 100 of each type and rating installed. Furnish at least one of each type.
2. Diffusers and Lenses: One for every 25 of each type and rating installed. Furnish at least one of each type.
3. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.8 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

B. Warranty Period: Five year(s) from date of Substantial Completion.

1.9 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:
1. In addition to items specified in 01 77 00 “Contract Closeout Procedures,” include the following:
a. Parts list.
b. Test reports.

## PART 2 - PRODUCTS

2.1 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Recessed Fixtures: Comply with NEMA LE 4.

C. Bulb shape complying with ANSI C79.1.

D. Rated lamp life of 50,000 hours.

E. Lamps dimmable from 100 percent to 0 percent of maximum light output.

F. Internal driver.

G. Nominal Operating Voltage: 277 V ac.

2.2 LOWBAY

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Lithonia Lighting; Acuity Brands Lighting, Inc.

C. Universal mounting bracket.

2.3 RECESSED LINEAR

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Lithonia Lighting; Acuity Brands Lighting, Inc.

C. Integral junction box with conduit fittings.

2.4 STRIP LIGHT

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Lithonia Lighting; Acuity Brands Lighting, Inc.

C. Integral junction box with conduit fittings.

2.5 MATERIALS

A. Metal Parts:
1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

2.6 LUMINAIRE FIXTURE SUPPORT COMPONENTS

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage .

D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before fixture installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports:
1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Provide support for luminaire without causing deflection of ceiling or wall.

4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.

E. Flush-Mounted Luminaire Support:
1. Secured to outlet box.
2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
3. Trim ring flush with finished surface.

F. Wall-Mounted Luminaire Support:
1. Attached to structural members in walls.
2. Do not attach luminaires directly to gypsum board.

G. Suspended Luminaire Support:
1. Pendants and Rods: Where longer than 48 inches , brace to limit swinging.
2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of luminaire chassis, including one at each end.
4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

H. Ceiling-Grid-Mounted Luminaires:
1. Secure to any required outlet box.
2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

I. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

**END OF SECTION 26 51 19**

# SECTION 26 52 19 - EMERGENCY AND EXIT LIGHTING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
   1. Exit signs.

### 1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Emergency Lighting Unit: A lighting unit with internal or external emergency battery powered supply and the means for controlling and charging the battery and unit operation.

D. Fixture: See "Luminaire" Paragraph.

E. Lumen: Measured output of lamp and luminaire, or both.

F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

### 1.4 ACTION SUBMITTALS

A. Product Data: For each type of emergency lighting unit, exit sign, and emergency lighting support.
   1. Include data on features, accessories, and finishes.
   2. Include physical description of the unit and dimensions.
   3. Battery and charger for light units.
   4. Include life, output of luminaire (lumens, CCT, and CRI), and energy-efficiency data.

B. Shop Drawings: For nonstandard or custom luminaires.
   1. Include plans, elevations, sections, and mounting and attachment details.
   2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Include diagrams for power, signal, and control wiring.

### 1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.6 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Two year(s) from date of Substantial Completion.

1.7 CLOSEOUT SUBMITTAL

A. Operation and Maintenance Data:
   1. In addition to items specified in 01 77 00 “Contract Closeout Procedures,” include the following:
      a. Parts list.
      b. Test reports.

**PART 2 - PRODUCTS**

2.1 GENERAL REQUIREMENTS FOR EMERGENCY LIGHTING

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NRTL Compliance: Fabricate and label emergency lighting units, exit signs, and batteries to comply with UL 924.

C. Comply with NFPA 70 and NFPA 101.

D. Internal Type Emergency Power Unit: Self-contained, modular, battery-inverter unit, factory mounted within luminaire body and compatible with ballast.
   1. Emergency Connection: Operate one lamp(s) continuously upon loss of normal power. Connect unswitched circuit to battery-inverter unit and switched circuit to luminaire ballast.
   2. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
   3. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
      a. Ambient Temperature: Less than 0 deg F or exceeding 104 deg F, with an average value exceeding 95 deg F over a 24-hour period.
      b. Ambient Storage Temperature: Not less than minus 4 deg F and not exceeding 140 deg F.
      c. Humidity: More than 95 percent (condensing).
      d. Altitude: Exceeding 2000 feet.
   4. Test Push-Button and Indicator Light: Visible and accessible without opening luminaire or entering ceiling space.
      a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
      b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

5. Battery: Sealed, maintenance-free, nickel-cadmium type.
6. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
7. Remote Test: Switch in handheld remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
8. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

## 2.2 EXIT SIGNS

A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. Amerlux.
   b. Cooper Lighting.
   c. Lithonia Lighting; Acuity Brands Lighting, Inc.
3. Operating at nominal voltage of 277 V ac.
4. Lamps for AC Operation: LEDs; 50,000 hours minimum rated lamp life.
5. Self-Powered Exit Signs (Battery Type): Internal emergency power unit.

## 2.3 MATERIALS

A. Metal Parts:
1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Housings:
1. Extruded aluminum housing and heat sink.

## 2.4 METAL FINISHES

A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for conditions affecting performance of luminaires.

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.

C. Examine walls, floors, roofs, and ceilings for suitable conditions where emergency lighting luminaires will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports:
1. Sized and rated for luminaire and emergency power unit weight.
2. Able to maintain luminaire position when testing emergency power unit.
3. Provide support for luminaire and emergency power unit without causing deflection of ceiling or wall.
4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire and emergency power unit weight and vertical force of 400 percent of luminaire weight.

E. Wall-Mounted Luminaire Support:
1. Attached to structural members in walls.
2. Do not attach luminaires directly to gypsum board.

F. Ceiling Grid Mounted Luminaires:
1. Secure to any required outlet box.
2. Secure emergency power unit using approved fasteners in a minimum of four locations, spaced near corners of emergency power unit.
3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.4 ADJUSTING

A. Adjustments: Within 12 months of date of Substantial Completion, provide on-site visit to do the following:

1. Inspect all luminaires. Replace lamps, emergency power units or luminaires that are defective.
   a. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
2. Conduct short-duration tests on all emergency lighting.

**END OF SECTION 26 52 19**

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# SECTION 26 56 00 - EXTERIOR LIGHTING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
   1. Poles and accessories.

### 1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color-rendering index.

C. LER: Luminaire efficacy rating.

D. Luminaire: Complete lighting fixture, including ballast housing if provided.

E. Pole: Luminaire support structure, including tower used for large area illumination.

F. Standard: Same definition as "Pole" above.

### 1.4 ACTION SUBMITTALS

A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:
   1. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.
   2. Details of attaching luminaires and accessories.
   3. Details of installation and construction.
   4. Luminaire materials.
   5. Photometric data based on laboratory tests of each luminaire type, complete with indicated lamps, ballasts, and accessories.
      a. Testing Agency Certified Data: For indicated luminaires, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
      b. Manufacturer Certified Data: Photometric data shall be certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
   6. Photoelectric relays.
   7. Ballasts, including energy-efficiency data.
   8. Lamps, including life, output, CCT, CRI, lumens, and energy-efficiency data.
   9. Materials, dimensions, and finishes of poles.

10. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.
11. Anchor bolts for poles.
12. Manufactured pole foundations.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Anchor-bolt templates keyed to specific poles and certified by manufacturer.
3. Design calculations, certified by a qualified professional engineer, indicating strength of screw foundations and soil conditions on which they are based.
4. Wiring Diagrams: For power, signal, and control wiring.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Package aluminum poles for shipping according to ASTM B 660.

B. Retain factory-applied pole wrappings on metal poles until right before pole installation. For poles with nonmetallic finishes, handle with web fabric straps.

1.6 CLOSEOUT SUBMITTALS

A. Test reports.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, product(s) indicated on Drawings.

2.2 GENERAL REQUIREMENTS FOR POLES AND SUPPORT COMPONENTS

A. Structural Characteristics: Comply with AASHTO LTS-4-M.
1. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in "Structural Analysis Criteria for Pole Selection" Article.

B. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.

C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.
1. Materials: Shall not cause galvanic action at contact points.
2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.
3. Anchor-Bolt Template: Plywood or steel.

D. Handhole: Oval-shaped, with minimum clear opening of 2-1/2 by 5 inches, with cover secured by stainless-steel captive screws.

E. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."

F. Power-Installed Screw Foundations: Factory fabricated by pole manufacturer, with structural steel complying with ASTM A 36/A 36M and hot-dip galvanized according to ASTM A 123/A 123M; and with top-plate and mounting bolts to match pole base flange and strength required to support pole, luminaire, and accessories.

## 2.3 ALUMINUM POLES

A. Poles: Seamless, extruded structural tube complying with ASTM B 429/B 429M, Alloy 6063-T6 with access handhole in pole wall.

B. Poles: ASTM B 209, 5052-H34 marine sheet alloy with access handhole in pole wall.
   1. Shape: Round, straight.
   2. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.

C. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.

D. Grounding and Bonding Lugs: Welded 1/2-inch threaded lug, complying with requirements in Section 260526 "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.

E. Brackets for Luminaires: Detachable, with pole and adapter fittings of cast aluminum. Adapter fitting welded to pole and bracket, then bolted together with stainless-steel bolts.
   1. Tapered oval cross section, with straight tubular end section to accommodate luminaire.
   2. Finish: Same as pole.

## 2.4 POLE ACCESSORIES

A. Duplex Receptacle: 120 V, 20 A in a weatherproof assembly complying with Section 262726 "Wiring Devices" for ground-fault circuit-interrupter type.
   1. Recessed, 12 inches above finished grade.
   2. Nonmetallic polycarbonate plastic or reinforced fiberglass, weatherproof in use, cover, color to match pole, that when mounted results in NEMA 250, Type 3R enclosure.
   3. With cord opening.
   4. With lockable hasp and latch that complies with OSHA lockout and tag-out requirements.

**PART 3 - EXECUTION**

3.1 POLE INSTALLATION

A. Alignment: Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.

B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features unless otherwise indicated on Drawings:
1. Fire Hydrants and Storm Drainage Piping: 60 inches.
2. Water, Gas, Electric, Communication, and Sewer Lines: 10 feet.
3. Trees: 15 feet from tree trunk.

C. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Section 033000 "Cast-in-Place Concrete."

D. Raise and set poles using web fabric slings (not chain or cable).

3.2 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.3 GROUNDING

A. Ground metal poles and support structures according to Section 260526 "Grounding and Bonding for Electrical Systems."
1. Install grounding electrode for each pole unless otherwise indicated.
2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

B. Ground nonmetallic poles and support structures according to Section 260526 "Grounding and Bonding for Electrical Systems."
1. Install grounding electrode for each pole.
2. Install grounding conductor and conductor protector.
3. Ground metallic components of pole accessories and foundations.

3.4 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.
1. Verify operation of photoelectric controls.

C. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

**END OF SECTION 26 56 00**

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# SECTION 27 05 26 - GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
1. Grounding conductors.
2. Grounding connectors.
3. Grounding busbars.
4. Grounding labeling.

### 1.3 DEFINITIONS

A. BCT: Bonding conductor for telecommunications.

B. EMT: Electrical metallic tubing.

C. TGB: Telecommunications grounding busbar.

D. TMGB: Telecommunications main grounding busbar.

### 1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For communications equipment room signal reference grid. Include plans, elevations, sections, details, and attachments to other work.

### 1.5 CLOSEOUT SUBMITTALS

A. Test reports.

## PART 2 - PRODUCTS

### 2.1 SYSTEM COMPONENTS

A. Comply with J-STD-607-A.

### 2.2 CONDUCTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Harger Lightning and Grounding.
2. Panduit Corp.
3. Tyco Electronics Corp.

B. Comply with UL 486A-486B.

C. Insulated Conductors: Stranded copper wire, green or green with yellow stripe insulation, insulated for 600 V, and complying with UL 83.
   1. Ground wire for custom-length equipment ground jumpers shall be No. 6 AWG, 19-strand, UL-listed, Type THHN wire.
   2. Cable Tray Equipment Grounding Wire: No. 8 AWG.

D. Cable Tray Grounding Jumper:
   1. Not smaller than No. 10 AWG and not longer than 12 inches. If jumper is a wire, it shall have a crimped grounding lug with one hole and standard barrel for one crimp. If jumper is a flexible braid, it shall have a one- or two-hole ferrule. Attach with grounding screw or connector provided by cable tray manufacturer.

E. Bare Copper Conductors:
   1. Solid Conductors: ASTM B 3.
   2. Stranded Conductors: ASTM B 8.
   3. Tinned Conductors: ASTM B 33.
   4. Bonding Cable: 28 kcmils, 14 strands of No. 17 AWG conductor, and 1/4 inch in diameter.
   5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
   6. Bonding Jumper: Tinned-copper tape, braided conductors terminated with two-hole copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.3 CONNECTORS

A. Irreversible connectors listed for the purpose. Listed by an NRTL as complying with NFPA 70 for specific types, sizes, and combinations of conductors and other items connected. Comply with UL 486A-486B.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

C. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Burndy; Part of Hubbell Electrical Systems.
   2. Chatsworth Products, Inc.
   3. Harger Lightning and Grounding.
   4. Panduit Corp.

D. Compression Wire Connectors: Crimp-and-compress connectors that bond to the conductor when the connector is compressed around the conductor. Comply with UL 467.
   1. Electroplated tinned copper, C and H shaped.

E. Busbar Connectors: Cast silicon bronze, solderless compression-type, mechanical connector; with a long barrel and two holes spaced on 5/8- or 1-inch centers for a two-bolt connection to the busbar.

2.4 GROUNDING BUSBARS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Chatsworth Products, Inc.
2. Harger Lightning and Grounding.
3. Panduit Corp.

C. TMGB: Predrilled, wall-mounted, rectangular bars of hard-drawn solid copper, 1/4 by 4 inches in cross section, length as indicated on Drawings. The busbar shall be NRTL listed for use as TMGB and shall comply with J-STD-607-A.
1. Predrilling shall be with holes for use with lugs specified in this Section.
2. Mounting Hardware: Stand-off brackets that provide a 4-inchclearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.
3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.

D. TGB: Predrilled rectangular bars of hard-drawn solid copper, 1/4 by 2 inches in cross section, length as indicated on Drawings. The busbar shall be for wall mounting, shall be NRTL listed as complying with UL 467, and shall comply with J-STD-607-A.
1. Predrilling shall be with holes for use with lugs specified in this Section.
2. Mounting Hardware: Stand-off brackets that provide at least a 2-inchclearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.
3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.

2.5 LABELING

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Brother International Corporation.
2. Panduit Corp.

B. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Examine the ac grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of the electrical system.

B. Inspect the test results of the ac grounding system measured at the point of BCT connection.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with connection of the BCT only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Bonding shall include the ac utility power service entrance, the communications cable entrance, and the grounding electrode system. The bonding of these elements shall form a loop so that each element is connected to at least two others.

B. Comply with NECA 1.

C. Comply with J-STD-607-A.

3.3 APPLICATION

A. Conductors: Install solid conductor for No. 8 AWG and smaller and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
   1. The bonding conductors between the TGB and structural steel of steel-frame buildings shall not be smaller than No. 6 AWG.
   2. The bonding conductors between the TMGB and structural steel of steel-frame buildings shall not be smaller than No. 6 AWG.

B. Conductor Terminations and Connections:
   1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
   2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
   3. Connections to Ground Rods at Test Wells: Bolted connectors.
   4. Connections to Structural Steel: Welded connectors.

C. Conductor Support:
   1. Secure grounding and bonding conductors at intervals of not less than 36 inches

D. Grounding and Bonding Conductors:
   1. Install in the straightest and shortest route between the origination and termination point, and no longer than required. The bend radius shall not be smaller than eight times the diameter of the conductor. No one bend may exceed 90 degrees.
   2. Install without splices.
   3. Support at not more than 36-inch intervals.

4. Install grounding and bonding conductors in 3/4-inch PVC conduit until conduit enters a telecommunications room. The grounding and bonding conductor pathway through a plenum shall be in EMT. Conductors shall not be installed in EMT unless otherwise indicated.
    a. If a grounding and bonding conductor is installed in ferrous metallic conduit, bond the conductor to the conduit using a grounding bushing that complies with requirements in Section 270528 "Pathways for Communications Systems," and bond both ends of the conduit to a TGB.

3.4 GROUNDING ELECTRODE SYSTEM

A. The BCT between the TMGB and the ac service equipment ground shall not be smaller than No. 3/0 AWG.

3.5 GROUNDING BUSBARS

A. Indicate locations of grounding busbars on Drawings. Install busbars horizontally, on insulated spacers 2 inches minimum from wall, 12 inches above finished floor unless otherwise indicated.

B. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

3.6 CONNECTIONS

A. Bond metallic equipment in a telecommunications equipment room to the grounding busbar in that room, using equipment grounding conductors not smaller than No. 6 AWG.

B. Stacking of conductors under a single bolt is not permitted when connecting to busbars.

C. Assemble the wire connector to the conductor, complying with manufacturer's written instructions and as follows:
    1. Use crimping tool and the die specific to the connector.
    2. Pretwist the conductor.
    3. Apply an antioxidant compound to all bolted and compression connections.

D. Primary Protector: Bond to the TMGB with insulated bonding conductor.

E. Interconnections: Interconnect all TGBs with the TMGB with the telecommunications backbone conductor. If more than one TMGB is installed, interconnect TMGBs using the grounding equalizer conductor. The telecommunications backbone conductor and grounding equalizer conductor size shall not be less than 2 kcmils/linear foot of conductor length, up to a maximum size of No. 3/0 AWG unless otherwise indicated.

F. Telecommunications Enclosures and Equipment Racks: Bond metallic components of enclosures to the telecommunications bonding and grounding system. Install vertically mounted rack grounding busbar unless the enclosure and rack are manufactured with the busbar. Bond the equipment grounding busbar to the TGB No. 2 AWG bonding conductors.

G. Structural Steel: Where the structural steel of a steel frame building is readily accessible within the room or space, bond each TGB and TMGB to the vertical steel of the building frame.

H. Electrical Power Panelboards: Where an electrical panelboard for telecommunications equipment is located in the same room or space, bond each TGB to the ground bar of the panelboard.

I. Rack- and Cabinet-Mounted Equipment: Bond powered equipment chassis to the cabinet or rack grounding bar. Power connection shall comply with NFPA 70; the equipment grounding conductor in the power cord of cord- and plug-connected equipment shall be considered as a supplement to bonding requirements in this Section.

J. Equipment Room Signal Reference Grid: Provide a low-impedance path between telecommunications cabinets, equipment racks, and the reference grid, using No. 6 AWG bonding conductors.
   1. Install the conductors in grid pattern on 4-foot centers, allowing bonding of one pedestal from each access floor tile.
   2. Bond the TGB of the equipment room to the reference grid at two or more locations.
   3. Bond all conduits and piping entering the equipment room to the TGB at the perimeter of the room.

K. Ground Ring:
   1. Ground Ring: Buried at least 30 inches below grade and at least 24 inches from the base of the tower or mounting.
   2. Bond each tower base and metallic frame of a dish to the ground ring, buried at least 18 inches below grade.
   3. Bond the ground ring and antenna grounds to the equipment room TMGB or TGB, buried at least 30 inches below grade.

## 3.7 IDENTIFICATION

A. Labels shall be preprinted or computer-printed type.
   1. Label TMGB(s) with "fs-TMGB," where "fs" is the telecommunications space identifier for the space containing the TMGB.
   2. Label TGB(s) with "fs-TGB," where "fs" is the telecommunications space identifier for the space containing the TGB.
   3. Label the BCT and each telecommunications backbone conductor at its attachment point: "WARNING! TELECOMMUNICATIONS BONDING CONDUCTOR. DO NOT REMOVE OR DISCONNECT!"

## 3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:
   1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

2. Test the bonding connections of the system using an ac earth ground-resistance tester, taking two-point bonding measurements in each telecommunications equipment room containing a TMGB and a TGB and using the process recommended by BICSI TDMM. Conduct tests with the facility in operation.
    a. Measure the resistance between the busbar and the nearest available grounding electrode. The maximum acceptable value of this bonding resistance is 100 milliohms.
3. Test for ground loop currents using a digital clamp-on ammeter, with a full-scale of not more than 10 A, displaying current in increments of 0.01 A at an accuracy of plus/minus 2.0 percent.
    a. With the grounding infrastructure completed and the communications system electronics operating, measure the current in every conductor connected to the TMGB and in each TGB. Maximum acceptable ac current level is 1 A.

C. Excessive Ground Resistance: If resistance to ground at the BCT exceeds 5 ohms, notify Architect promptly and include recommendations to reduce ground resistance.

D. Grounding system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

**END OF SECTION 27 05 26**

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# SECTION 27 05 28 - PATHWAYS FOR COMMUNICATIONS SYSTEMS

## PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Related Requirements:
1. Section 260533 "Raceways and Boxes for Electrical Systems" for conduits, wireways, surface raceways, boxes, enclosures, cabinets, handholes, and faceplate adapters serving electrical systems.

1.3 DEFINITIONS

A. ARC: Aluminum rigid conduit.

B. GRC: Galvanized rigid steel conduit.

C. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface pathways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

## PART 2 - PRODUCTS

2.1 CABLE HOOKS

A. Static load capacity a minimum of 30 lbs.

B. Pre-galvanized steel.

C. Quick-latch cable retainer.

## PART 3 - EXECUTION

3.1 PATHWAY APPLICATION

A. Outdoors: Apply pathway products as specified below unless otherwise indicated:
1. Exposed Conduit: GRC.
2. Concealed Conduit, Aboveground: EMT .
3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.

B. Indoors: Apply pathway products as specified below unless otherwise indicated:
   1. Pathways for Concealed General-Purpose Distribution of Optical-Fiber or Communications Cable: General-use, optical-fiber-cable pathway.

C. Minimum Pathway Size: 3/4-inch trade size. Minimum size for optical-fiber cables is 1 inch.

D. Pathway Fittings: Compatible with pathways and suitable for use and location.
   1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
   2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
   3. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.

E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

F. Install surface pathways only where indicated on Drawings.

3.2 INSTALLATION

A. Comply with NECA 1, NECA 101, and TIA-569-B for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum pathways. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.

B. Keep pathways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.

C. Complete pathway installation before starting conductor installation.

D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of two 90-degree bends in any pathway run. Support within 12 inches of changes in direction. Utilize long radius ells for all optical-fiber cables.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inches of enclosures to which attached.

I. Pathways Embedded in Slabs:
   1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure pathways to reinforcement at maximum 10-footintervals.
   2. Arrange pathways to cross building expansion joints at right angles with expansion fittings.

3. Arrange pathways to keep a minimum of 1 inch of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.

J. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of pathway and fittings before making up joints. Follow compound manufacturer's written instructions.

K. Coat field-cut threads on PVC-coated pathway with a corrosion-preventing conductive compound prior to assembly.

L. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install insulated bushings on conduits terminated with locknuts.

M. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

N. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

O. Cut conduit perpendicular to the length. For conduits of 2-inch trade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.

P. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 200-lbtensile strength. Leave at least 12 inchesof slack at each end of pull wire. Cap underground pathways designated as spare above grade alongside pathways in use.

Q. Install pathway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed pathways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install pathway sealing fittings according to NFPA 70.

R. Install devices to seal pathway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all pathways at the following points:
1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service pathway enters a building or structure.
3. Where otherwise required by NFPA 70.

S. Comply with manufacturer's written instructions for solvent welding PVC conduit and fittings.

T. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surface to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

U. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

## 3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:
   1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches in nominal diameter.
   2. Install backfill as specified in Section 312000 "Earth Moving."
   3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
   4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
   5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
      a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
      b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
   6. Warning Planks: Bury warning planks approximately 12 inches above direct-buried conduits, but a minimum of 6 inches below grade. Align planks along centerline of conduit.
   7. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

## 3.4 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR COMMUNICATIONS PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 270544 "Sleeves and Sleeve Seals for Communications Pathways and Cabling."

## 3.5 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078443 "Firestopping."

## 3.6 PROTECTION

A. Protect coatings, finishes, and cabinets from damage or deterioration.
   1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
   2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

**END OF SECTION 27 05 28**

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# SECTION 27 05 36 - CABLE TRAYS FOR COMMUNICATIONS SYSTEMS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
   1. Wire-basket cable trays.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of cable tray.
   1. Include data indicating dimensions and finishes for each type of cable tray indicated.
   2. Shop drawings.

### 1.4 CLOSEOUT SUBMITTALS

A. Test reports.

## PART 2 - PRODUCTS

### 2.1 GENERAL REQUIREMENTS FOR CABLE TRAYS

A. Cable Trays and Accessories: Identified as defined in NFPA 70 and marked for intended location, application, and grounding.
   1. Source Limitations: Obtain cable trays and components from single manufacturer.

B. Sizes and Configurations: See the Cable Tray Schedule on Drawings for specific requirements for types, materials, sizes, and configurations.

C. Structural Performance: See articles for individual cable tray types for specific values for the following parameters:
   1. Uniform Load Distribution: Capable of supporting a uniformly distributed load on the indicated support span when supported as a simple span and tested according to NEMA VE 1.
   2. Concentrated Load: A load applied at midpoint of span and centerline of tray.
   3. Load and Safety Factors: Applicable to both side rails and rung capacities.

### 2.2 WIRE-BASKET CABLE TRAYS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Allied Tube & Conduit; a Tyco International Ltd. Co.
   2. Cooper B-Line, Inc.
   3. Mono-Systems, Inc.
   4. Snaketray.

C. Description:
   1. Configuration: Wires are formed into a standard 2-by-4-inch wire mesh pattern with intersecting wires welded together. Mesh sections must have at least one bottom longitudinal wire along entire length of section.
   2. Materials: High-strength-steel longitudinal wires with no bends.
   3. Safety Provisions: Wire ends along wire-basket sides (flanges) rounded during manufacturing to maintain integrity of cables and installer safety.
   4. Sizes:
      a. Straight sections shall be furnished in standard 118-inch lengths.
      b. Wire-Basket Depth: 2-inch usable loading depth by 18 inches wide.
   5. Connector Assemblies: Bolt welded to plate shaped to fit around adjoining tray wires and mating plate. Mechanically joins adjacent tray wires to splice sections together or to create horizontal fittings.
   6. Connector Assembly Capacity: Splices located within support span shall not diminish rated loading capacity of cable tray.
   7. Hardware and Fasteners: Steel, zinc plated according to ASTM B 633.

## 2.3 MATERIALS AND FINISHES

A. Steel:
   1. Straight Section and Fitting Side Rails and Rungs: Steel complies with the minimum mechanical properties of ASTM A 1011/A 1011M, SS, Grade 33.
   2. Steel Tray Splice Plates: ASTM A 1011/A 1011M, HSLAS, Grade 50, Class 1.
   3. Fasteners: Steel complies with the minimum mechanical properties of ASTM A 510/A 510M, Grade 1008.
   4. Finish: Electrogalvanized before fabrication.
      a. Standard: Comply with ASTM B 633.
      b. Hardware: Galvanized, ASTM B 633.
   5. Finish: paint.
      a. Hardware: Chromium-zinc plated, ASTM F 1136.

## 2.4 CABLE TRAY ACCESSORIES

A. Fittings: Tees, crosses, risers, elbows, and other fittings as indicated, of same materials and finishes as cable tray.

B. Cable tray supports and connectors, including bonding jumpers, as recommended by cable tray manufacturer.

## PART 3 - EXECUTION

### 3.1 CABLE TRAY INSTALLATION

A. Install cable trays as a complete system, including fasteners, hold-down clips, support systems, barrier strips, adjustable horizontal and vertical splice plates, elbows, reducers, tees, crosses, cable dropouts, adapters, covers, and bonding.

B. Install cable trays so that the tray is accessible for cable installation and all splices are accessible for inspection and adjustment.

C. Remove burrs and sharp edges from cable trays.

D. Fasten cable tray supports to building structure.

E. Design fasteners and supports to carry cable tray, the cables, and a concentrated load of 200 lb (90 kg). Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems.

F. Place supports so that spans do not exceed maximum spans on schedules and provide clearances shown on Drawings. Install intermediate supports when cable weight exceeds the load-carrying capacity of the tray rungs.

G. Construct supports from channel members, threaded rods, and other appurtenances furnished by cable tray manufacturer. Arrange supports in trapeze or wall-bracket form as required by application.

H. Support bus assembly to prevent twisting from eccentric loading.

I. Install center-hung supports for single-rail trays designed for 60 versus 40 percent eccentric loading condition, with a safety factor of 3.

J. Locate and install supports according to NEMA FG 1. Do not install more than one cable tray splice between supports.

K. Support wire-basket cable trays with trapeze hangers.

L. Support trapeze hangers for wire-basket trays with 1/4-inch- diameter rods.

M. Make changes in direction and elevation using manufacturer's recommended fittings.

N. Make cable tray connections using manufacturer's recommended fittings.

O. Install cable trays with enough workspace to permit access for installing cables.

### 3.2 CABLE TRAY GROUNDING

A. Ground cable trays according to NFPA 70 unless additional grounding is specified. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems."

B. Cable trays with communications cable shall be bonded together with splice plates listed for grounding purposes or with listed bonding jumpers.

C. Cable trays with control conductors shall be bonded together with splice plates listed for grounding purposes or with listed bonding jumpers.

D. Bond cable trays to power source for cables contained within with bonding conductors sized according to NFPA 70, Article 250.122, "Size of Equipment Grounding Conductors."

3.3 CABLE INSTALLATION

A. Install cables only when each cable tray run has been completed and inspected.

B. Fasten cables on horizontal runs with cable clamps or cable ties according to NEMA VE 2. Tighten clamps only enough to secure the cable, without indenting the cable jacket. Install cable ties with a tool that includes an automatic pressure-limiting device.

C. Fasten cables on vertical runs to cable trays every 18 inches.

D. Fasten and support cables that pass from one cable tray to another or drop from cable trays to equipment enclosures. Fasten cables to the cable tray at the point of exit and support cables independent of the enclosure. The cable length between cable trays or between cable tray and enclosure shall be no more than 72 inches.

E. Tie MI cables down every 36 inches where required to provide a 2-hour fire rating and every 72 inches elsewhere.

F. In existing construction, remove inactive or dead cables from cable trays.

3.4 CONNECTIONS

A. Connect pathways to cable trays according to requirements in NEMA VE 2 and NEMA FG 1.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. After installing cable trays and after electrical circuitry has been energized, survey for compliance with requirements.
   2. Visually inspect cable insulation for damage. Correct sharp corners, protuberances in cable trays, vibrations, and thermal expansion and contraction conditions, which may cause or have caused damage.
   3. Verify that the number, size, and voltage of cables in cable trays do not exceed that permitted by NFPA 70. Verify that communications or data-processing circuits are separated from power circuits by barriers or are installed in separate cable trays.
   4. Verify that there are no intruding items such as pipes, hangers, or other equipment in the cable tray.
   5. Remove dust deposits, industrial process materials, trash of any description, and any blockage of tray ventilation.
   6. Visually inspect each cable tray joint and each ground connection for mechanical continuity. Check bolted connections between sections for corrosion. Clean and retorque in suspect areas.

7. Check for improperly sized or installed bonding jumpers.
8. Check for missing, incorrect, or damaged bolts, bolt heads, or nuts. When found, replace with specified hardware.
9. Perform visual and mechanical checks for adequacy of cable tray grounding; verify that all takeoff raceways are bonded to cable trays. Test entire cable tray system for continuity. Maximum allowable resistance is 1 ohm.

B. Prepare test and inspection reports.

3.6 PROTECTION

A. Protect installed cable trays and cables.
1. Install temporary protection for cables in open trays to safeguard exposed cables against falling objects or debris during construction. Temporary protection for cables and cable tray can be constructed of wood or metal materials and shall remain in place until the risk of damage is over.
2. Repair damage to galvanized finishes with zinc-rich paint recommended by cable tray manufacturer.

**END OF SECTION 27 05 36**

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# SECTION 27 05 44 - SLEEVES AND SLEEVE SEALS FOR COMMUNICATIONS PATHWAYS AND CABLING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
1. Sleeves for pathway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:
1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

## PART 2 - PRODUCTS

### 2.1 SLEEVES

A. Wall Sleeves:
1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

### 2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Advance Products & Systems, Inc.
   b. CALPICO, Inc.
   c. Metraflex Company (The).
   d. .
2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Presealed Systems.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.
   1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

## PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
   1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
      a. Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
      b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
   2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
   3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and pathway or cable unless sleeve seal is to be installed.
   4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
   5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
   1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
   2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

## 3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at pathway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pathway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

## 3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

**END OF SECTION 27 05 44**

# SECTION 27 05 48 - VIBRATION AND SEISMIC CONTROLS FOR COMMUNICATION SYSTEMS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. General provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

### 1.2 SUMMARY

A. Section Includes
1. Anchoring and restraints.

B. Related Sections
1. Section 275123 Intercom System.
2. Section 280533 Raceways and Boxes for Electrical Systems.

### 1.3 REFERENCES

A. ASTM E2265- Standard Terminology for Anchors and Fasteners in Concrete and Masonry.

### 1.4 SYSTEM DESCRIPTION

A. Design Requirements
1. Provide seismic components for the following systems:
   a. Intercom System
2. Provide seismic restraints for the listed materials and equipment. The attachments shall resist forces to the center of gravity of the component. Criteria shall be the operating weight of the item times 0.5g for horizontal force to be applied in any direction. Wall-mounted or suspended components shall in addition, resist a downward force of 200 pounds minimum added to the operating weight.
3. The Importance Factor ($I_P$) of the above systems equals 1.5.
4. From structural sheets, the applicable seismic design parameters are as follows:
   a. Site Class (C)
   b. Occupancy Category: Risk Category III
   c. Seismic Design Category (D).
   d. Coordinate with structural submittals.

### 1.5 SUBMITTALS

A. Product data.

B. Provide all required submittals under provisions of Section 013300.

C. Submit proposed system to engineer for review prior to installation.

D. Project Information:
1. Submit seismic support calculations for all electrical equipment and conduit where isolation restraints are supplied.
2. Certification of seismic restraints.
a. Substantiated by calculations or test reports verified by a professional structural engineer or equipment manufacturer.

E. Shop Drawings
1. Submit seismic restraint installation shop drawing prior to installation.

1.6 QUALITY ASSURANCE

A. Racks and Conduits: ASCE 7 Guidelines, Chapter 13 "Seismic Design Requirements for Nonstructural Components".

B. Anchor Bolts: All anchor bolts shall comply with ASTM A307.

C. Certifications: All Seismic components shall be certified as appropriate for seismic installation by the manufacturer or by a delegated design professional.

**PART 2 -PRODUCTS**

2.1 GENERAL

A. Acceptable Manufacturers:
1. Seismic Control Devices:
a. Mason Industries.
b. Vibration Eliminator Co.
c. Korfund Dynamics Corp.
d. Amber-Booth Co.
e. Consolidated Kinetics.
f. Kinetics Noise Control

B. Provide conduit and equipment anchoring systems as indicated in the Contract Documents.

C. Provide all mounting hardware, support wires, conduits for alignment, eyebolts, bolts, nuts and washers required for equipment mounting and seismic control. Structural blocking/backing and hardware required for installation shall be provided as indicated in the Contract Documents.

2.2 ANCHORING AND RESTRAINTS

A. Equipment Anchors:
1. Anchor all equipment in accordance with the approved shop drawings.
2. Contractor shall be responsible for design and acquiring of approval for anchoring of equipment where required by ASCE 7.

B. Conduit Supports:
1. Conduits shall be supported and braced in accordance with ASCE 7 Chapter 13.

2. Conduits individually supported above finished floors with an importance factor of 1.5 and greater than 2.5 inches in diameter shall be provided with seismic restraints as required by ASCE 7, Chapter 13.
3. Trapeze supported conduits with a total weight exceeding 10 lb/ft shall be provided with seismic restraints as required by ASCE 7, Chapter 13.
4. Cable trays must be listed for seismic installation in accordance with ASCE 7, Chapter 13. Securely attach cable to tray at intervals equal to one half the cable tray support spacing.

C. Device Support:
1. Provide independent seismic support system for all boxes not directly anchored to concrete walls or concrete ceilings for the following:
   a. Wireless Access Points.

D. Floor Mounted Racks:
1. Furnish and install seismic racks and attach per manufacture's installation instructions.
2. Furnish and install seismic restraints for shelf mounted computers, monitors, and any other component not securely attached to the frame.

## PART 3 -EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturers' written instructions in a manner to achieve full capacity of support.

**END OF SECTION 27 05 48**

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# SECTION 27 15 00 - TEL/DATA COMMUNICATIONS SYSTEMS

## PART 1 - GENERAL

1.1 TEL/DATA COMMUNICATIONS REFERENCE STANDARDS

A. ANSI/TIA/EIA-568-B.1 Commercial Building Telecommunications Cabling Standard, General Requirements

B. ANSI/TIA/EIA-568-B.2 Balanced Twisted Pair Components

C. ANSI/TIA/EIA-568-B.2-2 Balanced Twisted Pair Cabling Components

D. ANSI/TIA/EIA-568-B.2-3 Additional Considerations for RL and Pass/Fail Determinations

E. ANSI/TIA/EIA-568-B.3 Optical Fiber Cabling Components

F. ANSI/TIA/EIA-568-B.3-1 Optical Fiber Cabling Components, Addendum 1

G. ANSI/TIA/EIA-569-B Commercial Building Telecommunications Pathways & Spaces

H. ANSI/TIA/EIA-569-A 1 through 7 Addendums

I. ANSI/TIA/EIA-606-A Administration for Telecom. Infrastructure of Commercial Bldg.

J. ANSI J-STD-607-A Commercial Building Grounding and Bonding for Telecom.

K. ANSI/TIA/EIA-758 Customer-Owned Outside Plant Telecom Cabling Standard

L. ANSI/TIA/EIA-758-1 Addendum No. 1 to TIA/EIA-758

M. Building Industry Consulting Services International (BISCI) Telecommunications Distribution Methods Manual (TDMM)

N. National Fire Protection Agency (NFPA) – 70, National Electrical Code (NEC)

O. California Electrical Code (CEC)

P. California Electrical Code Title 24 – Part 3

1.2 SUBMITTALS

A. Submit under provisions od 01 33 00.

B. Product Data: submit for all Tel/Data products and components.

C. Submit shop drawings for the following:
1. Racks – Including front side and top views.

1.3 CLOSEOUT SUBMITTALS

A. Test reports.

**PART 2 - PRODUCTS**

2.1 FACEPLATES AND COVER PLATES

A. Four position faceplate. Single gang. Color: White. Compatible with specified modular connectors. Panduit model CFPL4IW.

B. Wall phone. Single gang faceplate compatible with specified modular connectors. Stainless steel and having mounting studs designed to support a wall phone. Molex KSJ-00024-08.

C. Modular connectors for furniture and faceplates. Made by panduit and compatible with Panduit modular connectors. Panduit model CJ688TGGN Green Connector, model CMBIWX Blank Faceplate, model CFFP4IW Faceplate.

D. Blanks for faceplate: Designed for specified faceplate. Panduit model CMBIWX.

2.2 CABLE AND WIRE

A. Category 6 station cable. 4-pair unshielded twisted pair (UTP). 23 AWG. Cable to meet the performance characteristics of Category 6 to 450 MHz. UL Listed CMP. Jacket color: Green. General Cable model Genspeed 6000.

B. Optical fiber - Indoor: 50/125-micron multimode fiber. Color: Orange. Minimum bandwidth: 500 MHz at both 850nm and 1300nm. Maximum attenuation is 1.00 dB at 1300nm. 24- and 12-strand configurations. UL Listed OFNP. General Cable model BG0241P1U or BG0121PNU.

C. Optical fiber – Outdoor: 50/125-micron singlemode fiber loose tube, gel-filled, polyethelene jacket. Color: Orange. Minimum bandwidth: 500 MHz at both 850nm and 1300nm. Maximum attenuation is 1.00 dB at 1300nm. 12-strand configuration. UL Listed OFNR/OFN. General Cable.

2.3 PATCH CORD ASSEMBLIES

A. Fiber patch cords. LC/LC duplex fiber patch cords. 50/125 micron fiber. Cable jacket color: Orange. General Cable.

B. Category 6 patch cords. Color: Green. Patch cable shall be 8 conductor Tangle Free RJ-45 plug-to-plug. Panduit model UTPSP5GR (refer to Panduit part numbers for appropriate length variable).

C. Bonding wire: #6 AWG, green-insulated THWN. Stranded or solid. Superior Essex 12-018-04 or approved equal.

2.4 RACKS AND RUNWAY

A. Equipment rack. 19 inches by 84 inches open bay rack. UL Listed. Finish: black. Chatsworth 66353-703 or approved equal.

B. Cable runway. Trough cable runway. Steel construction with rubber capped vertical members on 12 inch centers. Width: 12”. Rung spacing: 12 inches. Chatsworth 10693-112 or approved equal.

C. Distribution runway. Width: 18 inches. Depth: 4 inches. Flextray FT4X18X10 or approved equal.

D. Wall angle support kit. Designed for supporting specified the end of trough cable runway section to the wall. Color: black. Chatsworth 11421-112 or approved equal.

E. Channel rack-to-runway mounting plate. Designed to secure trough cable runway to equipment rack. Complete with mounting hardware. Chatsworth 12730-X12 or approved equal.

2.5 MOUNTING HARDWARE

A. Bonding screws. 12-24 by 1/2 inch mounting screws with serrations on bottom of screw head designed to cut through paint and provide an electrical bond between mounted equipment and rack. Package of fifty. Panduit RGTBS-C or approved equal.

B. Paint-piercing washers. For use with 3/8 inch studs. Complete with antioxidant gel. Designed to assemble equipment racks, ensuring bond between parts. Panduit RGW-12-1 or approved equal.

C. Anchors. Hex design. Designed for securing equipment to concrete slab. 2 inch minimum embedment. 5/8 inch by 2-1/4 inch. B-Line ASA-50-225HN or approved equal.

D. Equipment jumper kits. Designed for grounding metallic telecommunications infrastructure to the telecommunications grounding busbar (TGB). Complete with lugs, #10 grounding conductor, thread-forming screws, and antioxidant. Panduit RGEJ10xxPH (where xx is length in inches) or approved equal.

E. Seismic bracing. Single brace kit designed to brace cable runway. Chatsworth 10695-001 or approved equal.

2.6 CABLE MANAGEMENT

A. Vertical cable manager. 6 inches by 72 inches by 16 inches (WHD). Designed to maintain cable bend radii. Front and rear hinged doors. Chatsworth 11729-703 or approved equal.

B. Horizontal cable manager. For routing jumpers horizontally while maintaining acceptable bend radii. 2U. Compatible with specified vertical cable manager and equipment rack. Chatsworth 30130-719 or approved equal.

C. Cross member waterfall. Maintains acceptable bend radii when transitioning vertically from an 18 inch wide cable runway cross member. Waterfall to be include cable spools (or

approved equal) to separate bundles of cable. Color: gray. Chatsworth 12100-118 or approved equal.

D. 4 inch cable spool. Spool to be attached with a #12/24 threaded screw. Chatsworth 15002-001 or approved equal.

E. Cable loop support system. Rated for plenum return areas. Arlington Industries TL25P, TL50P or approved equal.

2.8 TERMINATION HARDWARE

A. Modular connector: RJ-45 jack inserts exceeding the performance characteristics of Category 6. Compatible with specified faceplates. Color: Green. Panduit model CJ688TGGN.

B. Modular connector (Wall phone). RJ-45 jack inserts. Compatible with specified wall phone plates. Color: White.

C. Fiber connector. LC-type connector. 50-micron multimode fiber. Molex 86024-3500.

D. Fiber adapter plates. Adapter panels compatible with specified fiber enclosures. Three duplex LC-type adapters. Molex AFR-00164.

E. Patch panel. 48-port. 19-inch rack mountable. 2U. Category 6. Panduit model CPP48WBL.

F. 110-type hardware. 100-pair and 300-pair configuration. Designed for terminating 4-pair voice cables. Block complete with standoff legs. Block to meet Category 5e performance parameters. Complete with designation strips and C4 connectors. Molex KDP-00045 and KDP-00047.

G. 100-pair and 300-pair configuration. Designed for terminating inter- and intra building cables. Block complete with standoff legs. Block to meet Category 5e performance parameters. Complete with designation strips and C5 connectors. Panduit per County Standard.

H. Fiber enclosure. 19 inch rack mountable. Available in 2U and 4U sizes. Corning

I. Backboard: A/C grade plywood and without blemish (e.g. screw or nail holes, water damage or staining). Trade size 3/4 inch by 48 inches by 84 inches. Plywood to be treaed with fire-retardant material compliant with APWA and CSFM/CBC standards. Paint plywood with a flat latex enamel. Verify paint color prior to ordering and application. Leave rating stamp exposed if backboard is mounted to a rated partition.

2.9 MISCELLANEOUS MATERIAL

A. Penetration Sealants: Biotherm Biofire, 3M CD25, Nelson Flameseal, Scotch/3M PSS794 or approved equal.

B. Labels: Brother P-Touch (TM), Panasonic, 3M or approved equal.

C. Anchors. Wood Surfaces: Wood screws.

D. Anchors. Concrete Surfaces. Non-post-tensioned concrete/slabs: Anchors, self-drilling. powder-driven anchors will not be acceptable unless approved in writing by the Owner and the AHJ.

E. Anchors. Concrete Surfaces. Post-tensioned concrete/slabs where equipment mass is less than to 20 lbm (pounds of mass): Wedge-type concrete inserts; nut/bolt combinations, USS 1/4 inch (minimum); additional support according to weight and listing.

F. Anchors. Concrete Surfaces. Post-tensioned concrete/slabs where equipment mass is greater than 20 lbm: Approved anchor plates according to FSD sealed and signed by a California-licensed structural engineer and the AHJ.

G. Bolts and Anchors: 1/4 inch (minimum) for equipment less than 20 lbm and 3/8 inch diameter (minimum) for all others unless otherwise specifically noted. Tighten fasteners to, and capable of withstanding, thirty ft/lb. torque (minimum); non-powder-actuated.

## PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

A. Build from approved shop drawings where approved shop drawings supersede project drawings and these specifications.

B. Plenum Rated cable is the requirement for all new construction.

C. Provide specified Category 6 cable for data outlets. All workstation and wall jack locations shall consist of three each category 6 cable runs. The installation and termination of Category 6 cables shall comply with 568A, IEEE, TSB, and EIA/TIA specifications. A service coil of 10 feet shall be neatly secured and labels at every workstation location and MDF or IDF termination point. (Normally in the ceiling)

D. Use Category 6 cable to support emergency phone locations and special alarm circuits.

E. Install work in conformity with local and state building codes.

F. Install cable in accordance with the referenced standards, manufacturer’s recommendations, and best industry practices.

G. Seal conduits and sleeves provided for the support of the communications cabling system with approved sealant type(s). When applying Fire Block in sleeved wall penetrations, pillows shall be used to allow for future expansion.

H. Cable damaged or exceeding recommended installation parameters during the installation must be replaced by the contractor before final acceptance and at no additional cost to the Owner.

I. Provide one inch bend radii (or larger) when installing 4-pair communications cabling. In general, provide bend radii greater than four times cable's diameter for copper cabling and ten times cable diameter for fiber cable.

J. Provide Jetline (or approved equal) pull cord in existing conduits or conduits installed under this project that exceed 10 feet such that cables and a pull cord are in conduit when the installation is complete.

K. Do not install cables with:
1. Pullbacks
2. Loops
3. Stray cables
4. Splices
5. Kinks

L. Cable support. Provide approved cable supports for communications cables. All cabling routed through the ceiling interstitial shall be supported with a dedicated means of support. The recommended means of support consists of cable trays or ladder racks in tel/data equipment closets and main arterial paths. Suspended J hook type of support for the branch paths is permissible. J- Hooks for suspended cables shall be every 4 feet when possible and not exceed every 6 feet.

M. Provide vertical cable runway as shown on Drawings. Install three inches offset from wall. Provide cable runway elevation kit and necessary mounting hardware.

N. Where conduits, cable tray or cable runway are not installed, support cable using specified cable supports. Do not support cables or cable supports on duct-supporting structures, non-communications supports, devices or utility piping.

O. Do not route cable nearer than eighteen inches from lighting ballasts or RF sources.

P. Provide Velcro cable ties around bundled cable in cable trays on six foot centers. Verify bundling requirements with the Owner's prior to placing cable ties. Do not bundle more than forty-eight cables in a given group.

Q. Do not use acoustic ceiling grids wires, lighting support wires, ceiling tiles, conduit, HVAC ductwork or piping to support communications cabling. Provide a separate means of support for communications cabling.

R. Install (and support) communications cabling as near as practical to the overhead decking when routing cabling through ceiling area. Do not obscure valves, fire alarm conduit or other control devices when installing cable. Cable ladders must have 18" clearance minimum for cable accessibility

S. Maintain at least 18 inches of clearances from fluorescent lighting and power lines when installing copper communications cabling.

T. Do not exceed a 40 percent fill ratio when routing communications cabling through raceways, conduits or other penetrations, inclusive for core drill, fire sleeves and I/O wall drops.

Furthermore, when a raceway and conduit segment has in excess of 90 degrees of bend, de-rate such raceway or conduit by 10 percent per 90 degrees of bend in determining fill ratios.

U. All tel/data closets shall have plywood backboard afixed to all four walls.

V. All tel/data closet floors to be covered with anti-static tile

W. Dedicated power circuits to be supplied to each outlet indicated on equipment racks as shown on drawings. Circuits shall be protected by building emergency generator when applicable

X. Labels shall be computer generated and permanently attached to the apparatus (patch panel, faceplate) and cables. Numbering scheme will conform to existing building format or as specified (ex. in the case of multiple IDFs, label shall identify the floor, IDF number and jack number).

Y. Core drill through floors and walls shall be sleeved with EMT conduit secured per local building code. Each end of the conduit must be fitted with proper fittings and plastic bushings.

Z. Racks must be grounded to common building ground, seismically mounted and secured to meet all standards.

3.2 FIELD QUALITY DATA

RFI 0195 — Electrical Peer Review — See RFI 0195 response #5 for Testing requirements

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:
1. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
2. Test UTP copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity betweeen conductors. Test operation of shorting bars in connection blocks. Test cables after temination but not cross-connection.
   a. Test instruments shall meet or exceed applicable requirements. Data for submittals shall be printed in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in “test Instruments (Normative)” Annex, complying with measurement accuracy specified in “Measurement Accuracy (Informative)” Annex. Use only test cords and adapters that are qualified by test equipment manufacterer for channel or link test configuration.

C. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to Tble 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

D. Remove and replace cabling where test results indicate that they do not comply with specified requirements.

E. End-to-end cabling will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

**END OF SECTION 27 15 00**

# SECTION 27 41 13 - AUDIOVISUAL SYSTEMS

RFI 0283 Audio Visual Sequence of Operations
See RFI 0283 for AV Sequence of Operations

## PART 1 - GENERAL

### 1.1 SCOPE OF WORK

A. Engineering and Design: provide all system engineering and design necessary to develop the complete systems as called for in this document and indicated on the drawings. Engineering and Design shall include preparation of all necessary electronic schematics, hardware drawings, systems diagrams, schedules and lists. Additionally, final system design and configuration with the Owner, as well as on site audiovisual coordination and infrastructure installation review with the General Contractor is required.

B. Software Programming: perform all required software setup, configuration, and programming required to develop a complete operating system in accordance with this Specification, including all control logic and push button component faceplate or interface programming.

C. Extron is indicated on the documents as the basis of design manufacturer. Any substitutions must be approved and shall include all components for a fully functional system equal to the Extron basis.

### 1.2 REGULATORY REQUIREMENTS

A. All products and materials provided shall be listed by Underwriters Laboratory (UL) and shall bear the UL label intended for the purpose specified and indicated. If UL has no published standards for a particular item, then other national independent testing standards shall apply and such items shall bear those labels.

B. All equipment and installations under this Specification shall conform to the following:
1. ANSI/NFPA 70 - National Electrical Code.
2. ANSI/IEEE C2 - National Electrical Safety Code
3. TIA/EIA Standards 568-B, 569 and 607
4. IEEE/ANSI 142-2007 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.

C. Perform all work in compliance with current Occupational Safety and Health Administration (OSHA) guidelines and regulations and other safety and health requirements as may be mandated by the Owner or other authorities.

D. Have a thorough knowledge of governing codes and standards in effect and having jurisdiction over the Project. Lack of awareness of any of the relevant codes and standards will not be accepted as a reason for non-compliance.

E. Provide cable and materials that comply with applicable codes and requirements of regulating bodies. The cost for these materials shall be included in the Bid price, as the Owner shall not accept change orders for changes in materials.

1.3 COORDINATION OF RELATED WORK BY OTHERS

A. Coordinate with the General Contractor and other construction trades to ensure proper integration and operation of the Audiovisual Systems with the complete Project designs, building systems and all other elements of the Project. Coordinate with the General Contractor and complete project Construction Documents to help facilitate effective coordination of the work with the work of other trades.
   1. Paging and life safety: Interfacing the Audiovisual System(s) to the paging or life safety systems is required. Coordinate with the Contractor or the Owner's designated representative regarding connections between the Audiovisual Systems and the Paging or Life Safety system. All Audiovisual Systems with a control processor shall be connected to the fire/life safety systems by cabling extended by the F/LS contractor into the AV equipment rack and that be configured upon fire alarm or testing contact closure trigger to mute the audio until the trigger is cleared and the system audio (program and voice) can be un-muted again.

B. Electrical (AC) Power Service and Connections
   1. Technical Power Service: All electrical panels, power receptacles, lighting fixtures, dimmers, lighting controls, and interconnecting wiring shall be supplied by General Contractor.
   2. Extend AC power circuits and insulated ground wires into each equipment rack. This work must be done by a qualified electrician, licensed in the jurisdiction of this project, and under direction from the Audiovisual Integrator.

C. Low Voltage Cable Containment
   1. Low voltage cable containment, including raceways, conduits and junction boxes, required to support Audiovisual System devices and interconnecting cabling shall be as specified in the Construction Documents.

D. Low Voltage Cabling and Termination
   1. All audio, video, control and other low voltage cabling associated with the Audiovisual System shall be provided, installed and terminated by the utilizing the cable containment infrastructure (e.g. conduit, raceways, junction boxes, etc.) provided by contractor as noted on the Construction Documents.
   2. Provide all patch cords and other cable assemblies required to connect Audiovisual Equipment to voice/data outlets and any other required system or network inputs or outputs.

E. Equipment Mounting and Support
   1. Structural support for wall mounted monitors and other Audiovisual Equipment shall be provided by the General Contractor as noted and detailed in the Construction Documents. Coordinate with the General Contractor and other trades as necessary to ensure

compatibility of the structural supports provided the General Contractor with the Audiovisual Equipment provided by the Audiovisual Integrator.

2. Install all Audiovisual Equipment, including display mounts, as indicated in this Specification and the Construction Documents. Verify location and structural suitability before attaching equipment and mounts. Any variations from the drawings and specifications or any question of structural integrity shall be brought to the attention of the Architect before installing the equipment.

F. Audiovisual System Connections to Building Systems and Controls
1. Coordinate with the General Contractor to verify that all devices and controls to be interconnected to the Audiovisual System are functioning properly prior to commencing interconnection to the Audiovisual Equipment.
2. Select and install the appropriate cable type to facilitate device communication from the Audiovisual Equipment to interconnected building systems.
3. Coordinate with the General Contractor to verify proper operation of the connected Audiovisual Equipment and the building systems after interconnecting the systems.

## 1.4 REFERENCES

A. The following documents provide information regarding audiovisual industry “best practices," including commonly accepted standards for design, installation, and performance of integrated audiovisual systems. The technical quality of the work and the resulting performance of the Audiovisual Systems installed in the Project will generally be measured against the standards and practices delineated in these References.

B. Audiovisual Best Practices: The Design and Integration Process for the AV and Construction Industry, Timothy Cape and Jim Smith; Fairfax, VA; International Communications Industries Association, 2005

## 1.5 PROJECT / SITE CONDITIONS

A. Refer to Division 1 of the Construction Documents for coordination with other trades on this project.

B. Coordinate all access to the site at all times with the General Contractor.

C. Adhere to the safety standards established by the General Contractor while performing work on site.

D. All employees shall comply with rules and policies established by the Owner and/or the General Contractor.

E. Store equipment in a manner that will not interfere with the work of the GC or its sub-contractors, or Owner. Coordinate secured storage on site with the General Contractor.

F. Do not install equipment in dusty conditions or allow dust to accumulate in or on installed Audiovisual Equipment.

G. Protect all work and equipment from damage by others.

1.6 SUBMITTALS

A. General Submittal Requirements
1. A submittal package consists of all items (forms, lists, drawings, etc.) specified for that submittal.
2. All specified items for each submittal shall be provided at the same time. Partial or incomplete submittals will be rejected.
3. Product Submittals shall be issued no sooner than six (6) months prior to scheduled substantial completion date of the building.
4. Unless directed otherwise in writing by the Architect, the Contractor is not authorized to proceed with the acquisition, assembly or installation of any systems or components until all required submittals have been approved by the Architect. Any acquisition, assembly or installation of any systems or components without Architect's approval will be subject to removal at the expense of the contractor.
5. Submit only one copy of each data sheet to be included, even if the device or system is used in more than one space. The equipment list should be equivalent to the list used by the AV contractor's purchasing department to purchase all equipment for the job.
6. Drawing Formatting Requirements:
   a. Shop Drawings shall be submitted in both PDF and CAD format.
   b. Shop Drawings shall be numbered consecutively and shall accurately and distinctly present the following information:
      1) Title Sheet
      2) Single-Line/Block Diagrams showing signal relationships of all controls and devices within the system.
      3) Necessary details, including complete information for making connections between work under this Contract and work under other Contracts.
   c. Formatting of shop drawings and other drawing submittals shall include the following:
      1) Title Block with;
      2) Project name and address, Project Number and Drawing Name.
      3) Sequential number of submittal
      4) Date of submittal
      5) Name and address of the Audiovisual Integrator
      6) Drawing Scale
      7) Critical dimensions at accurate scale
      8) Submittal date and space for revision dates.
      9) Identification of equipment, product or material.
      10) Name of Supplier / Manufacturer.
      11) Physical dimensions, clearly identified, where applicable.
      12) Specification references.
      13) Identification of deviations from the Contract Documents, if necessary.
      14) Audiovisual Integrator's stamp, initialed or signed, dated and certifying to review of submittal, certification of field measurements and compliance with Contract.

d. The drawings shall clearly identify the specific equipment make and model number(s) as well as specific Audiovisual System configuration and installation requirements as noted below.
   1) Type fonts must be legible (minimum 1/16" on 11x17 prints) and must be exportable to .DWG or .DXF format.
   2) Plans indicating Audiovisual Equipment layouts shall be scaled to be not less than 1/8" = 1’-0". Details for particular equipment mounting shall be scaled to be not less than 1/4" = 1’-0".
   3) Background CAD files (in .DWG format) of the building will be made available if requested.
   4) Architect assumes no responsibility for errors and/or omissions due to electronic translation of CAD and PDF file formats.
   5) Prior to being issued electronic Project documents, warrant in writing that any electronic files submitted on the Project will be used only for the Project, and that any intellectual property originated, copyrighted and/or owned by others is for use only on this Project.
   6) Any building plans or drawings originated by others and reproduced in their documentation shall be labeled with “Shop Drawing” and the names and stamps of others shall be removed.
   7) Submit qualifications that the contractor has the capability to manage and install the complete A/V system. Provide information to reflect a minimum of 5 years in installation, configuration, and servicing of commercial audiovisual systems.

B. Engineering Submittals

Engineering Submittals shall be presented to the Architect for review, comment and approval prior to commencing further work. Engineering Submittals shall include, but not limited to, the following:

1. Equipment List
2. Audiovisual System Shop Drawings
   a. At a minimum, Shop Drawings shall include the following:
      1) Single-line system design diagrams
      2) Equipment rack elevations
      3) Custom fabrication drawings
      4) Wiring diagrams of all equipment, with types and model numbers specified under these Contract Documents.
      5) Fully dimensioned housing and mounting drawing including information on finishes.
   b. Additionally, Audiovisual System Shop Drawings shall include the following:
      1) Drawings, diagrams or other information providing evidence of Audiovisual System design compatibility with the architectural, infrastructure and building systems designs delineated in the Project Construction Documents.
      2) Critical points of coordination with other trades
      3) Specific notation of critical field measurements at accurate scale
      4) Identification of specific products and materials used
      5) Cross references for all related Construction Documents (e.g. drawings, detail numbers, specification sections, etc)

6) Reference to room numbers and room names where Audiovisual Systems are to be installed

C. Warranty and Maintenance Support
1. Basic Warranty: Include repair or replacement for one year from Final Acceptance on all Audiovisual Equipment provided (including products having a manufacturer's warranty of less than one year) and all workmanship. Basic Warranty shall be provided at no additional cost, except in case of obvious abuse. Consumable items such as lamps, batteries, tapes, etc. are not covered by Basic Warranty. Manufacturers' warranties on Audiovisual Equipment of more than one year shall remain in force beyond the Basic Warranty period.
2. During the Basic Warranty period the shall:
   a. Provide telephone support within 4 hours of a call requesting service.
   b. Provide on-site support within 24 hours of a call requesting service not corrected by telephone support.
   c. Repair or replace faulty items within 72 hours of on-site service or within manufacturers' specific repair program whichever is quicker.
3. Do not involve the Owner with removing, re-installing equipment, shipping or receiving equipment being repaired under Basic Warranty, nor shall the Owner be responsible for any shipping or freight charges associated with any item under warranty.
4. Architect and the Owner shall be copied with all paperwork related to any and all warranty work during the Basic Warranty period.
5. The Basic Warranty period will commence after System Acceptance.

D. Day-One Support
1. As part of the warranty, training and installation completion, provide on-site presence on the first day of critical move-in and operation to support the staff and instructors in equipment use. This date will be coordinated with the Owner and the CM for reasonable staffing requirements. Typically, this will require one certified technician to be present to resolve and issues that may arise and to provide basic operational support in the early usage stages. Programming support should be on stand-by to help resolve more complex issues as they arise.
2. All programming resources (code, software, configuration files, etc.) should be made available to on-site technicians.

## PART 2 - PRODUCTS

2.1 GENERAL

A. Acceptable products are listed below categorized by type of equipment. Quantities are listed for movable, portable or loose equipment, and other selected entries. Where quantities are not listed, refer to the system drawings and provide quantities as necessary to deliver the specified functionality.

B. Provide all options, accessories and hardware necessary to meet the functionality of the design even if all components are not specifically listed (i.e. rack mount kits, separate or additional power supplies, input modules, transformers, special or longer power cords, AV adapters or break-out cables, etc.).

2.2 SPECIFICS

A. Cable Cubby 202

Provide a modular, configurable, and furniture-mountable enclosure that shall support an AC power module and combination of AV cables and cable retraction modules

1. Device shall support one AC power module plus
   a. Up to four AV cables, or
   b. Up to two AV connectivity plates, or
   c. Up to three cable retraction modules
2. The device shall include modules and mounting frames to support AV cables and/or AV connectivity plates.
   a. The modules shall be positionable within the enclosure, mounting to the left of an AC power module
   b. AC power modules shall be available for all world markets
      1) AC power modules shall be UL listed and CE compliant when installed within the enclosure.
      2) AC power modules shall include one AC power outlets.
      3) AC power modules shall include an attached AC power cord or IEC power inlet with detachable AC power cord, as required by local electrical power codes and conventions.
      4) US AC shall include an opening for one MAAP – Mini Architectural Adapter Plate, such as a momentary switch or USB pass-through connector; sold separately.
   c. The external power supply shall be designed and manufactured by the same entity providing the enclosure and power module.
   d. The cable pass-through plate shall be a single unit
      1) The plate shall be flexible to allow the installation, removal, or replacement of cables.
      2) The plate shall utilize a split-ring design that accommodates a range of AV cable diameters without the need for supplemental grommets.
      3) The plate shall include plugs to cap cable pass-through openings that are not utilized.
      4) The assembled plate, with cables, shall install from the top of the enclosure, after it’s installed within the furniture surface.
   e. The AV connectivity frame shall be a single unit
      1) The frame shall support two single-space AV connectivity plates, or one double-space AV connectivity plate.
      2) The assembled frame, with AV connectivity plates and attached cables, shall install from the top of the enclosure, after it’s installed within the furniture surface.
3. Device shall include an attached and fully integrated, all metal lid and bezel assembly
   a. The lid and bezel assembly shall be available in a black powder coat finish.
   b. Device lid shall fit entirely within the bezel.

1) When closed, the lid shall provide a full-width opening for cable pass-through.
2) When open, the lid shall articulate such that it fits within the enclosure body.
3) Device shall include a magnet catch, facilitating use of the enclosure in both horizontal and vertical mounting operations.

4. Device enclosure shall mount entirely within an opening sufficient to accommodate the enclosure.
   a. An installation routing template, of an appropriate size to accommodate the enclosure, shall be available optionally.
   b. The enclosure shall feature an integrated clamp system
      1) The clamps shall be permanently affixed to the enclosure body.
      2) The clamps shall utilize the dog leg clamp mechanism.
      3) The clamps shall secure the enclosure to the furniture with common hand tools.
      4) The clamps shall allow for removal of the enclosure from the furniture with common hand tools.
5. Approved device shall be the Extron Cable Cubby 202 or approved equal.

B. Ceiling Speakers

Provide a two-way open back ceiling speaker that shall provide an internal transformer.

1. Two-way open back ceiling speaker with internal transformer for 8 ohm direct and 70/100 volt operation.
   a. Driver Requirements
      1) Shall consist of a 6.5" (16.5 cm) long-throw, polypropylene cone woofer.
      2) Shall consist of a 3/4" (1.9 cm) ferrofluid-cooled dome tweeter that is mounted on a honeycomb tweeter bridge.
   b. Performance Requirements
      1) Shall provide a frequency range of 42 Hz to 20 kHz, -10 dB below average SPL, measured on-axis in half space.
      2) Shall provide a frequency response of 58 Hz to 16 kHz, ±3 dB, measured in full space.
      3) Shall provide a power handling capacity of 60 watts (rms) continuous pink noise per IEC 60268-5 and 120 watts (rms) continuous program
      4) Shall provide a nominal sensitivity of 86 dB SPL (1 W, 1 m) measured in half space.
      5) Shall provide a nominal impedance of 8 ohms per speaker.
      6) Shall provide a nominal conical coverage angle of 112°
   c. Electrical Requirements
      1) Shall support 8 ohm direct or 70/100 volt connection from power amplifiers
      2) Shall provide a six-position, through-the-grille power tap selector
         i. Shall provide selectable rotary switch taps for 70 volt operation, including 32, 16, 8, 4, and 2 watts, and 8 ohms direct.
         ii. Shall provide selectable rotary switch taps for 100 volt operation, including 32, 16, 8, and 4 watts, and 8 ohms direct.
      3) Shall provide speaker tap selector and selection guide on the front of the speaker.
      4) Shall provide an internal overload protection circuit.
      5) Shall support one incoming and one outgoing speaker level signal on one 4-pole, 5 mm captive screw connector

i. Shall support wiring multiple speakers using parallel or loop-through wiring.
ii. Shall support a maximum wire gauge of 12 AWG per connection point for a single wire.
iii. Shall support a maximum wire gauge of 16 AWG per connection point for two wires.

d. Speaker Cartridge Enclosure Requirements
1) Shall have a white, paintable textured finish.
2) Shall provide a thin-edged bezel surrounding the grille.
3) Shall measure 10.3" (26.2 cm) in diameter from bezel edge to edge.
4) Shall measure 3" (7.6 cm) in height from mounting surface to top of woofer magnet.
5) Shall weigh 5.7 lbs (2.6 kg) per speaker cartridge.
6) Shall require 9.2" (23.4 cm) diameter opening in mounting surface for speaker cutout.
7) Shall provide a white, paintable magnetically-attached perforated steel grille with black scrim.

e. General Requirements
1) Shall be sold in pairs
2) Shall be compatible with Extron CS 120P plenum rated enclosure
3) Shall meet regulatory compliances
i. Shall meet safety compliances under CE, NFPA 70, and NFPA 90A.
ii. Shall be UL listed for plenum airspaces and meet UL 2043 for heat and smoke release, only when speaker cartridge is used with CS 120P plenum ceiling tile enclosure.
iii. Shall meet UL 1480 for commercial and professional audio systems.
iv. Shall comply with appropriate requirements for RoHS and WEEE
4) Shall provide five year parts and labor warranty.

2. Approved device shall be the Extron CS 26T Plus or approved equal.

C. Matrix Switcher

Provide an 8x2 scaling presentation matrix switcher that shall support up to eight inputs and two outputs for matrix switching of HDMI sources, one digital audio expansion port, 4K upscaling and downscaling, plus additional support for signal extension over shielded CATx cable and audio digital signal processing with AEC.

1. Rack-mountable matrix switcher for HDMI and DTP sources and associated digital and analog audio, 4K scaling, signal extension over shielded CATx cable, audio digital signal processing with AEC, and automixing for eight microphone groups.
a. Video Input Requirements
1) Provide video input connections
i. Six HDMI
ii. Two RJ-45 for video from Extron DTP® twisted pair transmitters
a) Shall be configurable for compatibility with Extron DTP transmitters or DTP-enabled products.
b) Shall be configurable for compatibility with Extron XTP® CrossPoint® matrix switchers
2) Support 4K and UHD signals at all inputs

3) Provide image adjustments for the DTP outputs, including brightness, contrast, color, tint, detail, H/V positioning, and sizing.
4) Provide storage and recall of video parameters and picture settings when activated for the scaled DTP outputs.
   i. Automatic memories for each video input
      a) Save video settings and picture adjustments without user intervention
      b) Automatically recall settings when the same video rate is encountered
      c) The user may selectively enable or disable automatic memories
   ii. Manual user presets
      a) Save picture adjustments
      b) User presets may be saved and recalled using front panel controls
      c) User presets may be saved and recalled electronically via Ethernet, RS-232, or USB connection.
   iii. Manual input presets
      a) Save video settings and picture adjustments
      b) Input presets may be saved and recalled electronically via Ethernet, RS-232, or USB connection.
5) Support HDMI specifications including data rates up to 10.2 Gbps, Deep Color up to 12-bit, 3D, and HD lossless audio formats
6) Provide automatic cable equalization for each digital input to 100 feet (30 meters) at 1080p/60 with 8-bit color when used with Extron HDMI Pro cables.
7) Provide automatic cable equalization for each digital input to 50 feet (15 meters) at 4K/30 and 2560x1600 @ 60 Hz resolutions when used with Extron HDMI Pro cables.
8) Support video transmission over shielded CATx up to 330 feet (100 meters).

2. Video Output Requirements
   a. Provide video output connections
      1) Two RJ-45 for video to Extron DTP twisted pair receivers
         i. Shall be configurable for compatibility with Extron DTP receivers or DTP-enabled products.
         ii. Shall be configurable for sending digital video and embedded audio, plus bidirectional RS-232 and IR signals to Extron XTP CrossPoint matrix switchers.
         iii. Shall be configurable for sending digital video and embedded audio, plus bidirectional RS-232 and IR signals to HDBaseT-enabled displays.
         iv. Shall support mirrored content between both DTP outputs and the two corresponding HDMI outputs for local monitoring.
   b. Provide a range of selectable scaled DTP output rates from 640x480 to 4K, including 2560x1600 and 1080p/60.
   c. Support 4K and UHD signals at the two HDMI outputs
   d. Provide independent scaling for each DTP output
      1) Provide image scaling and video format conversion at 30-bit precision for signals up to 4K.
      2) Support motion-adaptive deinterlacing for signals up to 1080i
   e. Provide aspect ratio control for each scaled DTP output
      1) When in FILL mode, the video image shall always fill the output screen without letterbox or pillarbox.

2) When in FOLLOW mode, the video image shall always preserve the aspect ratio of the input signals without distortion.

f. Provide internal test patterns for the scaled DTP outputs to facilitate system setup and calibration.

g. Support upload and placement of custom logo graphics at any position on any of the scaled DTP outputs.
   1) Support logo placement as a foreground image
   2) Shall support uploading logo graphics in BMP, JPG, PNG, or TIFF format
   3) Shall support displaying full screen images up to 4096x2400 resolution
   4) Shall support up to 16 logo presets

h. Support muting of one or all video outputs at any time

i. Support automatic muting of video and sync output when no video signal is present
   1) Provide a choice to generate a blue screen or a black screen before disabling sync
   2) Provide a configurable timeout period before disabling sync
   3) The user may selectively enable or disable automatic muting of sync output

j. Support the connection of DVI displays that do not recognize HDMI-specific formats
   1) Automatically enable or disable embedded TMDS audio and InfoFrames
   2) Automatically set the correct color space

k. Support video transmission over shielded CATx up to 330 feet (100 meters)

l. Provide automatic reclocking of HDMI video signals at each HDMI output

3. Switching Requirements
   a. Provide video and audio matrix switching between any input and any output
      1) Support incoming 4K and UHD signals at all HDMI and DTP inputs
      2) Support routing of 4K and UHD signals to the two HDMI outputs
      3) Support routing of scaled 4K or UHD video signals to the two DTP outputs
   b. Provide storage and recall of input and output ties
      1) Save video and audio ties between inputs and outputs
      2) Presets may be recalled using front panel controls
      3) Presets may be saved and recalled electronically via Ethernet, RS-232, or USB connection
   c. Provide the ability to view which inputs and outputs are actively connected
   d. Provide selectable transition effects when switching inputs
      1) Freeze/Fade: video output shall fade out a final frozen frame of the previous input source as the newly selected input source fades in
      2) Cut: video output shall cut to black, then cut to the newly selected input source
      3) Fade: video output shall fade to black, then fade into the newly selected input source
4. EDID Requirements
   a. Provide automatic EDID management between connected devices
      1) Provide a set of pre-stored EDID files
      2) Support capture of EDID from any connected display
      3) Support user uploading of custom-generated EDID files
      4) Support assignment of pre-stored, captured, or custom uploaded EDID files for each input connection
5. HDCP Requirements
   a. The unit shall be HDCP compliant

1) Provide authentication and maintain continuous verification of HDCP key exchange with connected sink devices.
2) Provide authentication and maintain continuous verification of HDCP key exchange with connected source devices.
3) Provide the option to disable HDCP processing at any HDMI input connection when passing unencrypted content.
4) Provide selectable, human-readable visual confirmation of HDCP compliance when encrypted content is routed to a non-HDCP compliant display.
   i. When enabled, the video output shall be a solid green color and an on-screen message stating “HDCP CONTENT” shall be displayed.
   ii. When disabled, the output shall be muted.

b. Provide real-time verification of HDCP status for each HDMI input and output
   1) Electronically accessible over Ethernet, RS-232, or USB connection

6. Audio Requirements
   a. Provide audio input connections
      1) Support embedded audio on six HDMI connectors
      2) Support embedded and analog audio on two RJ-45 connectors
      3) Support six stereo line level, balanced or unbalanced signals on six 5-pole, 3.5 mm captive screw connectors.
      4) Support four mono microphone or line level, balanced or unbalanced signals with +48 volt phantom power on four 3-pole, 3.5 mm captive screw connectors.
   b. Provide audio output connections
      1) Support embedded audio on two HDMI connectors
      2) Support embedded and analog audio on two RJ-45 connectors
      3) Support two stereo line level, balanced or unbalanced signals with independent output level control on two 5-pole, 3.5 mm captive screw connectors
      4) Support S/PDIF digital audio signal on one RCA connector
   c. Provide 64-bit floating point DSP engine
      1) Support 32-bit and 64-bit processing algorithms
      2) Provide a deterministic latency from input to output
      3) Provide additional, deterministic latency when Virtual Path routing is used
      4) Provide additional, deterministic latency when Automixing is used
      5) Provide additional, deterministic latency when AEC is used
   d. Support embedding of any analog audio input signal onto the matrix video outputs
   e. Support extraction of two-channel PCM HDMI audio signals to the analog stereo outputs, or route embedded multi-channel bitstream audio to the HDMI outputs.
   f. Support de-embedding, processing, and re-embedding of two-channel PCM HDMI audio signals onto the HDMI outputs.
   g. Support mixing of program audio and mic/line audio signals.
   h. Support mic audio mixed with program audio onto the HDMI/DTP outputs, variable audio outputs, and S/PDIF audio output.
   i. Provide the capability to break two-channel audio away from its corresponding video signal and route to the audio outputs, allowing the audio and video signals from one source to be switched to different destinations.
   j. Provide adjustable, automatic ducking of program audio when a signal is detected on the microphone input.

1) Program audio shall automatically ramp up to reach the original volume level when audio is no longer detected on the microphone input

k. Support audio transmission over twisted pair up to 330 feet (100 meters)

7. Expansion Port Requirements
   a. Provide a digital audio expansion port for bidirectional signal routing between the matrix switcher and a connected Extron DMP 128 Digital Matrix Processor.
   b. Support 16 incoming signals and 16 outgoing signals.
   c. Provide uncompressed digital audio at 48 kHz sampling rate with 24-bit resolution
8. Automixer Requirements
   a. Shall provide Automixer Group selection for optional channel assignment into any of eight groups.
   b. Shall provide gated and gain sharing automixer types.
   c. Shall provide Last Mic Open Priority and Chairman Priority modes.
   d. Shall provide Number of Open Microphone parameter from 0 to 12 microphones.
   e. Shall provide Gate Threshold level and adjustable Off Reduction level for gated channels.
   f. Shall provide adjustable parameters for Attack, Hold, and Release times.
   g. Shall provide real-time metering of Signal Level, Gate Status, and Gate Threshold target from within the Automix parameter setup window in the DSP Configuration software.
   h. Shall provide global view with Gate Status indication of all channels assigned to an automixer group, within the DSP Configuration software.
9. AEC - Acoustic Echo Cancellation Processing Requirements
   a. Shall provide four independent channels of AEC.
   b. Shall provide real-time software-based metering of Echo Return Loss, Echo Return Loss Enhancement, and Total Echo Reduction levels.
   c. Shall provide real-time indication of remote site activity, local site activity, and AEC processor reconverging.
   d. Shall provide up to 20 dB of selectable noise cancellation for each AEC channel.
   e. Shall provide advanced controls and adjustable parameters for Non-Linear Processing, Double Talk Echo Reduction, and Comfort Noise for each AEC channel
   f. Shall provide greater than 200 milliseconds of AEC tail length.
   g. Shall provide up to 60 dB per second AEC convergence rate.
10. DSP Configuration Software Requirements
    a. Shall support PC-based DSP configuration software, allowing flexible control of the integrated digital signal processing.
       1) Shall provide a Live mode for real-time control of parameters without compiling and file uploading to matrix switcher.
       2) Shall provide an Emulate mode for offline configuration.
       3) Shall provide single window view of all inputs and outputs, audio processing blocks, routing, mix points, and virtual routing.
       4) Shall provide setup and configuration of digital signal processing tools including, but not limited to: Filters (high pass, low pass, bass, treble, and parametric EQ); AEC; Dynamics processing (AGC, compressor, limiter, noise gate); Delay processing; Ducking processor; Automixing; Loudness processor; and multiple gain stages.
       5) Shall provide cut and paste editing between processing blocks

6) Shall provide matrix routing with integrated mix point gain adjustment between inputs, outputs, virtual sends, virtual returns, expansion inputs, and expansion outputs.
7) Shall provide a library of pre-designed processor settings for inputs and outputs with user-customizable parameters.
8) Shall provide 32 Group Master controls for consolidation of up to 28 individual gain or mute control members of the same type into one point of control.
9) Shall provide Soft Limits settings to define upper and lower control limits on Group Masters for use with external controls.
10) Shall provide 32 Presets for recall of any processing block setting, level setting, or audio routing; presets shall be saved for the entire system, or any selected partial groups of inputs, outputs, mix points, and DSP blocks.
11) Shall provide real-time metering of levels within each Input Gain, AEC, AGC, Compressor, Limiter, Noise Gate, Automixer, and Output Volume processing block in Live mode.

11. Shall provide a Meter Bridge window for real-time metering of all input and output channels with clipping indication in Live mode.
12. Shall provide keyboard-based navigation of configuration software utilizing directional controls, keyboard shortcuts, and spreadsheet software-style commands.
13. Shall provide file saving in both Live and Emulate mode.
14. Shall provide file upload in both Live and Emulate mode.
15. Shall provide configuration and file saving of the matrix switcher and a linked, compatible Extron digital matrix processor from a single configuration software session.
16. Control/remote - RS-232 and IR Pass-Through Over Shielded CATx Requirements
    a. Provide connections for AV device control
        1) Two 5-pole captive screw: RS-232 or IR pass-through to DTP twisted pair transmitters.
        2) Two 5-pole captive screw: RS-232 or IR pass-through to DTP twisted pair receivers.
    b. Support RS-232 and IR transmission over shielded CATx up to 330 feet (100 meters).
17. Control/Remote - Matrix Switcher Requirements
    a. Provide connections for remote matrix switcher control
        1) RJ-45: 10/100Base-T Ethernet
        2) 3-pole captive screw: RS-232
        3) Mini USB-B: USB 2.0
    b. Provide alternatives for configuration and operation
        1) Front panel controls
        2) Built-in Web pages accessible using a standard Web browser via Ethernet connection
        3) Product configuration software connected via Ethernet or USB
        4) Serial commands sent over Ethernet, RS-232, or USB connection
    c. Support disabling of front panel controls to prevent inadvertent or unauthorized changes to configuration settings
18. General Requirements
    a. Provide real-time verification of signal flow and operation from DTP transmitter or DTP receiver

1) Directly readable on RJ-45 signal and link LEDs
b. Shall be compatible with all Extron DTP Series models, DTP-enabled products, and Extron XTP CrossPoint matrix switchers.
c. Shall be compatible with CATx shielded twisted pair cable, and Extron XTP DTP 24 shielded twisted pair cable.
d. Shall provide remote power to two DTP transmitters and two DTP receivers over the shielded CATx connections.
e. Shall provide power to external peripheral devices on each HDMI output.
f. Enclosure shall be rack-mountable, full rack width, and 2RU in height.
g. Shall be equipped with an internal 100-240 VAC, 50/60 Hz universal power supply.

19. Approved device shall be the Extron DTP CrossPoint 82.

D. Audio Amplifier

Provide a compact, energy efficient audio power amplifier that shall support three analog stereo or mono inputs and one amplified mono analog output with 40 watts rms into a 70 volt line.

1. Compact mono amplifier with 40 watts rms power output into a 70 volt line and ENERGY STAR® qualification
   a. Input Requirements
      1) Shall support one stereo, balanced or unbalanced signal on one 5-pole, 3.5 mm captive screw connector.
      2) Shall support one stereo, unbalanced signal on one pair of RCA connectors.
      3) Shall support one stereo, unbalanced signal on one 3.5 mm stereo mini jack.
      4) Shall provide individual buffering for each input.
      5) Shall provide stereo input summing of all inputs into a single mono signal.
   b. Output Requirements
      1) Shall support one mono speaker level signal on one 2-pole, 5 mm captive screw connector.
      2) Shall provide a total of 40 watts rms output power into a 70 volt line measured at 1 kHz with 1% THD.
      3) Shall provide a signal-to-noise ratio of greater than 75 dB measured from 20 Hz to 20 kHz, unweighted.
      4) Shall support a minimum load impedance of 125 ohms
      5) Shall provide a THD+N measurement of less than 0.2% measured at 1 kHz and 3 dB below clipping.
      6) Shall provide damping factor of greater than 100.
      7) Shall provide a high pass filter for frequencies below 80 Hz with a 12 dB per octave rolloff.
   c. Amplifier Requirements
      1) Shall utilize an efficient Class D amplifier design.
      2) Shall provide Class D Ripple Suppression technology.
      3) Shall be convection cooled and operate without fans or vents.
      4) Shall provide an automatic clip limiter to detect onset of clipping by comparing input and output waveforms and automatically reduce gain without audible artifacts to eliminate clipping distortion.
   d. Power Requirements
      1) Shall draw 11.0 watts during typical (1/8 power) operation.

2) In conjunction with power supply, shall draw 13.9 watts during typical (1/8 power) operation.
3) Shall draw 4.6 watts during quiescent operation.
4) In conjunction with power supply, shall draw 7.1 watts during quiescent operation.
5) Shall provide a low power standby mode
   i. Shall enter standby mode after 25 minutes (+/- 5 minutes) of inactivity
   ii. Shall draw less than 1 watt while in standby mode
   iii. Shall return to full power status in less than one second upon signal detection while in standby mode
   iv. Shall feature an input signal detection threshold of -44 dBV, +/- 3 dB on unbalanced RCA and 3.5 mm stereo mini jack inputs to deactivate standby mode
   v. Shall feature an input signal detection threshold of -30 dBu, +/- 3 dB on balanced captive screw connector input to deactivate standby mode
6) Shall be ENERGY STAR qualified.
7) Shall provide energy-efficient external universal power supply with 2-pole captive screw connector.
   i. Shall be universal in-line power supply with IEC power socket and support for international 100-240 VAC, 50/60 Hz standards
   ii. Shall provide output of 12 VDC, 3 A, 36 watts
   iii. Shall support use of optional Extron ZipClip™ 200 mounting bracket
   iv. Shall meet energy efficiency level V and bear the UL Environment Energy Efficiency Certification (EEC) Mark

e. Control Requirements
1) Shall support remote control of volume and muting on 3-pole, 3.5 mm captive screw connector using optional Extron analog volume and mute controllers.

f. Front Panel Requirements
1) Shall provide an LED for power indication that lights green when the unit is receiving power and active, and lights amber when the unit is in standby mode.
2) Shall provide potentiometers for bass, treble, and input level adjustment.

g. Rear Panel Requirements
1) Shall provide one input on one 5-pole, 3.5 mm captive screw connector
2) Shall provide one input on one pair of RCA connectors
3) Shall provide one input on one 3.5 mm stereo mini jack
4) Shall provide one output on one 2-pole, 5 mm captive screw connector
5) Shall provide remote volume and mute control port on one 3-pole, 3.5 mm captive screw connector

h. General Requirements
1) Shall be enclosed in a rack-mountable 1U, quarter rack width metal enclosure
2) Shall meet regulatory compliances.
   i. Shall meet safety compliances under CCC, CE, c-UL, and UL
   ii. Shall be UL rated for use in plenum airspaces and meet UL 2043 compliance for heat and smoke release, excluding the power supply
   iii. Shall meet UL 60065 and IEC 60065 for safety
   iv. Shall meet EMI/EMC compliances under CE, C-tick, FCC Class B, ICES Class B, KCC, and VCCI

v. Shall comply with appropriate requirements of CEC, ENERGY STAR, EU code of conduct, RoHS, and WEEE
vi. Shall provide three year parts and labor warranty

2. Approved device shall be the Extron MPA 401-70V or approved equal.

E. Touchscreen
1. Provide a 5” capacitive touchscreen interface for switching and control of AV equipment
a. Wall mountable 5” touchscreen user interface for AV and control systems.
1) Provide a 5” LCD color touchscreen that supports up to 16M colors and 800x480 resolution.
2) Device shall support Extron IP Link Pro control processors.
3) Provide built-in speakers located in the bottom center of the touchpanel which can be configured to provide audio and button feedback.
4) Device shall have a female RJ-45 jack located on the back of the enclosure that supports 10/100Base-T, half/full duplex with auto-detect for connection to a LAN or WAN and includes link and activity LED indicators located on the left and right of the jack for troubleshooting network issues as well as supports PoE-Power over Ethernet, 802.3af.
5) Device shall support the following protocols: DHCP, DNS, HTTP, HTTPS, ICMP, SFTP, SMTP, SSH, TCP/IP, UDP/IP.
6) Device shall support mounting in either portrait or landscape orientation.
7) Device shall feature a digital input on the back of the panel.
8) Provide integrated and configurable red/green led status lights located on the center of the left and right sides of the touchpanel when mounted in a landscape orientation.
9) Provide a built-in configurable motion sensor located above the center of the touch surface allowing the panel to be woken from a sleep state or configured via software to trigger any number of actions.
10) Provide a light sensor located above the center of the touch surface of the touchpanels that automatically adjusts the LCD screen’s backlight based on available ambient light.
11) Provide a network status LED that blinks red if the touchpanel loses network connectivity with the control processor located above the center of the touch surface.
12) Device shall have a menu button located behind the bezel of the touchpanel for setup of items such as IP address and sound volume at minimum.
13) Device shall have the following memory available, at minimum:
i. SDRAM
a) 512 MB
ii. Flash
a) 512 MB
14) Device shall have an optional 12 volt captive screw connection located on the back of the panel should PoE not be available.
15) Device shall include a multi-function button that allows for the reset of the device or its communication properties at minimum.
16) Device shall have the ability to controlled by an Apple iPad as a secondary point of control.

17) Device shall include black and white bezels

b. Mounting requirements
   1) Device shall have the ability to be mounted directly in a wall, lectern, or other flat surface and shall be able to be secured using the built-in four locking arms located on the top and bottom of the panel respectively or by using an optional back box. Provide a plastic white bezel landscape kit.

c. Software requirements
   1) User interface shall be created using Extron's GUI Designer software
   2) Panel may be configured using Extron's Global Configurator Plus or Pro

d. Shall meet regulatory compliances
   1) CE
   2) UL
   3) c-UL
   4) C-tick
   5) FCC Class A
   6) ICES
   7) VCCI
   8) RoHS
   9) WEEE

e. Product Warranty
   1) Shall provide at least 3 years parts and labor
   2) Shall provide 1 year touchscreen and overlay components

2. Approved device shall be the Extron TLP Pro 520M.

F. USB Extender

1. Provide a transmitter for extending signals from USB peripheral devices such as human interface devices, imaging devices, mass storage devices, and other USB devices over a single CATx cable in a point-to-point configuration or via a Gigabit Ethernet network.
   a. Twisted pair transmitter for USB peripherals
      1) Shall be paired with a receiver to provide extension of USB peripheral devices up to 330 feet (100 meters) from the host device over one CATx twisted pair cable.
      2) Shall be paired with a receiver through a Gigabit Ethernet switch to provide extension of USB peripheral devices up to 660 feet (200 meters) from the host device within an IP network.
      3) Shall support up to four receivers via an IP network using a Gigabit Ethernet switch.
      4) Shall be compatible with up to five Gigabit Ethernet switches to provide extension of USB peripheral devices up to 1,980 feet (600 meters) within an IP network.
      5) Shall support USB 2.0, 1.1, or 1.0 peripherals.
      6) Shall support USB 3.0 peripherals that can operate at USB 2.0 rates.
      7) Shall support data transfer rates up to 480 Mbps.
      8) Shall provide connection for the host computer on one USB Type mini B connector located on the front panel.
         i. Shall provide peripheral emulation for a virtual connection of a keyboard and mouse to the host computer
         ii. Shall provide the capability to configure the unit with peripheral emulation disabled

9) Shall provide connection for twisted pair cable on one female RJ-45 connector located on the rear panel.
10) Shall provide connection for RS-232 configuration of the transmitter on one 2.5 mm tip, ring, sleeve connector located on the rear panel.
11) Shall provide a recessed button located on the rear panel to pair a transmitter to a receiver.
12) Shall provide connection for 12 VDC power on one 2-pole, 3.5 mm captive screw connector located on the rear panel.
13) Shall be equipped with an external, universal AC power supply capable of supporting 100 - 240 VAC, 50/60 Hz power.

b. General requirements
1) Shall be available in a wall-mountable enclosure that fits within standard US one-gang electrical box.
i. Wall or furniture mountable with optional mounting kits.

2) Shall provide LED indicators located on the front panel for power, link status, and host status.
3) Shall meet regulatory compliances
i. CE, c-UL, UL
ii. CE, C-tick, FCC Class A, ICES, VCCI
iii. RoHS, WEEE
4) Shall provide at least three years parts and labor warranty

2. Approved device shall be the Extron USB Extender Plus D T or approved equal.

G. Power Injection
1. Provide a four (4) port power injector that is compatible with XTP Systems transmitters and receivers.
a. Four (4) port power injector that provides power for up to four (4) remote devices in order to eliminate the need for local power supplies.
1) Provide eight (8) RJ-45 style jacks
i. Four (4) XTP signal input
ii. Four (4) XTP loop-through with power
2) Supports high data rate of XTP System devices
3) Rack mountable when used with optional shelf
2. Approved device shall be the Extron XTP PI 400 or approved equal.

## 2.3 SOFTWARE

A. General
1. All source code becomes the exclusive property of the Owner.
2. All source code changes must be fully documented. Updated programming (compiled and un-compiled soft copy versions of code) must be updated and located at all equipment rack locations and for all equipment manuals.
3. Source code changes and/or additional programming will be warranted by the vendor for a period of 1 year for any required diagnosis and repair.
4. All manufacturer's software operating system updates, bug fixes, patches, etc., shall be installed as part of the periodic system maintenance of the system during the warranty period.

5. An acceptance test will be performed at commissioning during which the software and any additional code changes or upgrades must perform accurately and be error free.

B. Audiovisual System Control Software
1. Audiovisual System Control Software shall facilitate operation and/or status monitoring of all designated Audiovisual Equipment.
2. Coordinate with Client for all required IP address range and info for AV networked devices and supply any specific requirements for network parameters (MDO for switches, multicast for streaming, bandwidth and port settings for videoconferencing, etc.). Configure and record all final IP address information and supply final listing of devices and their information to Client IT Department.
3. Configuration of all networked AV devices with appropriate settings and instruction on how to access remotely for support of management. Tie all control system and networked AV peripherals into main Client or specific management software package (either included in this scope or existing system) for remote control, management and support.

## 2.4 DEVICE PLATES

A. NEMA “gang-type” device and cover plates shall be standard (or “jumbo” size as required) with color and finish as specified by the Architect.

B. Device plates other that NEMA “gang-type" plates shall be 1/8" aluminum or 1/16" stainless steel or other material/finish as specified by the Architect.

C. All device plates shall be sized to fully cover the mounting box and rough opening.

D. All text and graphics shall be engraved. Colors and type font shall be as specified by the Architect.

E. Detailed shop drawings of device plates and panels showing all finishes, dimensions, labeling and cutout information shall be submitted prior to fabrication.

F. Blank cover plates shall be provided at all wall, floor and ceiling boxes that do not have device plates installed. Material/finish shall be as specified by Architect.

## 2.5 FIXED INSTALLATION CABLE

A. The cable types listed in the table below are specified for fixed installation within the base-building raceway and within fixed equipment racks. Unless specifically noted elsewhere, these are NOT acceptable for flexible cables used within lecterns or credenzas or for connection of portable equipment.

B. Where plenum rated cables required, plenum equivalents shall meet the same performance characteristics as non-plenum cables listed below

C. All speaker cable shall be sized to produce less than 1dB of loss in the speaker/cable circuit.

D. All video cable shall be sized to meet the criteria listed in Paragraph 3.3 D. 6.

E. Select the UTP cable type (Cat 5, Cat5e, Cat6, shielded CAT6, MediaTwist, etc.) for correct operation of AV over UTP equipment. Certain manufacturers offer extended warranties with maintaining the vendor cabling solution with the vendor product. This can be beneficial to the project.

| | | |
|---|---|---|
| 1. Audio Speaker Level 8 ohm medium run (20' – 35') | Stranded 14 AWG | Belden 5100UP, Liberty 14-2C-TTP |
| 2. Audio Speaker Level 8 ohm medium run (35' – 60') | Stranded 12 AWG | Belden 5100UP, Liberty 12-2C-TTP |
| 3. Audio Speaker Level 8 ohm medium run (60' – 100') | Stranded 10 AWG | Belden STOOUP Liberty |
| 4. Lectern, credenza, cart and Portable cables | Use highly flexible, premade or molded Cables. Select AWG, Number of conductors | Extron or Liberty as required. |

2.6 RACK ENCLOSURES & ACCESSORIES

A. Provide the accessories noted below for each AV cabinet.
1. Side panels (for end racks of each group of racks)
2. Cable chase (as required)
3. Vented top and solid rear door
4. Grounding stud in top rear of rack
5. Forced air ventilation configured for equipment and heat loads
6. Full height rear mounting rails
7. Seismic base and support
8. Switched & circuit protected vertical power strip(s)

2.7 Classroom Flat Panel Display

A. 65" LED monitor. 4K, Ultra HD premium. Include IR control.

**PART 3 - EXECUTION**

3.1 INSTALLATION

A. General
1. All equipment and enclosures described in this Specification shall be installed plumb and square unless specifically detailed otherwise.
2. All Audiovisual Equipment, except that designated as movable, portable or loose equipment, shall be secured and permanently attached to racks or other appropriate rigid surface in a manner which will require the use of a tool (e.g.: screw driver, nut driver, etc.) for removal.

3. All Audiovisual Equipment installed in a manner or location that may visually impact the finished appearance or functionality of any part of the facility shall be coordinated and approved by the Architect prior to installation.
4. All Audiovisual Equipment supports shall meet or exceed the load requirements of the intended application with a minimum safety factor of five times the actual load.
5. Provide support structure and hardware with a SAE Grade 8 load rating (min.).
6. Secure all external hanging devices (speakers, cameras, etc.) with 3/16" diameter stainless steel cable tether to main wall/ceiling attachment point for secondary seismic support.

B. Equipment Racks
1. Electrical power distribution
   a. Provide labels on receptacles indicating branch panel and circuit number.
   b. Power loads on outlet strips should be equalized for even load distribution.
   c. Power cable attachment to outlet strips should be secured with remaining slack cabling bundled and secured leaving only enough to remove from outlet when serviced.
2. Install rack mounted equipment as indicated on the approved Audiovisual Shop Drawings, and make all connections within the racks before delivery to job site.
3. Provide vents or blank panels in unused equipment spaces.

C. Conduit and Raceways
1. Where cabling transitions from the building distribution infrastructure into equipment racks, provide strain relief and insulation as necessary to protect the cables.
2. Segregate cabling within conduits by signal and cable types.
3. Do not exceed 40% fill in conduits.

D. Cable Dressing
1. Cable dressing shall be considered from a maintenance standpoint. Suitable service loops shall be provided to allow removal of equipment, or to extend equipment that is mounted in the rack on rack slides. Where there is no rear access to the rack mounted equipment, this requirement shall be carefully addressed, and cabling shall be of sufficient length to enable the removal and replacement of any individual piece of equipment with all others in place.
2. Be responsible for determining the proper length of all cables whether manufactured on or off the job site.
3. Determine the desired method of securing cables. All of the following requirements must be met by the system:
   a. Plastic cable ties are the preferred method of cable lacing. Lay-in systems are not acceptable except as applied to a horizontal cable tray.
   b. Wires and cable shall be installed in a neat and orderly fashion, with like cable types following similar paths. Groups of cables shall be neatly combed and harnessed. Harnessed groups of cables shall be anchored at suitable intervals to reduce and

relieve wire strain, especially strain on connections. Adequate service loops shall be provided at all cable endpoints.

c. Some rack-mounted equipment utilizes slide assemblies for front extension while in operation. For this type of mounting, additional, carefully dressed service loops on all cables shall be provided and installed with spring operated cable retractor assemblies to gather and recoil the service loop.

4. For all schemes of cable routing, no point in the path shall be subjected to a bend radius of less than eight (8) times the cable diameter, or minimum cable bend radius specified by the manufacturer.
5. Captive cables shall not be laced in such a manner as to prevent removal of the equipment to which they are captive.
6. Speaker level audio circuits shall be kept a minimum of three inches (3") from line level audio and AC power circuits. All other signal circuits shall be kept at least three inches (3") away from any parallel AC power circuits.
7. Where circuits of different types must cross, they shall do so at right angles and then return to the above required separations in as short a distance as possible.
8. Conductors, wires, and cables shall be continuous between termination points. Splices are not acceptable.
9. Cable tie and lacing installation shall be accomplished using hand tools specifically designed to apply proper tension to the cable tie, and to cut the end of flush with no protruding sharp edges. The field supervisor shall spot check assemblies using cable ties both visually and by touch, thereby detecting any sharp edges of improperly cut cable ties. Install cable ties on all cable runs of two or more cables that are not supported by raceway, cable tray, or other means. Place cable ties approximately six inches (6") apart. Do not use more cable ties than are necessary for a neat installation. Cable ties shall not be applied with excessive force that may damage or deform sensitive and fragile cables.
10. Rack mounting rails shall not be used for cable lacing. Lacing bars and/or tie mount bases mounted to cabinets or console shall be provided where appropriate.

E. Labeling

1. Provide permanent, self-adhesive, engraved labels on the following (use 1/8 inch letters with contrasting core):
   a. Front panel of rack mounted equipment to indicate system designation and/or functionality (e.g. Automixer 3, Press Feed, ADA, Speech Amp- Zone A, etc.).
   b. Terminals (all types) to indicate system designation and/or functionality.
2. Provide permanent, self-adhesive labels on the back of rack mounted equipment to indicate system designation and/or functionality. Text shall be identical to equipment front panels noted above; however, labels for equipment back panels do not need to be rigid, engraved labels.
3. Provide engraved text or graphics directly on the following (use 1/8 inch letters with contrasting paint fill):
   a. Receptacle plates and panels.
   b. Rack panels.
4. Provide heat-shrink labels within six inches of both ends of all installed cabling. Use self-adhesive wire numbers under clear heat-shrink, direct-printed heat-shrink or direct-printed self-adhesive wrap-around.
5. Provide printed tags 6 inches from the male connector end on all portable cables.

6. Text, graphics and colors used on labels visible on finished surfaces visible to Audiovisual System end-users must be approved by Architect before fabrication of labeling, plates or other labeled items.

F. Wiring
1. Do not make any in-line wire splices unless specifically approved and noted.
2. Use only wire pulling lubricants specified by the wire manufacturer.
3. Provide grommets or chase nipples at cable entry where conduit is not installed.
4. Provide cable anchors for any cable or cable bundle » 1-inch diameter. Do not use self-sticking adhesive cable anchors.
5. Provide a service loop for each cable that connects to equipment in racks or AV furniture. Service loops shall be long enough to allow equipment to be pulled out no less than half-way from the rack and/or furniture. On racks, the equipment should be able to be removed from the front of the rack halfway without disconnecting any cables. On floor and wall boxes, plates should be able to be pulled entirely out of the box and laid on a surface for access to the rear connectors without disconnecting any cables.
6. All cables to or from a movable lectern, cart, or desk or lectern shall be highly flexible cable, specifically designed by the manufacturer to be flexed repeatedly. Permanent installation type of cable is not acceptable for this application.

G. Terminations
1. Use crimping tools recommended by the termination manufacturer.
2. Use properly sized spade lugs for cable gauge and screw size.
3. Terminate conductors with proper mating connectors.
4. Audio shield/drain wires shall not be connected to the connector body at any time.
5. Only one cable or set of wires should be installed into any single connector; do not loop cable in and out of a connector. Provide a terminal block to parallel any audio signal wiring.
6. Maintain proper polarity when wiring components and loudspeakers.

## 3.2 QUALITY CONTROL

A. Using the necessary test equipment, record and report to Architect the results of all tests called for under this heading and as noted elsewhere.

B. Correct or replace at no expense to the Owner any component that does not meet the manufacturer’s specifications or indicated performance during any test.

C. AV System Tests:
1. Audio Systems — For each system, set equipment to unity gain (microphone preamplifiers at 40dB gain) and test all system audio inputs to normally configured system electronic outputs (not speakers).
2. Audio Equipment — If the audio system tests reveal problems with the equipment or system wiring or installation, troubleshoot all individual equipment inputs to equipment outputs until the problem is determined and resolved. Then retest system inputs to system outputs per paragraph above and record results.

3. Video Systems — For each room system, test all system inputs to normally configured system outputs with commercially pre-recorded, calibrated source media.
4. Video Equipment — If the video system tests reveal problems with the equipment or system wiring/installation, troubleshoot all individual equipment inputs to equipment outputs until the problem is determined and resolved. Then retest system inputs to system outputs per paragraph above and record results.
5. Digital / HDMI Equipment — Follow current manufacturer required testing procedures for specific digital-based equipment.

RFI 0586 — GEN - Audio Visual Acceptance Testing — See RFI for Testing Checklist

## 3.3 PROJECT CLOSEOUT

A. Installation Testing and Adjustment
1. Perform all tests and adjustments, shall furnish all test equipment necessary and perform all work required to verify performance of the system in accordance with these Specifications. When these initial tests and adjustments are completed, notify the Owner that the systems are in compliance with the Specifications and are ready and complete for Acceptance Tests.

B. Substantial Completion
1. Provide record document equipment list.
2. Provide redlined design drawings, rack layouts, spreadsheets, and any other relevant and current documentation.
3. Test, adjust, balance, equalize and calibrate all equipment (including OFE) as required for optimum quality. Establish and tabulate normal settings for all level controls. These settings shall be recorded in the maintenance manual for reference.
4. Signal and Cable Testing and Documentation: Provide documentation on the point to point testing of all CAT6, Audio, Video and Cabling, provided by the Audiovisual Integrator. The following will be tested for each of the respective category of cable and/or signal types:
   a. Audio: continuity, polarity, sound check
   b. Speaker: impedance, polarity, proper zoning, buzz & rattle (frequency sweep), sound check, signal quality.
   c. Video: signal continuity, proper routing.
   d. Control: continuity & confirmation of control capability between designated control locations and control processors.
   e. Data/Cat6: Bandwidth testing
5. Quality of Installation: The areas around the racks and consoles should be free of debris and excess wires. Racks, consoles, and equipment should be free from dust, dirt and grease.
6. Emergency Muting: Verify that any required muting or operational change of the installed sound system(s) has been made in accordance with local regulations in the event of a life safety or similar emergency.
7. Loudspeaker Zoning: Verify that loudspeaker zones are wired as defined in the project documentation.
8. Audio Buzz and Rattles: Verify that no audible noise caused by improper installation of any equipment provided in completed system(s) is present.

9. Software Licensing: Verify that the usage and ownership rights have been assigned as defined in the project documentation.
10. User Manuals: Verify that manufacturer's user manuals are delivered to the owner in a format defined in the project documentation (e.g., binders, PDFs), or dispose of the manuals in a responsible manner (recycling) if the owner specifies that they do not wish to receive the manuals. Integrator- or programmer- created manuals and documentation shall be delivered to the owner in a format defined in the project documentation.
11. Warranties: Verify that all warranties are activated and that all warranty details have been passed to the owner.
12. Structural Mounting: Verify configuration and compatibility of structural accommodations and mounting hardware based on the intended application. All equipment mounting hardware shall be installed in the manner specified by the hardware manufacturer.
13. Protection of Installed Equipment: Verify that all elements of the AV system are free of damage.
14. Accessibility: Verify that all systems are accessible in accordance with regulatory requirements.
15. AV Rack Air Flow and Temperature Performance
    a. Verify that the AV rack(s) provides the airflow as design requires.
    b. Verify that the temperature in the AV rack has been measured and is within tolerances defined by manufacturers' guidelines.

## 3.4 TRAINING

A. Provide sufficient training for the Owner's designated staff to become proficient in the general operation, routine maintenance, troubleshooting, and other basic system support functions. This training shall include up to 2 sessions of 2 hours each session totaling 4 hours. This training shall include a session or sessions that are focused on the Owner's designated technical staff and also a session or sessions that focus on the administrative and/or instructional staff. Training of end users will be provided by the Owner's technical staff.
B. Times of day for training must be coordinated with Client availability including evening hours if requested for least disruption to Client day time operations.
C. Training shall be recorded and provided in a digital format for staff to review as needed.

**END OF SECTION 27 41 13**

# SECTION 27 51 23 - INTERCOM SYSTEM

## PART 1 – GENERAL

### 1.1 SUMMARY

A. Scope of work: Provide materials, labor, equipment and services necessary to furnish, install, and deliver a standalone intercom system. The system shall be similar in form and function to the nearby Stanton security systems. Although such work may not be specifically shown or specified, all supplementary or miscellaneous items appurtenances, and devices incidental to, or necessary for a sound, secure, complete, and compatible installation shall be furnished and installed as part of the work. Any case of error, omission, discrepancy, or lack of clarity shall be promptly identified for clarification prior to the bid due date.

B. The ESC as defined in Section 280500 Common Work Results for Electronic Safety and Security shall be responsible for providing and coordinating this system.

### 1.2 SYSTEM DESCRIPTION

A. Intercom Control: The intercom system shall provide two-way communications from each area to a master control station. Master control stations are located at Touchscreen Control Stations (TCS). Communications shall be established between the TCS and the intercom stations throughout the facility as indicated on the plans. Program functions as indicated in the Control Matrix Specification section 284600.1.

B. Furnish and install an intercom station (IC) as indicated on the plans to allow staff to place a call and communicate verbally to the assigned TCS. The intercom station shall consist of a call button and a speaker/intercom.

C. Personal Digital Assistant (PDA): The intercom system shall provide two-way communication between hand-held PDA devices and local intercom stations. Communication shall be established by selecting an icon on the PDA. Program functions as indicated in the Control Matrix Specification section 284600.1.

D. Intercom Annunciation: When an intercom call is placed, the related intercom icon will flash on the TCS monitoring the area until the call is answered. Once answered, the icon will illuminate steady until another station is selected or the call is reset.

E. Intercom Answer: Activating the appropriate icon on the TCS shall connect the intercom voice path from the TCS to the related intercom speaker for communication.

F. Paging: Activating the appropriate icon the TCS shall connect the intercom voice path to the related paging speakers for general or zoned paging. Zones shall be divided as indicated on the plans.

### 1.3 SUBMITTALS

A. Basic Submittals: Provide submittals as required by the General Conditions.

B. Special Submittal Requirements: In addition to the general requirements for submittals, provide the following for approval:

1. System interconnection one-line diagram.
2. Sequence of Operation

1.4 SYSTEMS INTEGRATION

A. Integration: Integrate the intercom system with the IP Video system to provide the following:
   1. When an intercom call is selected by the TCS station, the camera monitoring the area will automatically be called up on the spot monitor associated with the TCS station.

**PART 2 – PRODUCTS**

2.1 ACCEPTABLE EQUIPMENT MANUFACTURERS

A. Acceptable Manufacturers:
   1. Harding (No Substitute)
   2. Quam (paging speakers)
   3. Biamp (paging amplifier)

2.2 EQUIPMENT

A. All major electronic components shall be on printed circuit boards. The printed circuit boards shall utilize **push-on connectors with set screw terminal connections** (Phoenix Contact Type MSTB, screw-type, 24-12AWG, strand or solid) or equal for ease in maintenance and replacement. Push-in wire connections will not be allowed.

B. The major components shall be as follows:
   1. Digital Communications Controllers (DCCs)
   2. Digital Communication Expanders (DCEs)
   3. Talkback Expanders (TBEs)
   4. Page Zone Expanders (PZEs)
   5. VoIP Paging/Talkback Amplifier (PTA-620)
   6. SPA-120 Station Port Adapter
   7. MicroComm DXL Administrator Software for configuring and maintaining the system
   8. Intercom master stations (TMM-641)
   9. Intercom stations
   10. Call operating devices
   11. Discrete input/output modules
   12. Auxiliary power supplies
   13. Audio program sources
   14. Paging amplifiers
   15. Loudspeakers and horn loudspeakers

C. The system shall provide for two-way conversations between a TCS and the selected intercom station. The system shall allow one (1) two-way conversation to occur for each TCS. Each intercom station may communicate with the TCS to which it is directly connected. A TCS shall be able to connect to any intercom that is in the station's assigned task group. For TCS equipment refer to Specification section 284600.

D. The system shall provide for two-way conversations between a PDA and the selected intercom station. The system shall allow one (1) two-way conversation to occur for each

PDA. Each intercom station may communicate with the PDA to which it is directly connected. A PDA shall be able to connect to any intercom that is in the station's assigned task group. For PDA equipment refer to Specification section 284600.

E. The master intercom station shall be the following: Harding TMM-640 or equal.

F. Intercom stations shall be flush mounted with 11 gauge stainless steel security cover plate equal to the Harding ICE 4X0 where shown on the drawings.
1. The intercom stations shall comply with the following specifications:
   a. Speaker: 2.5" water resistant.
   b. Exterior rated if called out as exterior intercom
   c. Microphone Sensitivity: 10mV at 74 dB SPL
   d. Pushbutton: 1 vandal resistant long life switch.
   e. Backbox: Two gang electrical back box.
   f. Part number equal to ICE-420-220-700

G. Paging Amplifier: Furnish and install a Biamp MCA 8050 (or equal) amplifier to power paging speakers as indicated on the plans. Provide features as follows:
1. Frequency response of 20 Hz to 20 KHz.
2. Signal-to-Noise ratio shall be greater than 78 dB from 20 Hz to 20 KHz at line input at rated power.
3. Balanced or single-ended 25 volt and 70 volt outputs at a screw terminal.
4. The Mixer/Amplifier shall provide a minimum of 4 balanced input channels.
5. Automatic and/or manual muting shall be selectable on each channel.
6. Mixer/Amplifier shall provide an internal "pre-announcement" chime tone with level control.
7. Amplifier shall be sized to drive 125% of the connected load.
8. Provide zone relays as indicated.

H. Speakers: Furnish and install wall and ceiling speakers as indicated on the plans. Speaker housings in inmate accessible areas shall be detention grade construction while those in public areas shall be commercial grade.
1. Detention grade speakers shall consist of the following Quam (or equal) equipment:
   a. SE1WVP vandal proof enclosure.
   b. 8C10PAOT Speaker
   c. TBLU transformer
   d. Frequency range of 80-8,000 Hz
   e. Provide in all inmate accessible areas.

I. Intercom Control Board:
1. Furnish and install Harding Digital Communications Controller (DCC) as indicated on the plans.
   a. Furnish and install the correct Station Control Cards (SCC) series to connect to the appropriate series intercom.
2. Furnish and install Harding Digital Communications Expander (DCE) as needed to handle the intercom load.
3. Furnish and install Harding Talkback Expander (TBE-310) as indicated on the plans for the paging system.

J. Pedestals: Furnish and install heavy-duty pedestals for intercom stations at vehicle sallyports as indicated on the drawings. ~~Pedestal shall be height adjustable~~ and shall be anchored to a concrete base. Provide hooded intercom stations with surface boxes. Pedestal shall be constructed of round pipe allowing the housing to spin without breaking if sufficient pressure is applied from the side.

K. Talk Path: Each TCS and PDA shall have an independent talk path allowing simultaneous communication from all TCS to the stations under their control. Intercom stations can establish a talk path with only one master at a time.

## 2.3 TRANSIENT SURGE SUPPRESSION

A. Acceptable manufacturers are as follows:
1. Northern Technologies Incorporated
2. DITEK
3. PolyPhaser Corporation
4. Transtector

B. Intercom Suppression: Provide surge protection for intercom wiring that leaves the building. Provide Northern Technologies series PLP units matched to the voltage of the circuit suppressed. The suppressors shall have a peak pulse power dissipation rating of 10 joules each mode, minimum.

C. Security System Power: Provide surge protection for all power connections both inside and outside the building. Devices shall be equal to Northern Technologies TCS-HWR series rated for the power of the circuit suppressed. The suppressors shall have a peak pulse power dissipation rating of 300 joules L-N, minimum. Units shall provide a dry contact monitored by the security system and identified by electrical panel circuit number.

## 2.4 FIBER OPTIC MODULES

A. Furnish and install all fiber optic modules required for transmitting one audio link between buildings.

B. Furnish and install fiber optic modules to establish an independent audio link from the vehicle sallyport intercoms to the TCS over fiber.

C. Modules to be located in a common module rack located next to the fiber optic patch panel (or LIU) in each building. Module shall be equal to AFI 89D series.

## 2.5 CABLING AND WIRE

A. Acceptable manufacturers:
1. Liberty Wire and Cable
2. Eastman Wire & Cable
3. West Penn Wire
4. Belden
5. Carol
6. General Cable
7. Clifford of Vermont, Inc.

B. Wire Size: Furnish and install sufficient wire gauge to limit voltage drop to 5%.

C. Intercom: Intercom wiring shall be compatible with the equipment provided.
   1. Provide one shielded pair – 22 AWG.
   2. For dry Locations intercom wiring as a minimum shall be equal to West Penn 291. Wet rated cable may be run in dry locations at the contractor's option. Wire must be rated for installation. (ie plenum or wet).

D. Fiber Media Converter (voice path): Furnish and install one (1) OM3 fiber strand per voice path.

2.6 EQUIPMENT ENCLOSURES

A. Acceptable Manufacturers:
   1. Hammond
   2. Lowell

B. Cabinets: Mount intercom equipment in a minimum 23" wide by 27" deep by 84" high free standing cabinets as indicated on the plans equal to LSER-4427. Size cabinets to accommodate all system components.
   1. Cabinets shall be constructed of cold rolled steel and provide standard mounting rails for 19" rack mounted equipment.
   2. Conduit shall enter from the top.
   3. Low voltage wiring shall be separated from 120 volt wiring.
   4. Intercom equipment may be mounted with PLC or IP Video control equipment.
   5. Furnish and install mounting hardware as required to install all intercom security electronics equipment required in the space allowed.
   6. Furnish and install solid metal doors for access to both the front and back. Doors shall be minimum 16 gauge flush mounted with air louvers and flush pulls.
   7. Side panels shall be a minimum of 16 gauge flush mount.
   8. Both front and rear doors shall be provide with key locks. Furnish two (2) door keys.
   9. Furnish and install ventilation fans as required to enable proper ventilation for the equipment.
   10. Coordinate cabinet power receptacles with and Division 26.
   11. Furnish and install blank plates by manufacturer on all unused rack sections.

C. Refer to Specification Section 270548 for Seismic Requirements for Equipment Enclosures.

**PART 3 – EXECUTION**

3.1 COORDINATION

A. Preliminary Coordination: Coordinate all required embeds, block-outs and boxes.

B. Control Coordination: Verify that all stations are provided with an appropriate control and an annunciating icon on the TCS.

C. Coordinate system power and conduit with Division 26.

3.2 INSTALLATION

A. Speakers: All attenuation controls shall be set to the minimum practical level. All costs for balancing shall be included in the base bid. Record and submit listing all tap settings with closeout documents.

B. Devices: Install all devices per manufacturer's recommendations. Square devices shall be installed with the bottom line parallel with the floor at designated heights.

C. Intercom Stations: Verify the device is installed with security screws.

D. Field Wiring: The wiring shall be installed in raceways and equipment enclosures with other conductors, within limitations defined by Article 725 of the California Electric Code.
   1. Installation: Dress wires and cables to provide a neat and orderly appearance within all enclosures, equipment racks, cabinets, and consoles by routing in snap-cover, plastic wiring duct. In locations where wiring duct is not feasible, organize by cable clamping, dressing and tie-wrapping.
   2. Strain Relief: Relieve strain on all loose wire bundles using tie-wrap, supports fastened with machine screws or bolts. Do not use self-adhesive type supports.
   3. Shrink Tubing: Apply shrink tubing neatly for cable ends to shielded cables or where necessary to secure the insulation against fraying or raveling.
   4. Edge Protection: Install edge protection materials on edges, holes, lips of ducts, or any other place where wires or cables cross sharp metallic edges.
   5. Service Loops: Allow sufficient service loops where conductors leave cabinet or transition to door mounted electronics.
   6. Splicing: Field wiring shall not be spliced. All wiring shall be continuous from the field device to the termination in the control panel.
   7. Listings: Wiring shall be listed for the installation. Wire identified herein is intended to provide electrical characteristic requirements.
   8. Wire Termination: All wiring shall be terminated at both ends and labeled in accordance with the equipment wiring plans. Wire not energized or connected to active devices shall be labeled for future use.

## 3.3 TRAINING

A. The ESC shall provide, without additional cost to the owner, representatives specially trained in the operation of the intercom system provided. The representatives shall train the Owner's personnel in operation, repair, and upkeep of this system. Refer to Specification section 280500 Part 3.6 Training for additional information.

## 3.4 SPARE PARTS

A. Furnish to the owner the following spare parts:
   1. One (1) spare intercom stations.

B. Spare parts shall be packaged in appropriate protective packing material.

C. Box spare parts for easy storage and clearly identify the contents of each box on all four sides of each container.

## 3.5 FIELD QUALITY CONTROL

A. Intercom Station Operation: Verify and document that intercom station calls register on the TCS and PDA. Verify that each intercom can be called from the TCS and PDA. Check that all integrated events occur as specified for each intercom actuation.

B. Audio Path: Verify and document the voice path of each intercom station to the local TCS station for clarity and volume. List the final tap setting for each intercom station after testing is complete.

C. UPS Operation: Operate the system on standby power or UPS for one hour. Place and answer an intercom station call every 60 seconds during this test. After the test is complete, record the output levels of the UPS and batteries.

D. Test Reports: Provide written test reports documenting all of the above with either a narrative for each point or a list of features noting "pass" or "fail". Provide copies of the tests to the Engineer before requesting the Engineer to witness a functional test.

**INTERCOM AND PAGING VERIFICATION AND CHECK-OUT FORM**

✓ = OK

**Job #**
**Job Name:**
**Panel #**

| **FIELD TEST CODE:** | | **REPAIR CODE:** | |
|---|---|---|---|
| A - No status change | M -Adjust paging amp | 1-SSI | Software Test By:_____ Date_____ |
| B- No power to intercom | N -Paging reversed | 2-ELECTRICIAN | |
| C -No audio | O - | 3-IRONWORKER | Hardware Test By:_____ Date_____ |
| D -Poor audio | P - | 4-CARPENTER | |
| E -No CCTV call-up | Q - | 5-OWNER/REP | System Test By:_____ Date_____ |
| F -Intercom button sticks | R - | 6-ENG | |
| G -Intercom Reversed | S - | 7 - | Design Engineering By:_____ Date_____ |
| H - Adjust intercom amp | T - | 8 - | |
| I - Software problem | U - | 9 - | Wiring By:_____ Date_____ |
| J -Not installed | V - | 10 - | |
| K -Paging zone failure | W - | 11 - | Field Test By:_____ Date_____ |
| L - Paging speaker failure | X - | 12 - | |

| | | | | | | | **ON-SITE** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ICON ID#** | **ICON TYPE** | **C/U CAM. NO.** | **CCTV INTLK WITH** | | **SOFT-WARE TEST** | **IC TEST** | **FIELD TEST CODE** | **REPAIR CODE** | **RE-CHECK "X"** | **FIELD CHECK OUT NOTES** | **PROBLEM RESOLVED (BY/DATE)** |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**END OF SECTION 27 51 23**

# SECTION 27 53 20 – DISTRIBUTED ANTENNA SYSTEM

**PART 1 -** General

1.1 RELATED DOCUMENTS

A. General provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

B. America National Standard ANSI/TIA/EIA Telecommunications Building Wiring Standards.

C. California Fire Code.

1.2 SUMMARY

A. Section Includes:
1. Head End Components (Furnished by Owner installed by ESC)
2. Equipment racks (Furnished and installed by the ESC)
3. Coaxial Cable (Furnished and installed by ESC)
4. Splitters / Directional Couplers (Furnished and installed by ESC)
5. Cable Hangers (Furnished and installed by ESC)
6. Cable Connectors (Furnished and installed by ESC)
7. Cable Jumpers (Furnished and installed by ESC)
8. Antennas (Furnished and installed by the ESC)

B. The ESC shall furnish and install cabling, raceway, wall mounted rack, splitters, cable connectors, cable jumpers, and antennas. The ESC shall install owner furnished amplifiers, base stations, and repeaters.

C. It is the ESC's responsibility to ensure adequate radio coverage in buildings A, B and the outside area enclosed by the perimeter fence. In addition the equipment provided by the ESC, the ESC shall provide time to install owner's equipment and test the system.

D. The purpose of the Distributed Antenna System (DAS) will be to receive donor signal(s) from an external source and distribute desired radio signals as listed below to the intended coverage area within the building.

E. The amplification system shall be approved by the Authority Having Jurisdiction before installation.

1.3 DEFINITIONS

A. ATTENUATION: The reduction in signal power, expressed in decibels, as a result of coupling, heat loss, or transmission distance in a cable or in air.

B. BASE STATION: A wireless communications station installed in a fixed location and used to communicate as part of one of the following: a push-to-talk two-way radio system, or; a wireless telephone system such as cellular CDMA or GSM cell site.

C. CABLE ASSEMBLY (JUMPER): Short length of flexible coaxial cable used to attach antennas or other components to the main coaxial cable distribution system.

D. DAS (DISTRIBUTED ANTENNA SYSTEM): A network of service antennas connected at intervals along shielded coaxial transmission lines and all connected to head-end electronics amplifying the signals to be distributed. Often refers to a system that includes both the passive distribution system and the active amplifying electronics.

E. DONOR ANTENNA: The antenna, usually mounted on the outside of a structure where a DAS is installed, which picks up signals over-the-air from a donor source.

F. DONOR SOURCE: The repeater, transceiver, cell site or other radio site that produces signals which a DAS will relay and distribute.

G. REFLECTED POWER: Power which is reflected back along a transmission line as a result of discontinuities in line impedance caused at connectors or close proximity of metallic objects.

H. RF (RADIO FREQUENCY): Energy from electromagnetic waves, or alternating currents that produce electromagnetic waves, in the spectrum of radio frequencies (30 kHz to 300GHz).

I. SYMMETRICAL SPLITTER: A passive component that has a single input port and two or more output ports, effectively splitting the signal equally amongst the output ports. It also serves to combine upstream signals from the "output" ports into composite signals at the "input" port.

J. UNSYMMETRICAL SPLITTER: A passive component that has a single input port and two or more output ports, effectively splitting the signal amongst the output ports based on a dB ratio that is specified by the part.

K. TERMINATION: A device that is installed on the end of a transmission line to provide a pure resistive 50-ohm load.

L. RADIATING CABLE or LEAKY COAX: A coaxial cable that has small sections of its copper shielding stripped away to allow radio frequency (RF) signals to escape, which acts as an extended antenna.

## 1.4 QUALITY ASSURANCE

A. Contractor Qualifications

1. The ESC shall have installed similar systems in at least five locations in the previous five years.
2. The ESC must test the radio system as outlined in CFC 2013, 510.5.3.
3. The contractor must have installers qualified to accomplish in-field soldered connections meeting MIL specifications for soldered connectors, if required.
4. The installation contractor shall have demonstrable experience (one project in past 2 years) in installing above-ceiling cabling systems.
5. The installation contractor shall be industry trained in the installation and testing of the proposed system. Technicians in the field shall demonstrate knowledge of material and installation of the product line and testing.

1.5 CONTRACTOR

A. The selected contractor shall install, commission, and test the completed DAS section according to the drawings and specification documents.

1.6 WARRANTY

A. The contractor shall provide a one year parts/labor warranty for the system with the option to extend for up to two years at an additional cost. Any and all maintenance and/or repairs shall be handled directly by the contractor during this warranty period.

B. Contractor shall accomplish all registrations and proof of purchases required to activate any manufacturer's warranty.

C. Contractor shall be responsible for meeting all requirements of any manufacturer's warranty during the warranty period listed in "A" above.

D. Contractor shall invoke manufacturer's warranties as necessary during the warranty period. Including, but not limited to obtaining Return Merchandise Authorization, shipping defective material, and receiving replacements.

1.7 SUBMITTALS

A. Shop Drawings:
1. Provide floor plans, showing the layout and location of antennas, couplers, splitters and cabling.
2. Provide schematic drawings for the head-end and distributed electronics equipment.
3. Provide space requirements in security rooms
4. Provide power requirements in security rooms

B. Close-out documents which include:
1. As-built documentation of the installed system shall be in PDF format as well as AutoCad or Revit.
2. Any test documentation shall be provided in an electronic form acceptable to the owner, which is maintainable for annual or subsequent re-test and comparison.
3. Pictures of installation, showing locations of major components (BDA, Donor Antenna, etc) and samples of typical components (splitter, couplers, ceiling antennas, etc).
4. Screen shots of initial system settings and status in BDA user application software (Gain Levels, RSSI levels, Digital Filtering, etc).
5. Manufacturer's installation and operation manuals for all components, application software and any associated cables shall be left on-site with support documentation for future reference.

1.8 DESIGN

A. Signal Accommodation: The system shall be designed to support frequencies listed:
1. UHF Range: 450-520MHz
2. Communication will be Analog

B. General Building areas shall have 90% coverage of the floor area.

**PART 2 -** PRODUCTS

2.1 MANUFACTURERS

A. All material shall be the product of a manufacturer that has been in the business of manufacturing like product and financially stable for a period of at least five years.

B. Electronic equipment manufacturers shall have a well-defined technical support structure with 24/7 support available.

2.2 COMPONENTS

A. Base Station
1. Motorola MTR3000 Base station (Furnished by owner and installed by ESC)

B. Antenna(s)
1. Wideband Outdoor Fractal Antenna Systems Inc. Antenna

C. Battery System / Power Supply
1. Power will be provided from UPS circuit using a quad outlet mounted near the wall mounted radio rack in the main SEC room.
2. Base station in SEC Booth A120 will be powered from UPS outlet.
3. ESC is to coordinate all power with Division 26.

D. VOIP Radio Console and Tone Gateway
1. MIP 5000 VOIP Radio Console (Furnished by owner and installed by ESC)
2. Software will be installed on a computer station
3. A network cable will be installed between that computer and the DAS rack
4. Network cable will connect to a Tone Gateway (L3483A) that connects to the Base station

E. Splitters
1. 2-Way Symmetrical Splitter: Spinner BN 818289 (3.0/3.0dB 7-16 socket) or equal.
2. 2-Way Unsymmetrical Splitter: Spinner BN 818244 (8.1/0.8dB 7-16 socket) or equal.

F. Shielded Coaxial Cable
1. AirCell - Trilogy Communications AT078R50 (7/8” Coaxial Cable) or equal.

G. Radiating Cable / Leaky Cable
1. AirCell - Trilogy Communications AR078FX50 (7/8” Leaky Coaxial Cable) or equal.

H. Cable Hangers
1. Cable hangers shall be used to support the horizontal cable runs on each floor. Cable hangers shall be spaced according to cable manufacturer recommendations.
2. Attach cables to ceiling using methods detailed in section 270529 – Hangers and Supports for Communications Systems Cables.
3. Radiating Cable / Leaky Cable will be installed a minimum of 6” from the metal roof of Building B.

I. Connectors

1. The cabling shall be connected using the connectors recommended by coaxial cable manufacturer.

J. Wall Mounted Rack: Furnish and install (1) 43" H X 18" D X 21" W universal swing gate rack in the IDF rooms as indicated on the plans, CPI Part Number 11791-X18.
   1. Furnish and install on each equipment rack (2) 1-RMU front only horizontal wire manager, CPI Part Number 30139-719. Coordinate installation with all trades.
   2. Furnish (1) set of screws/cage nuts (25 counts per set set) per rack for project owner's use to mount network and computing equipment; CPI Part Number 12639-001.
   3. Size rack for two Base stations and one Tone Gateway unit furnished by the owner. Coordinate rack depth with owner furnished equipment.
   4. Grounding design shall meet Motorola R56 standards and all local codes in the installation environment.
   5. Coordinate with the exact location above incoming underground conduits to mount the swing gate rack based on field conditions, ensuring proper clearance for the rack to swing open to the maximum per manufacturer design.

K. Entrance Port
   1. A rubber, watertight entrance port shall be utilized on the roof in order for the coaxial cable to transition from the roof to the interior of the structure.

L. Transient Protection at inside entrance for donor antennas (if required)
   1. A bulkhead mount protector shall protect against lightning damage
   2. Lightning Protection Device: Polyphaser IS-50NX-C2

M. Cable Assemblies (Jumpers)
   1. Use cable assemblies (jumpers) recommended by the coaxial cabling manufacturer when connecting antennas to rigid coaxial cable. This will provide flexibility necessary to properly mount antennas without over stressing connectors.

N. Other Components
   1. Any additional components needed for correct installation of this system, including but not limited to, coupler/splitter holders for cable trays, and 50 Ohm resistive loads, shall be installed according to the manufacturer guidelines and intentions.

2.3 COMPONENT SUBSTITUTION

A. Substitution of any component listed in this specification for another component must be approved by the design team prior to substitution.

**PART 3 - EXECUTION**

3.1 COORDINATION

A. ESC shall hold and coordinate meetings with owner, general contractor and the design team to coordinate system installation.

B. Coordinate layout and installation of DAS pathways, cabling, conduits, and antenna placement with electrical and telecom contractors and design team.

C. Coordinate installation activities with general contractor and electrical contractor.

D. Coordinate and confirm placement of antennas with owner, architect, and design team.

E. Coordinate with each licensee or system owner for all signals to be re-radiated by the DAS System.

F. Officially notify licensees prior to system going on-air.

G. Procure consent to carry letter for each provider as required.

H. Coordinate power requirements for head-end equipment with electrical design team.

I. Coordinate cooling requirements for head-end equipment with mechanical design team.

3.2 PRE-INSTALLATION INSPECTION

A. ESC shall carry the cost to provide a pre-installation inspection and testing of the facility during the construction period. Test should take place after the walls and ceiling have been erected. ESC shall notify the Architect and Designer immediately if changes need to be made to the design before proceeding with the installation.

3.3 GENERAL INSTALLATION

A. Place all terminations and antennas above 7 feet and out of reach of the general public.

B. Sleeve all terminations with appropriately sized heat shrink tubing to a point at least 6" behind the connector.

C. Ground all miscellaneous metallic components, such as splitters, directional couplers, and connectors.

3.4 CABLE INSTALLATION

A. Do not bend shielded coaxial cables to a radius that is less than the minimum manufacturer specification for that cable.

B. Cables shall be run at right angles to, and remain clear of, all other trade works.

C. Attach cables to walls or ceilings using cable hangers specified in PART 2 of this section.
1. Whenever cable hangers/attachments are utilized, they shall be spaced so that the cable is adequately supported according to the manufacturer specifications.

D. When using cable hangers, care shall be taken to not tighten hangers beyond what is necessary to firmly hold the cable in place. This could compromise the internal integrity of the cable by crimping or kinking the outer conductor or dielectric.
1. All cable shall pass a FDR test specified in PART 4.

E. For short connections close to antenna connections (less than 2 feet), flexible coaxial cable assemblies (also known as jumpers) may be used instead of rigid coaxial cable.

3.5 SPLITTER INSTALLATION

A. Install splitters in such a manner so as to have minimal effect on cables.

B. Mount each splitter on a bracket that provides for the structural integrity of the input and output ports of the device.

3.6 ANTENNA INSTALLATION

A. Coordinate antenna installation with the owner to ensure correct placement.
1. Antenna placement shall be as indicated on the technology drawings ES100, ES201, ES202, & ES203. Placement of these antennas more than 5 feet from intended location must be approved by the design team prior to placement.

3.7 CONNECTOR INSTALLATION

A. Install all connectors for cabling and other components in accordance with the manufacturer's recommendations.

3.8 INSTALLATION STANDARDS

A. Install all equipment with a high degree of technical workmanship.

B. Installation details, including but not limited to grounding, structural soundness, and power connections shall be accomplished in accordance with the latest version of Motorola Standard R56, Construction Practices for Radio System Installations.

C. All miscellaneous connectors and cables shall be of a type meeting MIL specifications for resistance to corrosion and vibration.

D. All miscellaneous metallic components, such as splitters, directional couplers, etc., shall be mounted on metal shelves (when installed in the head-end cabinet) or otherwise provided with a robust ground connection, and to the remainder of the system components within any room.

E. All cabling shall be connected to walls or ceilings using the appropriate cable hangers. Cable runs shall be neat and shall not, under any circumstances, be attached to electrical conduits or metalwork associated with other building systems.

F. Each cable between any two locations shall be tagged or marked with bands of colored tape, identically at both ends, unique to the specific cable and the radio system. Markings shall be permanent and placed where they are visible for inspection without moving other cables. Cable markings shall be noted on as-built drawings.

3.9 COMPONENT TESTING

A. Perform and record a test of every installed cable segment using an RF FDR. (Cable segments shall be temporarily terminated at one end in a 50-ohm resistive load (termination) for these tests.)

B. Test all cables segments (as defined below) at frequency sweeps around: 160, 460, 840, 930, and 1925 MHz. The sweep bandwidth should be reflective of common spectrum bands in that frequency range (i.e, 806-894 MHz covers the cellular and LMR band in 800 MHz).

1. Test every segment of cable that has no more than a pair of connectors individually with a termination at one end.

C. The return loss at any connector along a length of cable segment shall be greater than 20dB. Inspect the FDR trace for any locations other than connectors where return loss is below nominal value. If apparent cause is proximity to external metal devices, correct the routing of the cable and re-test. If apparent cause is stretching or tearing of cable or its materials, replace the section of cable and re-test.

D. Provide copies of test results (both tabular and screenshots of cable tests) for all cable tests to design team two weeks prior to Punch List visit.

## 3.10 SYSTEM TESTING

A. Prior to the start of testing, using electronic copies of design drawings, create as-built documents showing the exact components, locations, paths, connections, and test points used.

B. Prior to initial activation of system for testing, contractor should notify the design team a minimum of two weeks before activation for coordination purposes.

C. Connect distribution system to head-end electronics and perform signal coverage tests as follows for the radio system:

1. Divide each floor into twenty (20), approximately equal, test zones.
    a. Spaces with large inaccessible areas, such as those occupied by machinery, electrical equipment, etc., shall be represented by a typical personnel space.
    b. Each stairwell (with door closed) on every even numbered floor shall be a test zone. Each elevator shall be three test zones, one at the top, bottom, and midpoint with its doors closed.
2. Test zones shall be drawn on as-built floor plans. A test point shall be selected approximately in the center of the zone, and labeled in an appropriate fashion (such as Wing, Floor No. , Location No.). Test location numbers shall be entered on an Excel spreadsheet with columns indicating "Received Signal Level" and "Uplink Keying Check".
3. The testing devices shall consist of a typical portable two-way radio programmed to operate on the radio system, and a spectrum analyzer or a calibrated test receiver that reads out or can be converted to true signal level in dBm using a conversion chart.
4. The portable radio shall be equipped with a typical antenna, with the radio held in the tester's hand and in a position for speaking into the built-in microphone.
5. The calibrated receiver shall be mounted on a rolling cart, using a calibrated dipole antenna at 48" above the floor.
6. The spectrum analyzer/calibrated test receiver shall be tuned to the active control channel of the public safety radio system.
7. At each test location:
    a. Read and record the downlink received level from the spectrum analyzer/calibrated test receiver and enter it on the spreadsheet opposite the location number, in the column labeled "Received Signal Level".
    b. Key the portable radio on an approved vacant talk group and listen for key-up (go-ahead) tone, and also the presence of a carrier for a few seconds after releasing the push-to-talk button.

c. If the received signal on the spectrum analyzer/calibrated test receiver is equivalent to -80dBm or better, and the repeater system responds immediately to key-up, enter "OK" in the column of the spread sheet labeled "Uplink Keying Check".
d. If the received signal level is equivalent to less than -80dBm, or the uplink check fails on the first attempt, then accomplish four more uplink keying attempts from the same location, and enter the number (0-4) of key-up tests that are successful. THEN move the cart in four directions from the selected test location (approximately along an "X") within the test zone. Observe the signal level behavior along the four directional lines, plot the lines on the test zone drawing, and indicate the location and values of maximum and minimum readings along those lines.
e. Note: The -80 dBm test point value using a dipole antenna is designed to provide a 15dB margin between the actual received level and the target minimum value of 95 dBm at the terminals of a portable radio with antenna worn next to body.

8. At the conclusion of the tests, confer with owner, design team, and other interested parties to determine revisions or corrections that might be necessary to achieve desired results.

**END OF SECTION 27 53 20**

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November 9, 2016

# SECTION 27 53 20 – DISTRIBUTED ANTENNA SYSTEM

## PART 1 - General

### 1.1 RELATED DOCUMENTS

A. General provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

B. America National Standard ANSI/TIA/EIA Telecommunications Building Wiring Standards.

C. California Fire Code.

### 1.2 SUMMARY

A. Section Includes:
1. Head End Components (Furnished by Owner installed by ESC)
2. Equipment racks (Furnished and installed by the ESC)
3. Coaxial Cable (Furnished and installed by ESC)
4. Splitters / Directional Couplers (Furnished and installed by ESC)
5. Cable Hangers (Furnished and installed by ESC)
6. Cable Connectors (Furnished and installed by ESC)
7. Cable Jumpers (Furnished and installed by ESC)
8. Antennas (Furnished and installed by the ESC)

RFI 0289 — Distributed Antenna System Clarifications — Radio system equipment specified. (1)

B. The ESC shall furnish and install cabling, raceway, wall mounted rack, splitters, cable connectors, cable jumpers, and antennas. The ESC shall install owner furnished amplifiers, base stations, and repeaters.

C. It is the ESC's responsibility to ensure adequate radio coverage in buildings A, B and the outside area enclosed by the perimeter fence. In addition the equipment provided by the ESC, the ESC shall provide time to install owner's equipment and test the system.

D. The purpose of the Distributed Antenna System (DAS) will be to receive donor signal(s) from an ~~external source~~ and distribute desired radio signals as listed below to the intended coverage area within the building.

(1) Only source is internal radio equipment.

E. The amplification system shall be approved by the Authority Having Jurisdiction before installation.

### 1.3 DEFINITIONS

A. ATTENUATION: The reduction in signal power, expressed in decibels, as a result of coupling, heat loss, or transmission distance in a cable or in air.

B. BASE STATION: A wireless communications station installed in a fixed location and used to communicate as part of one of the following: a push-to-talk two-way radio system, or; a wireless telephone system such as cellular CDMA or GSM cell site.

C. CABLE ASSEMBLY (JUMPER): Short length of flexible coaxial cable used to attach antennas or other components to the main coaxial cable distribution system.

D. DAS (DISTRIBUTED ANTENNA SYSTEM): A network of service antennas connected at intervals along shielded coaxial transmission lines and all connected to head-end electronics amplifying the signals to be distributed. Often refers to a system that includes both the passive distribution system and the active amplifying electronics.

E. DONOR ANTENNA: The antenna, usually mounted on the outside of a structure where a DAS is installed, which picks up signals over-the-air from a donor source.

F. DONOR SOURCE: The repeater, transceiver, cell site or other radio site that produces signals which a DAS will relay and distribute.

G. REFLECTED POWER: Power which is reflected back along a transmission line as a result of discontinuities in line impedance caused at connectors or close proximity of metallic objects.

H. RF (RADIO FREQUENCY): Energy from electromagnetic waves, or alternating currents that produce electromagnetic waves, in the spectrum of radio frequencies (30 kHz to 300GHz).

I. SYMMETRICAL SPLITTER: A passive component that has a single input port and two or more output ports, effectively splitting the signal equally amongst the output ports. It also serves to combine upstream signals from the "output" ports into composite signals at the "input" port.

J. UNSYMMETRICAL SPLITTER: A passive component that has a single input port and two or more output ports, effectively splitting the signal amongst the output ports based on a dB ratio that is specified by the part.

K. TERMINATION: A device that is installed on the end of a transmission line to provide a pure resistive 50-ohm load.

L. RADIATING CABLE or LEAKY COAX: A coaxial cable that has small sections of its copper shielding stripped away to allow radio frequency (RF) signals to escape, which acts as an extended antenna.

## 1.4 QUALITY ASSURANCE

A. Contractor Qualifications
1. The ESC shall have installed similar systems in at least five locations in the previous five years.
2. The ESC must test the radio system as outlined in CFC 2013, 510.5.3.
3. The contractor must have installers qualified to accomplish in-field soldered connections meeting MIL specifications for soldered connectors, if required.
4. The installation contractor shall have demonstrable experience (one project in past 2 years) in installing above-ceiling cabling systems.
5. The installation contractor shall be industry trained in the installation and testing of the proposed system. Technicians in the field shall demonstrate knowledge of material and installation of the product line and testing.

## 1.5 CONTRACTOR

A. The selected contractor shall install, commission, and test the completed DAS section according to the drawings and specification documents.

1.6 WARRANTY

**A.** The contractor shall provide a one year parts/labor warranty for the system with the option to extend for up to two years at an additional cost. Any and all maintenance and/or repairs shall be handled directly by the contractor during this warranty period. **Contractor shall warranty the parts and pieces they provide and the installation of parts they install.**

B. Contractor shall accomplish all registrations and proof of purchases required to activate any manufacturer's warranty.

C. Contractor shall be responsible for meeting all requirements of any manufacturer's warranty during the warranty period listed in "A" above.

D. Contractor shall invoke manufacturer's warranties as necessary during the warranty period. Including, but not limited to obtaining Return Merchandise Authorization, shipping defective material, and receiving replacements.

1.7 SUBMITTALS

A. The submittal for this section is to be provided with other sections defined in 280500 Common Work Results for Electronics Security and Safety. All sections defined in 280500 are to be submitted at the same time and in accordance with the specification. Refer to that specification for additional information.

B. Shop Drawings:
1. Provide floor plans, showing the layout and location of antennas, couplers, splitters and cabling.
2. Provide schematic drawings for the head-end and distributed electronics equipment.
3. Provide space requirements in security rooms
4. Provide power requirements in security rooms

RFI 0256 — LVSE Peer Review Clarification 1: Commissioning agent to supply any test documentation

C. Close-out documents which include:
1. As-built documentation of the installed system shall be in PDF format as well as AutoCad or Revit.
2. Any test documentation shall be provided in an electronic form acceptable to the owner, which is maintainable for annual or subsequent re-test and comparison. (1)
3. Pictures of installation, showing locations of major components (BDA, Donor Antenna, etc) and samples of typical components (splitter, couplers, ceiling antennas, etc).
4. Screen shots of initial system settings and status in BDA user application software (Gain Levels, RSSI levels, Digital Filtering, etc).
5. Manufacturer's installation and operation manuals for all components, application software and any associated cables shall be left on-site with support documentation for future reference.

1.8 DESIGN

A. Signal Accommodation: The system shall be designed to support frequencies listed:
1. UHF Range: 450-520MHz

RFI 0256 — LVSE Peer Review Clarifications: No design responsibility by ESC or GC

2. Communication will be Analog

B. General Building areas shall have 90% coverage of the floor area.

1.9 OWNER TRAINING

A. The owner training for this section is to be provided with other sections defined in 280500 Common Work Results for Electronics Security and Safety. All sections defined in 280500 are to be submitted at the same time and in accordance with the specification. Refer to that specification for additional information.

**PART 2 -** PRODUCTS

2.1 MANUFACTURERS

A. All material shall be the product of a manufacturer that has been in the business of manufacturing like product and financially stable for a period of at least five years.

B. Electronic equipment manufacturers shall have a well-defined technical support structure with 24/7 support available.

2.2 COMPONENTS

A. Base Station
1. Motorola MTR3000 Base station (Furnished by owner and installed by ESC)

B. Antenna(s)
1. Wideband Outdoor Fractal Antenna Systems Inc. Antenna

RFI 0393 — Antenna Make and Model Clarification — See RFI for product data

C. Battery System / Power Supply
1. Power will be provided from UPS circuit using a quad outlet mounted near the wall mounted radio rack in the main SEC room.
2. Base station in SEC Booth A120 will be powered from UPS outlet.
3. ESC is to coordinate all power with Division 26.

D. VOIP Radio Console and Tone Gateway
1. MIP 5000 VOIP Radio Console (Furnished by owner and installed by ESC)
2. Software will be installed on a computer station
3. A network cable will be installed between that computer and the DAS rack
4. Network cable will connect to a Tone Gateway (L3483A) that connects to the Base station

E. Splitters
1. 2-Way Symmetrical Splitter: Spinner BN 818289 (3.0/3.0dB 7-16 socket) or equal.
2. 2-Way Unsymmetrical Splitter: Spinner BN 818244 (8.1/0.8dB 7-16 socket) or equal.

F. Shielded Coaxial Cable
1. AirCell - Trilogy Communications AT078R50 (7/8” Coaxial Cable) or equal.

G. Radiating Cable / Leaky Cable
1. AirCell - Trilogy Communications AR078FX50 (7/8” Leaky Coaxial Cable) or equal.

H. Cable Hangers
1. Cable hangers shall be used to support the horizontal cable runs on each floor. Cable hangers shall be spaced according to cable manufacturer recommendations.
2. Attach cables to ceiling using methods detailed in section 270529 – Hangers and Supports for Communications Systems Cables.
3. Radiating Cable / Leaky Cable will be installed a minimum of 6” from the metal roof of Building B.

I. Connectors
1. The cabling shall be connected using the connectors recommended by coaxial cable manufacturer.

J. Wall Mounted Rack: Furnish and install (1) 43" H X 18" D X 21" W universal swing gate rack in the IDF rooms as indicated on the plans, CPI Part Number 11791-X18.
1. Furnish and install on each equipment rack (2) 1-RMU front only horizontal wire manager, CPI Part Number 30139-719. Coordinate installation with all trades.
2. Furnish (1) set of screws/cage nuts (25 counts per set set) per rack for project owner’s use to mount network and computing equipment; CPI Part Number 12639-001.
3. Size rack for two Base stations and one Tone Gateway unit furnished by the owner. Coordinate rack depth with owner furnished equipment.
4. Grounding design shall meet Motorola R56 standards and all local codes in the installation environment.
5. Coordinate with the exact location above incoming underground conduits to mount the swing gate rack based on field conditions, ensuring proper clearance for the rack to swing open to the maximum per manufacturer design.

K. Entrance Port
1. A rubber, watertight entrance port shall be utilized on the roof in order for the coaxial cable to transition from the roof to the interior of the structure.

L. Transient Protection at inside entrance for donor antennas (if required)
1. A bulkhead mount protector shall protect against lightning damage
2. Lightning Protection Device: Polyphaser IS-50NX-C2

M. Cable Assemblies (Jumpers)
1. Use cable assemblies (jumpers) recommended by the coaxial cabling manufacturer when connecting antennas to rigid coaxial cable. This will provide flexibility necessary to properly mount antennas without over stressing connectors.

N. Other Components
1. Any additional components needed for correct installation of this system, including but not limited to, coupler/splitter holders for cable trays, and 50 Ohm resistive loads, shall be installed according to the manufacturer guidelines and intentions.

## 2.3 COMPONENT SUBSTITUTION

A. Substitution of any component listed in this specification for another component must be approved by the design team prior to substitution.

## PART 3 - EXECUTION

3.1 COORDINATION

A. ESC shall hold and coordinate meetings with owner, general contractor and the design team to coordinate system installation.

B. Coordinate layout and installation of DAS pathways, cabling, conduits, and antenna placement with electrical and telecom contractors and design team.

C. Coordinate installation activities with general contractor and electrical contractor.

D. Coordinate and confirm placement of antennas with owner, architect, and design team.

E. Coordinate with each licensee or system owner for all signals to be re-radiated by the DAS System.

F. Officially notify licensees prior to system going on-air.

G. Procure consent to carry letter for each provider as required.

RFI 0289 DAS Clarifications
See RFI 289 for coordination details

H. Coordinate power requirements for head-end equipment with electrical design team.

I. Coordinate cooling requirements for head-end equipment with mechanical design team.

3.2 PRE-INSTALLATION INSPECTION

A. ESC shall carry the cost to provide a pre-installation inspection and testing of the facility during the construction period. Test should take place after the walls and ceiling have been erected. ESC shall notify the Architect and Designer immediately if changes need to be made to the design before proceeding with the installation.

3.3 GENERAL INSTALLATION

A. Place all terminations and antennas above 7 feet and out of reach of the general public.

B. Sleeve all terminations with appropriately sized heat shrink tubing to a point at least 6" behind the connector.

C. Ground all miscellaneous metallic components, such as splitters, directional couplers, and connectors.

3.4 CABLE INSTALLATION

A. Do not bend shielded coaxial cables to a radius that is less than the minimum manufacturer specification for that cable.

B. Cables shall be run at right angles to, and remain clear of, all other trade works.

C. Attach cables to walls or ceilings using cable hangers specified in PART 2 of this section.
1. Whenever cable hangers/attachments are utilized, they shall be spaced so that the cable is adequately supported according to the manufacturer specifications.

D. When using cable hangers, care shall be taken to not tighten hangers beyond what is necessary to firmly hold the cable in place. This could compromise the internal integrity of the cable by crimping or kinking the outer conductor or dielectric.
   1. All cable shall pass a FDR test specified in PART 4.

E. For short connections close to antenna connections (less than 2 feet), flexible coaxial cable assemblies (also known as jumpers) may be used instead of rigid coaxial cable.

3.5 SPLITTER INSTALLATION

A. Install splitters in such a manner so as to have minimal effect on cables.

B. Mount each splitter on a bracket that provides for the structural integrity of the input and output ports of the device.

3.6 ANTENNA INSTALLATION

A. Coordinate antenna installation with the owner to ensure correct placement.
   1. Antenna placement shall be as indicated on the technology drawings ES100, ES201, ES202, & ES203. Placement of these antennas more than 5 feet from intended location must be approved by the design team prior to placement.

3.7 CONNECTOR INSTALLATION

A. Install all connectors for cabling and other components in accordance with the manufacturer's recommendations.

3.8 INSTALLATION STANDARDS

A. Install all equipment with a high degree of technical workmanship.

B. Installation details, including but not limited to grounding, structural soundness, and power connections shall be accomplished in accordance with the latest version of Motorola Standard R56, Construction Practices for Radio System Installations.

C. All miscellaneous connectors and cables shall be of a type meeting MIL specifications for resistance to corrosion and vibration.

D. All miscellaneous metallic components, such as splitters, directional couplers, etc., shall be mounted on metal shelves (when installed in the head-end cabinet) or otherwise provided with a robust ground connection, and to the remainder of the system components within any room.

E. All cabling shall be connected to walls or ceilings using the appropriate cable hangers. Cable runs shall be neat and shall not, under any circumstances, be attached to electrical conduits or metalwork associated with other building systems.

F. Each cable between any two locations shall be tagged or marked with bands of colored tape, identically at both ends, unique to the specific cable and the radio system. Markings shall be permanent and placed where they are visible for inspection without moving other cables. Cable markings shall be noted on as-built drawings.

## 3.9 COMPONENT TESTING

A. Perform and record a test of every installed cable segment using an RF FDR. (Cable segments shall be temporarily terminated at one end in a 50-ohm resistive load (termination) for these tests.)

B. Test all cables segments (as defined below) at frequency sweeps around: 160, 460, 840, 930, and 1925 MHz. The sweep bandwidth should be reflective of common spectrum bands in that frequency range (i.e, 806-894 MHz covers the cellular and LMR band in 800 MHz).
1. Test every segment of cable that has no more than a pair of connectors individually with a termination at one end.

C. The return loss at any connector along a length of cable segment shall be greater than 20dB. Inspect the FDR trace for any locations other than connectors where return loss is below nominal value. If apparent cause is proximity to external metal devices, correct the routing of the cable and re-test. If apparent cause is stretching or tearing of cable or its materials, replace the section of cable and re-test.

D. Provide copies of test results (both tabular and screenshots of cable tests) for all cable tests to design team two weeks prior to Punch List visit.

## 3.10 SYSTEM TESTING

A. Prior to the start of testing, using electronic copies of design drawings, create as-built documents showing the exact components, locations, paths, connections, and test points used.

B. Prior to initial activation of system for testing, contractor should notify the design team a minimum of two weeks before activation for coordination purposes.

C. Connect distribution system to head-end electronics and perform signal coverage tests as follows for the radio system:
1. Divide each floor into twenty (20), approximately equal, test zones.
    a. Spaces with large inaccessible areas, such as those occupied by machinery, electrical equipment, etc., shall be represented by a typical personnel space.
    b. Each stairwell (with door closed) on every even numbered floor shall be a test zone. Each elevator shall be three test zones, one at the top, bottom, and midpoint with its doors closed.
2. Test zones shall be drawn on as-built floor plans. A test point shall be selected approximately in the center of the zone, and labeled in an appropriate fashion (such as Wing, Floor No. , Location No.). Test location numbers shall be entered on an Excel spreadsheet with columns indicating "Received Signal Level" and "Uplink Keying Check".
3. The testing devices shall consist of a typical portable two-way radio programmed to operate on the radio system, and a spectrum analyzer or a calibrated test receiver that reads out or can be converted to true signal level in dBm using a conversion chart.
4. The portable radio shall be equipped with a typical antenna, with the radio held in the tester's hand and in a position for speaking into the built-in microphone.
5. The calibrated receiver shall be mounted on a rolling cart, using a calibrated dipole antenna at 48" above the floor.
6. The spectrum analyzer/calibrated test receiver shall be tuned to the active control channel of the public safety radio system.
7. At each test location:

a. Read and record the downlink received level from the spectrum analyzer/calibrated test receiver and enter it on the spreadsheet opposite the location number, in the column labeled "Received Signal Level".
b. Key the portable radio on an approved vacant talk group and listen for key-up (go-ahead) tone, and also the presence of a carrier for a few seconds after releasing the push-to-talk button.
c. If the received signal on the spectrum analyzer/calibrated test receiver is equivalent to -80dBm or better, and the repeater system responds immediately to key-up, enter "OK" in the column of the spread sheet labeled "Uplink Keying Check".
d. If the received signal level is equivalent to less than -80dBm, or the uplink check fails on the first attempt, then accomplish four more uplink keying attempts from the same location, and enter the number (0-4) of key-up tests that are successful. THEN move the cart in four directions from the selected test location (approximately along an "X") within the test zone. Observe the signal level behavior along the four directional lines, plot the lines on the test zone drawing, and indicate the location and values of maximum and minimum readings along those lines.
e. Note: The -80 dBm test point value using a dipole antenna is designed to provide a 15dB margin between the actual received level and the target minimum value of 95 dBm at the terminals of a portable radio with antenna worn next to body.

8. At the conclusion of the tests, confer with owner, design team, and other interested parties to determine revisions or corrections that might be necessary to achieve desired results.

**END OF SECTION 27 53 20**

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# SECTION 28 05 00 - COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. General provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Limits and scope of work under the Electronics Security Contractor Section shall be defined in these specifications.

C. Provide materials, labor, equipment and services necessary to furnish, deliver a standalone security system. The system shall be similar in form and function to the nearby Stanton security systems. Although such work may not be specifically shown or specified, all supplementary or miscellaneous items appurtenances, and devices incidental to, or necessary for a sound, secure, complete, and compatible installation shall be furnished and installed as part of the work. Any case of error, omission, discrepancy, or lack of clarity shall be promptly identified for clarification prior to the bid due date.

D. All equipment and work shall comply with all applicable codes.

### 1.2 SUMMARY

A. The Electronic Security Contractor (ESC) shall provide all portions of the security systems and be responsible for integrating them into a system as specified.

1. The ESC shall submit an aggregate bid for Work described in the following specification sections. The ESC shall be responsible for performing the coordination required between security electronic systems and the detention equipment as well as the Electrical work. Security Electronic Systems Work required by, but not specified in, this Section includes the following:
   a. Division 27, Section 270548 “Vibration and Seismic Controls”
   b. Division 27, Section 275123 “Intercom System”
   c. Division 28, Section 280500.1 “Uninterruptible Power Source”
   d. Division 28, Section 280500.2 “ Conduit and Raceways”
      (Conduit Provided by Division 26. ESC is responsible to coordinate conduit installation)
   e. Division 28, Section 280513 “Conductors and Cables for Security Electronics”
   f. Division 28, Section 280548 ”Vibration and Seismic Controls”
   g. Division 28, Section 281000 “ Fiber Optic Testing”
   h. Division 28, Section 281300 “ Access Control System”
   i. Division 28, Section 282300 “ IP Video Surveillance”
   j. Division 28, Section 284600 “Touchscreen Control Station”
   k. Division 28, Section 284600.1 “Control Matrix”
   l. Division 28, Section 284619 “PLC Electronic Detention Monitoring and Control Systems”
2. This project is defined as a "Design/Bid/Build" project. ESC firms must base their bid on the equipment and products specified herein or approved by Addendum. Design changes

or product substitutions will not be allowed. Value engineering proposals will not be considered. Substitutions on the specified software will not be approved.

3. The ESC shall have in its employ a full time superintendent to supervise the work of this section. The superintendent's responsibility shall be to supervise and coordinate the scope of work of the ESC. The superintendent shall be at the site at all times when the work is being performed.
4. If any portion of the work listed in paragraph 1.2.A.1 above is subcontracted, the responsibility for system coordination and integration remains with the ESC.
5. The ESC shall be fully responsible for reviewing the conduit routing for the security electronic systems and devices and notify the Architect / Engineer of any modifications required prior to any conduit installation. The ESC shall meet with the Division 26 subcontractor prior to conduit installation and provide any coordination information associated with the systems and devices provided by the ESC. The ESC shall be responsible for providing a backbox schedule to the Division 26 Contractor prior to conduit installation.
6. The ESC shall be fully responsible for acquiring and paying for any and all licenses and permits required to perform their Work. If licenses are required before bidding, then the ESC shall not bid any portion of the Work until the required licenses are obtained.

B. Related Work Furnish and Installed by Others.
1. Specification section 087163 Detention Door Hardware
2. Specification section 083463 Detention Doors and Frames
3. Casework and Millwork.
4. Conduit installed by Division 26.
5. Equipment grounding system.
6. All 120/208/240 VAC branch circuits including conduit, wiring and connections from power distribution panels to terminal strips and/or receptacles in electronic control panels and/or at electronic system devices. All distribution and branch circuits described above shall be connected to the emergency power source.
7. Furnishing and installing hardware for non-security doors.

C. Manufacturer's Qualifications
1. Refer to each individual specification section for a list of acceptable manufacturers.
2. Throughout the specifications and drawings types of materials may be approved and specified by the manufacturer's name and catalog number in order to establish standards of quality and performance. If the bidder desires to substitute, he must request the Architect's approval in writing fourteen (14) days prior to bid date. Approval must be issued by written Addendum prior to bid date.

D. Electronic Components
1. Provide electronic components from manufacturers who at present have not less than ten (10) years continuous successful experience in the design and manufacture of the type products required for this project.
2. Electronic Components shall be tested and found to by a nationally recognized testing laboratory to meet nationally recognized standards or to be safe for its intended purpose.
3. Electronic Components shall be listed or recognized by the following;
   a. Factory Mutual Laboratories (FM).
   b. Underwriters Laboratories, Inc (UL).
   c. National Electrical Manufacturers Association (NEMA).

1.3 QUALIFICATION REQUIREMENTS

A. ESC firms that offer services related to this section scope of work, include but not limited to the following;
   1. **Basis of Design: Status Automation, Abbotsford, BC; 604-859-1892**
   2. Accurate Controls, Ripon, WI; 920-748-6603.
   3. CML Security, Erie, CO: 720-466-3650
   4. Com-Tec, Inc., Greenville, WI; 920-749-2840.
   5. Cornerstone Security Electronics, Decatur. AL; 256-560-4207
   6. Metroplex Control Systems, San Antonio TX; 210-495-5245.
   7. Sierra Detention Systems, Brighton, CO 303-278-6879

B. All firms listed above 'Or Approved Equal' can bid the scope of work provided they can furnish all materials from manufacturers as herein specified.

1.4 SUBMITTALS

A. Submittals shall be organized into four (4) major sections as follows:
   1. General data:
      a. Table of contents.
      b. Descriptive responsibility for all parties where the ESC must interface with other trades/contractors.
      c. System theory of operations that clearly defines the operating parameters of all systems being supplied.
      d. A functional systems block diagram showing single-line interconnection of all integrated systems and the major components of each system and methods of integration.
      e. Signed certification that the controls have been coordinated with the approved detention hardware submittals.
      f. Signed certification that the emergency power requirements been coordinated with the approved electrical contractor submittals.
   2. Manufacturer's data sheets organized by specification section:
      a. Table of contents.
      b. Bill of material for each system listing the quantity and device model submitted.
      c. Device data sheets to be organized in the same order as equipment was specified.
      d. Provide data sheets for additional items as required at the end of each section.
      e. The data sheets shall be annotated to clearly identify only those specific models, functions, and features that are applicable to this project.
   3. Calculations and schedules organized by system:
      a. Table of contents.
      b. Calculations as specified in each section.
      c. Voltage drop calculations for all circuits. Where multiple runs of the same conductor are furnished, figure worse case only. Provide certification that all other runs are shorter.
      d. Schedule of points of all electronically operated devices and their functional attributes for all systems being supplied. The schedules shall be organized by system (i.e., locking, audio, lighting, duress, etc.) and shall be formatted in alphanumeric order by architectural identification number. As a minimum for each commodity entry, the schedules shall include the following:
         1) Associated architectural number (i.e., door 108)
         2) Assigned operation number (i.e., D108)

3) Hardware group (i.e., HW-1). This is a designation given to a standard set of complete hardware being utilized. Identify all part numbers (P/N):
4) EX IC-1 consists of:
   a) 1-5" Speaker P/NXXXX
   b) 1-Baffle P/NXXXX
   c) 4-Security Screws

4. Shop Drawings
   a. Complete list of drawings.
   b. Table listing wire and installation components to be used.
   c. Wiring diagrams for each device.
   d. Review and coordinate conduit drawings and confirm routing locations prior to installation. Provide wiring information for each device and conduit run to Division 26. Provide wire fill information along with interconnection for all security items.
   e. Touchscreen Control Station drawings/artwork that depict configuration of all control maps. Include utility and administrative screens
   f. Rack layout drawings.
   g. Control room, security electronic equipment room and MDF T/D equipment room layout floor plans and elevations. Drawings shall include dimensions indicating clearance related requirements provided by ESC.
   h. Provide riser diagram of each system indicating the location of each component and all interconnections for signal and power. At a minimum the submittal shall include risers detailing all components for the following systems: PLC, IP Video Surveillance, Intercom, and Access Control System.

B. Submittals not organized as specified shall be considered incomplete and will be rejected.

C. The ESC shall provide one set of a "draft" submittal to the Architect/Engineer as described in "A" above. All comments and changes shall be noted on the "draft" submittal and returned to the ESC at the end of the review. The ESC shall incorporate those comments and changes into the "final" submittal. The ESC shall return the "draft" submittal along with the required number of sets of the corrected submittal for final review.

D. Submittals for all security electronics sections shall be submitted at one time regardless of which firm is providing equipment or installation.

E. Unless required otherwise in Division 1, the ESC shall submit one (1) complete sets of submittal documentation for final approval. Submittals shall include items listed in "A" above. Include one (1) electronic copy.

F. The ESC must include with the draft and final submittals one (1) set of submittal information in PDF format available from Adobe at www.adobe.com. Provide a single file bookmarked for each specification section and each data sheet for easy reference. All files shall be searchable by text through Adobe Reader. The files shall be electronically transmitted through the project ftp site or the contractors ftp site. Provide submittal as follows:
   1. Table of Contents
      a. List each major specification section.
      b. Each major specification section shall be subdivided into a Bill of Material for all equipment provided in that section. In each subdivision, provide a detailed list of

the equipment indicating manufacturer's model number and quantity. Each model number shall act as a hyperlink to the datasheet for the listed equipment.

c. The user shall be able to navigate to the correct file through the hyperlinks under the table of contents, by manually selecting folders until they find the correction file, or a text search.

2. Door Locking Control
   a. Programmable Logic Controller (PLC)
      i. Data sheets (including relays)
      ii. Operation manual
      iii. Programs
   b. Touchscreen Control Station
      i. Data sheet
      ii. Screen Maps
      iii. Operation Manual
      iv. Software versions and license numbers
   c. Personal Digital Assistant (PDA)
      i. Data sheet
      ii. Screen Maps
      iii. Operation Manual
   d. Intercom
      i. Data sheets
      ii. Operation manual
3. IP Video System
   a. IP Video Stations and Monitors
      i. Data sheets
      ii. Operation manual
      iii. Programs
   b. Cameras
      i. Data Sheets
      ii. Operation Manual
   c. Network Storage, Switches, and Servers
      i. Data sheet
      ii. Operation Manual
      iii. Programs
4. Access Control System
   a. Main Controller boards
      i. Data sheets
      ii. Operation manual
      iii. Programs
   b. Devices
      i. Readers
      ii. Door Position Switches
      iii. Request to Exit Devices
5. Miscellaneous components
   a. Conduit and Raceways coordination information.
   b. Racks and hardware
   c. Uninterruptible Power Supply

d. Wire and Cable

6. Installation and Fabrication Drawings.

G. The submittal documents shall be updated throughout the project construction and incorporated into the Operation and Maintenance manuals.

1.5 OPERATING/MAINTENANCE MANUALS

A. ESC shall furnish three (3) copies of Operation and Maintenance Manuals for all security electronics systems furnished under this specification. These manuals shall include:

1. Instructions for the care and operation of the systems and materials.
2. Parts list to aid the Owner with ordering replacement parts.
3. As-Built conditions, The ESC shall have a draft copy of the as-built drawings and Operating and Maintenance Manuals onsite for the final system inspection.
4. Telephone, Fax, Address, website and instructions for contacting the appropriate personnel during the warranty period as well as for service.

B. The owner has the right to request an interactive Operation Manual in place of the printed hard copy manuals described above. The interactive manual will utilize the files described in 1.03, D above as a basis for an interactive document utilizing a web browser. All manuals, files, and data sheets would be published in format compatible with Internet Browsers equal to Microsoft Internet Explorer. Hyperlinks would link each item in a master table of contents to individual manuals, CAD drawings, and files. The ESC shall clarify with the owner the type of documentation required.

C. One (1) copy of the programming and source code of the applications software on a non-volatile media (DVD/CD or Solid State) format. This copy shall have all programmer comments, variable names, and mnemonics included.

D. Provide a disk for each panel or CPU. Provide a typed directory with all required passwords and procedures to reload software.

E. All keys, passwords, access codes, and software required to access the programming shall be furnished to the owner as part of this project. Turn over to the owner at the end of the project.

F. Furnish a digital copy of the facility's Operation and Maintenance Manual in PDF format on the ERC.

1.6 SUBSTITUTIONS

A. No substitutions of equipment or material will be permitted where specific trade names or a manufacturer is listed, unless the Architect, Security Electronics Engineer, and Owner adds them by an addendum.

B. Materials and products specified by name of manufacturer or brand trade name shall be the basis of the bids received unless changed by addendum prior to the bid dates.

C. In the event a contractor wishes to use any materials or products other than those specified, he shall make a written request to the Architect, Security Electronics Engineer, and Owner naming the proposed substitution.

D. All additional costs resulting from the use of an approved substitution shall be borne by the contractor without additional expense to the Owner.

1.7 COORDINATION

A. Coordinate work to ensure efficient and orderly installation of each part of the work. Coordinate sequencing and scheduling of electronic work. Secure time commitments for performing critical construction activities from separate entities responsible the work.

B. Coordinate selection of electronic products for compatibility.

C. Coordinate installation of anchorages and embedment's for electronic work.

D. Coordinate temporary facilities required for electronic work.

E. Coordinate protection of installed electronic work.

F. Coordinate preparation of Project Record Documents for electronic work and integrate information from entities responsible for electronic work to form one combined record.

G. Coordinate preparation of operation and maintenance manuals for electronic work and integrate information from entities responsible for electronic work to form one combined record.

H. Coordination Meetings: Conduct coordination meetings specifically for electronic work at regular intervals.

1.8 WARRANTY

A. The ESC shall warrant the systems and equipment furnished by each under this Section to be free from defects in material and workmanship for a period of one (1) year after substantial completion.

B. The ESC must have full-time employees trained in and devoted to the maintenance and repair of systems and equipment furnished.

C. Additional Programming: The ESC shall include all associated costs for a three (3) month post occupancy system walk through with owner and shall allow for eighty (80) hours of site specific program changes to the system.

D. The contractor shall furnish and install all firmware upgrades and software patches released during the warranty period for all software furnished and installed as part of the Security Electronics systems. Firmware and software fixes shall be installed as they are released for both the video management system and the door locking control system.

E. The contractor shall complete a field report after each trip and have it signed by the facility leaving a copy with the facility.

F. Contractor shall certify in the Operation and Maintenance manual as well as in each field warranty report that the firmware, software, and hardware are compatible and have been

tested as a system for both the video management system and the door locking control system.

## PART 2 - PRODUCTS

2.1 SECURITY SCREWS

A. Equipment: All security equipment specified within divisions 27/28 shall have stainless steel torx-head with center-pin security screws. Security screws are required in all inmate areas. Such areas include but are not limited to corridors, dayrooms, cells, multipurpose rooms, classrooms, storage rooms, interview rooms, loading bays, bathrooms, and search rooms.

B. Alternatives: Additional means of locking or securing devices are as indicated in each section.

2.2 SECURITY COVERS

A. Equipment: All security equipment specified within divisions 27/28 located in inmate areas within reach of inmates, which are not of detention grade because of code requirements, or application shall be protected with security covers. Provide covers sized to completely surround the device without substantially degrading the function. Security covers are required in all inmate areas. Such areas include but are not limited to corridors, dayrooms, cells, multipurpose rooms, classrooms, storage rooms, interview rooms, loading bays, bathrooms, and search rooms.

B. Alternatives: Other options for protecting devices are as indicated in each section or shown on plan details and elevations.

## PART 3 - EXECUTION

3.1 FACTORY ASSESSMENT DEMONSTRATION

A. The ESC shall provide a factory assessment test and demonstration for the security electronic system. This shall be at the ESC's fabrication shop. The ESC shall notify both the security consultant and owner four (4) weeks in advance of the test being scheduled. **The ESC shall cover all travel expenses for one architect, one engineer, and two of the owner's representatives to be present.**

1. Provide the all of the TCS stations that will be installed in Central Control and in the housing buildings. This will include the intercom microphone, video spot and sequence monitors. All control functions shall be demonstrated. At least one field device of each type installed shall be active at the time of the test.
2. At a minimum provide an intercom and duress station. Simulate locks with lamps or LED's. Simulate door position switches with commercial DPS or switch.
3. Task group assignment will need to be operational. Demonstrate all utility functions and emergency release. Demonstrate the transfer of task groups between stations.
4. All alarms shall be functional. Examples are the duress pushbutton, UPS, network failure and door alarms.

5. Provide all IP Video monitors to be installed in the facility and connect two cameras of each type in each task group. One camera shall call up when answering a door intercom and the other shall be for general supervision.
6. Demonstrate the IP Camera system and recording call up. Generate at least 5 days of recording on the connected cameras for use in demonstration. Demonstrate three levels of recording quality.
7. Demonstrate the card access system.
8. One week before the factory demonstration, submit to the engineer a detailed schedule and agenda of the test for review and comment.
9. The listed above is a minimal that can be provided. It is preferred to have the entire electronic system operational as one system if possible.

B. If for any reason an additional FAT is required because the Work is incomplete or if any portion of the system fails to function as designed the ESC shall be responsible for paying for the time and expenses for the engineer and owner to re-schedule and re-test the Work. This cost shall include time and expense for each individual of the Security Consulting firm required to return for the re-test. The cost shall be a minimum of $5000.00 per individual occurrence. This cost will include travel time, inspection time and travel expenses. This amount must be paid **prior** to re-scheduling the inspection.

3.2 INSTALLATION

A. Listing: All wiring and raceways shall be listed for the intended installation and installed in strict accordance with the California Electric Code as required by the conditions of where it is installed.

B. Abandoned Wire: All wiring not energized shall be terminated at both ends and labeled for future use. There shall be no abandoned wire.

C. All wiring shall be fully terminated in all racks and cabinets on **screw type terminals**. All wire is to be landed on screw terminal units of size, amperage rating, material, type, and class suitable for service indicated.

D. All wiring/cabling shall be labeled with the system type and the device ID at each end. All labeling shall be by mechanical means. The label shall be generated by a Brady I.D. Plus Pro Printer or equal, and utilize a Brady part# WML-511-292 label or equal. The label used should allow for the clear part of the label to overlap and protect the printed portion of the label from being exposed to damage and/or being rubbed off over time. Hand written labels are not permitted.

E. All wiring outside of equipment rooms is to be in conduit. Coordinate conduit routing with Division 26.

F. Seismic: The entire system shall be installed to meet the seismic requirements for the area.

3.3 INSPECTIONS AND TESTING

A. The General Contractor and ESC shall be responsible for issuing a letter to the Architect and R&N Systems Design, LLC confirming that the work is complete and ready for inspection and testing. As an attachment to the letter confirming the work is “complete” and ready for inspection, the ESC must attach a self-generated “field test” report for each device which

confirms in detail that the ESC has performed their own inspection and test prior to the inspection by the Architect / Consultant.

B. The inspection shall include Systems, Subsystems, Equipment, and Components. Where these terms are used together or separately, they shall be referred to as "the system". The ESC shall be prepared to test every point for each system.

C. If additional inspections are required because the Work is incomplete at the time of the scheduled inspection or if any portion of the system fails to function as designed the ESC shall be responsible for paying for the time and expenses for the Architect and Security Consultant to re-schedule and re-inspect the Work. This cost shall include time and expense for each individual of the Security Consulting firm required for the re-inspection. The cost shall be a minimum of $5000.00 per individual occurrence. This cost will include travel time, inspection time and travel expenses. This amount must be paid **prior** to re-scheduling the inspection.

D. If additional inspections are required because the Work is incomplete at the time of the scheduled inspection or if any portion of the system fails to function as designed the ESC shall be responsible for paying for the time and expenses for the Owner to re-schedule and re-inspect the Work. This cost shall include time and expense for each individual representing the owner. The cost shall be a minimum of $1000.00 per individual occurrence. This cost will include inspection time. This amount must be paid **prior** to re-scheduling the inspection.

E. The Superintendent, Project Manager, and Owner's Representative shall be present and assist in the inspection / testing of the Work.

F. Substantial completion will not be granted by the engineer until the system is installed and functioning to the Engineer's satisfaction and in accordance with the contract documents. The Engineer has the right to withhold the granting of substantial completion and schedule additional inspection if the system is not installed and functioning in accordance with the contract documents.

3.4 SHAKEDOWN PERIOD

A. Coordinate with the Owner and Construction Manager/General Contractor to establish a shakedown period for the security systems. This shakedown period shall not begin until after "substantial completion" is issued. The shakedown period shall be a minimum of 15 days. If functionality or programming problems occur during the first 15 day, the shakedown period shall be extended for a minimum of two weeks after the systems are functioning dependably.

B. ESC shall be responsible for providing a full time technician at the facility at all times during the shakedown time period to support operation of the facility by the Owner's staff.

C. Maintain a detailed log of all anomalies, malfunction and repairs encountered during the shakedown period. Submit log to the Architect for assessment at the conclusion of the shakedown period.

D. Additional training of Owner's staff may occur during the shakedown period.

3.5 SPARE PARTS

A. The ESC shall deliver all spare parts at the completion of the project. The spare parts shall be clearly marked as to content and packaged for ease of handling by one (1) person without the use of forklifts or other equipment. The ESC shall obtain a signature from the owner's representative receiving the spare parts.

B. The ESC shall furnish the parts described in each subsection of the specifications.

C. Furnish 2 spare security covers of each type installed.

3.6 TRAINING

A. The ESC shall provide, without additional cost to the owner, training in the operation of the security systems provided. The representatives shall train the Owner's personnel in operation, repair, and upkeep of each system.

B. The ESC shall be responsible for notifying the architect three (3) weeks prior to substantial completion of the total security system that training is scheduled. The ESC will coordinate the number to be trained with the owner's representative.

C. The length of training is directly related to the size and complexity of the detention facility, but in no case shall the security electronics system training be less than forty (40) hours.

D. Course Structure

1. The ESC shall prepare and present to the Architect a detailed course outline that specifies each major training module to be covered. The training program on the security equipment shall include the sequences and instructions for proper use and maintenance of all hardware, locking devices, control, and monitoring systems. The material shall be presented in simple layman's terminology, describe and demonstrate all step-by-step physical operations necessary for proper operation, and detail necessary equipment adjustments. At the time of training, each trainer shall present to the trainees detailed outlines of each training module to be covered and the specific skills and knowledge which the trainee is expected to master within each training module.
2. At a minimum, the training program shall be subdivided into the following training modules:
    a. Operation of the Security System.
    b. Troubleshooting, General Maintenance, Equipment Adjustments, Repair and Replacement of Security System Components.
    c. Operator Controls.
    d. Descriptive modules organized by specification section.

E. The ESC shall videotape each training module. The videotaping does not have to include individual student practice. The ESC in preparing the videotape shall structure it for easy reference by the facility's training officer for future use. Furnish digital copies of the facility training videos in a Windows Media file format (.wmv or equal). Files shall be easily viewable on the TCS media player for training staff.

F. Training Certification

1. Each facility employee shall receive at the conclusion of the security systems training program a certificate certifying his attendance of the total session or portion thereof.
2. ESC shall maintain attendance records of each class.

G. Operation and Maintenance (O&M) manuals:
   1. Utilize the Operation and Maintenance manuals prepared for the facility for the training.
   2. Review all procedures in the Operation and Maintenance manuals.

H. In addition to the training requirements listed above the ESC shall include all associated cost to provide additional onsite owner training following substantial completion. The additional training shall occur at the three (3) months periods and shall cover topics as referenced above. This training shall be no less than sixteen (16) hours. Coordinate this additional training with the owner.

**END OF SECTION 28 05 00**

# SECTION 28 05 00 - COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. General provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Limits and scope of work under the Electronics Security Contractor Section shall be defined in these specifications.

C. Provide materials, labor, equipment and services necessary to furnish, deliver a standalone security system. The system shall be similar in form and function to the nearby Stanton security systems. Although such work may not be specifically shown or specified, all supplementary or miscellaneous items appurtenances, and devices incidental to, or necessary for a sound, secure, complete, and compatible installation shall be furnished and installed as part of the work. Any case of error, omission, discrepancy, or lack of clarity shall be promptly identified for clarification prior to the bid due date.

D. All equipment and work shall comply with all applicable codes.

### 1.2 SUMMARY

A. The Electronic Security Contractor (ESC) shall provide all portions of the security systems and be responsible for integrating them into a system as specified.
   1. The ESC shall submit an aggregate bid for Work described in the following specification sections. The ESC shall be responsible for performing the coordination required between security electronic systems and the detention equipment as well as the Electrical work. Security Electronic Systems Work required by, but not specified in, this Section includes the following:
      a. Division 27, Section 270548 “Vibration and Seismic Controls”
      b. Division 27, Section 275123 “Intercom System”
      c. Division 27, Section 275320 “Distributed Antenna System”
      d. Division 28, Section 280500.1 “Uninterruptible Power Source”
      e. Division 28, Section 280500.2 “ Conduit and Raceways”
         (Conduit Provided by Division 26. ESC is responsible to coordinate conduit installation)
      f. Division 28, Section 280513 “Conductors and Cables for Security Electronics”
      g. Division 28, Section 280548 ”Vibration and Seismic Controls”
      h. Division 28, Section 281000 “ Fiber Optic Testing”
      i. Division 28, Section 281300 “ Access Control System”
      j. Division 28, Section 282300 “ IP Video Surveillance”
      k. Division 28, Section 284600 “Touchscreen Control Station”
      l. Division 28, Section 284600.1 “Control Matrix”
      m. Division 28, Section 284600.2 “Event Recording Computer”
      n. Division 28, Section 284619 “PLC Electronic Detention Monitoring and Control Systems”

2. This project is defined as a "Design/Bid/Build" project. Approved ESC firms must base their bid on the equipment and products specified herein or approved by Addendum. Design changes or product substitutions will not be allowed. Value engineering proposals will not be considered. Substitutions on the specified software will not be approved.
3. The ESC shall have in its employ a full time superintendent to supervise the work of this section. The superintendent's responsibility shall be to supervise and coordinate the scope of work of the ESC. The superintendent shall be at the site at all times when the work is being performed.
4. If any portion of the work listed in paragraph 1.2.A.1 above is subcontracted, the responsibility for system coordination and integration remains with the ESC.
5. The ESC shall be fully responsible for reviewing the conduit routing for the security electronic systems and devices and notify the Architect / Engineer of any modifications required prior to any conduit installation. The ESC shall meet with the Division 26 subcontractor prior to conduit installation and provide any coordination information associated with the systems and devices provided by the ESC. The ESC shall be responsible for providing a backbox schedule to the Division 26 Contractor prior to conduit installation.
6. The ESC shall be fully responsible for acquiring and paying for any and all licenses and permits required to perform their Work. If licenses are required before bidding, then the ESC shall not bid any portion of the Work until the required licenses are obtained.

B. Related Work Furnish and Installed by Others.
1. Specification section 087163 Detention Door Hardware
2. Specification section 083463 Detention Doors and Frames
3. Casework and Millwork.
4. Conduit installed by Division 26.
5. Equipment grounding system.
6. **All 120/208/240 VAC branch circuits including conduit, wiring and connections from power distribution panels to terminal strips and/or receptacles in electronic control panels and/or at electronic system devices. All distribution and branch circuits described above shall be connected to the normal power source.**
7. Furnishing and installing hardware for non-security doors.

C. Manufacturer's Qualifications
1. Refer to each individual specification section for a list of acceptable manufacturers.
2. Throughout the specifications and drawings types of materials may be approved and specified by the manufacturer's name and catalog number in order to establish standards of quality and performance. If the bidder desires to substitute, he must request the Architect's approval in writing fourteen (14) days prior to bid date. Approval must be issued by written Addendum prior to bid date.

D. Electronic Components
1. Provide electronic components from manufacturers who at present have not less than ten (10) years continuous successful experience in the design and manufacture of the type products required for this project.
2. Electronic Components shall be tested and found to by a nationally recognized testing laboratory to meet nationally recognized standards or to be safe for its intended purpose.
3. Electronic Components shall be listed or recognized by the following;
   a. Factory Mutual Laboratories (FM).
   b. Underwriters Laboratories, Inc (UL).

c. National Electrical Manufacturers Association (NEMA).

1.3 PRE-QUALIFICATION REQUIREMENTS

A. The following ESC firms are pre-approved to perform the work of this Section:
   1. **Basis of Design: Status Automation, Abbotsford, BC; 604-859-1892**
   2. Accurate Controls, Ripon, WI; 920-748-6603
   3. CML Security Electronics, Decatur, AL; 256-560-4207
   4. Com-Tec, Inc., Greenville, WI; 920-749-2840
   5. Cornerstone Security Electronics, Decatur, AL; 256-560-4207
   6. Metroplex Control Systems, San Antonio, TX; 210-495-5245
   7. Sierra Detention Systems, Brighton, CO; 303-278-6879

***Note: Approval of a firm as an ESC does not relieve the ESC from furnishing all materials from manufacturers as herein specified.***

1.4 SUBMITTALS

A. Submittals shall be organized into four (4) major sections as follows:
   1. General data:
      a. Table of contents.
      b. Descriptive responsibility for all parties where the ESC must interface with other trades/contractors.
      c. System theory of operations that clearly defines the operating parameters of all systems being supplied.
      d. A functional systems block diagram showing single-line interconnection of all integrated systems and the major components of each system and methods of integration.
      e. Signed certification that the controls have been coordinated with the approved detention hardware submittals.
      ~~**f. Signed certification that the emergency power requirements been coordinated with the approved electrical contractor submittals.**~~
   2. Manufacturer's data sheets organized by specification section:
      a. Table of contents.
      b. Bill of material for each system listing the quantity and device model submitted.
      c. Device data sheets to be organized in the same order as equipment was specified.
      d. Provide data sheets for additional items as required at the end of each section.
      e. The data sheets shall be annotated to clearly identify only those specific models, functions, and features that are applicable to this project.
   3. Calculations and schedules organized by system:
      a. Table of contents.
      b. Calculations as specified in each section.
      c. Voltage drop calculations for all circuits. Where multiple runs of the same conductor are furnished, figure worse case only. Provide certification that all other runs are shorter.
      d. Schedule of points of all electronically operated devices and their functional attributes for all systems being supplied. The schedules shall be organized by system (i.e., locking, audio, lighting, duress, etc.) and shall be formatted in alphanumeric order by architectural identification number. As a minimum for each commodity entry, the schedules shall include the following:
         1) Associated architectural number (i.e., door 108)

2) Assigned operation number (i.e., D108)
3) Hardware group (i.e., HW-1). This is a designation given to a standard set of complete hardware being utilized. Identify all part numbers (P/N):
4) EX IC-1 consists of:
   a) 1-5" Speaker P/NXXXX
   b) 1-Baffle P/NXXXX
   c) 4-Security Screws

4. Shop Drawings
   a. Complete list of drawings.
   b. Table listing wire and installation components to be used.
   c. Wiring diagrams for each device.
   d. Review and coordinate conduit drawings and confirm routing locations prior to installation. Provide wiring information for each device and conduit run to Division 26. Provide wire fill information along with interconnection for all security items.
   e. Touchscreen Control Station drawings/artwork that depict configuration of all control maps. Include utility and administrative screens
   f. Rack layout drawings.
   g. Control room, security electronic equipment room and MDF T/D equipment room layout floor plans and elevations. Drawings shall include dimensions indicating clearance related requirements provided by ESC.
   h. Provide riser diagram of each system indicating the location of each component and all interconnections for signal and power. At a minimum the submittal shall include risers detailing all components for the following systems: PLC, IP Video Surveillance, Intercom, and Access Control System.

B. Submittals not organized as specified shall be considered incomplete and will be rejected.

C. The ESC shall provide one set of a "draft" submittal to the Architect/Engineer as described in "A" above. All comments and changes shall be noted on the "draft" submittal and returned to the ESC at the end of the review. The ESC shall incorporate those comments and changes into the "final" submittal. The ESC shall return the "draft" submittal along with the required number of sets of the corrected submittal for final review.

D. Submittals for all security electronics sections shall be submitted at one time regardless of which firm is providing equipment or installation.

E. Unless required otherwise in Division 1, the ESC shall submit one (1) complete sets of submittal documentation for final approval. Submittals shall include items listed in "A" above. Include one (1) electronic copy.

F. The ESC must include with the draft and final submittals one (1) set of submittal information in PDF format available from Adobe at www.adobe.com. Provide a single file bookmarked for each specification section and each data sheet for easy reference. All files shall be searchable by text through Adobe Reader. The files shall be electronically transmitted through the project ftp site or the contractors ftp site. Provide submittal as follows:
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      a. List each major specification section.
      b. Each major specification section shall be subdivided into a Bill of Material for all equipment provided in that section. In each subdivision, provide a detailed list of

the equipment indicating manufacturer's model number and quantity. Each model number shall act as a hyperlink to the datasheet for the listed equipment.

c. The user shall be able to navigate to the correct file through the hyperlinks under the table of contents, by manually selecting folders until they find the correction file, or a text search.

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      i. Data sheets (including relays)
      ii. Operation manual
      iii. Programs
   b. Touchscreen Control Station
      i. Data sheet
      ii. Screen Maps
      iii. Operation Manual
      iv. Software versions and license numbers
   c. Personal Digital Assistant (PDA)
      i. Data sheet
      ii. Screen Maps
      iii. Operation Manual
   d. Intercom
      i. Data sheets
      ii. Operation manual
3. IP Video System
   a. IP Video Stations and Monitors
      i. Data sheets
      ii. Operation manual
      iii. Programs
   b. Cameras
      i. Data Sheets
      ii. Operation Manual
   c. Network Storage, Switches, and Servers
      i. Data sheet
      ii. Operation Manual
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4. Access Control System
   a. Main Controller boards
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   b. Devices
      i. Readers
      ii. Door Position Switches
      iii. Request to Exit Devices
5. Miscellaneous components
   a. Conduit and Raceways coordination information.
   b. Racks and hardware
   c. Uninterruptible Power Supply
   d. Wire and Cable
6. Installation and Fabrication Drawings.

G. The submittal documents shall be updated throughout the project construction and incorporated into the Operation and Maintenance manuals.

1.5 OPERATING/MAINTENANCE MANUALS

A. ESC shall furnish three (3) copies of Operation and Maintenance Manuals for all security electronics systems furnished under this specification. These manuals shall include:
   1. Instructions for the care and operation of the systems and materials.
   2. Parts list to aid the Owner with ordering replacement parts.
   3. As-Built conditions, The ESC shall have a draft copy of the as-built drawings and Operating and Maintenance Manuals onsite for the final system inspection.
   4. Telephone, Fax, Address, website and instructions for contacting the appropriate personnel during the warranty period as well as for service.

B. The owner has the right to request an interactive Operation Manual in place of the printed hard copy manuals described above. The interactive manual will utilize the files described in 1.03, D above as a basis for an interactive document utilizing a web browser. All manuals, files, and data sheets would be published in format compatible with Internet Browsers equal to Microsoft Internet Explorer. Hyperlinks would link each item in a master table of contents to individual manuals, CAD drawings, and files. The ESC shall clarify with the owner the type of documentation required.

C. One (1) copy of the programming and source code of the applications software on a non-volatile media (DVD/CD or Solid State) format. This copy shall have all programmer comments, variable names, and mnemonics included.

D. Provide a disk for each panel or CPU. Provide a typed directory with all required passwords and procedures to reload software.

E. All keys, passwords, access codes, and software required to access the programming shall be furnished to the owner as part of this project. Turn over to the owner at the end of the project.

F. Furnish a digital copy of the facility's Operation and Maintenance Manual in PDF format on the ERC.

1.6 SUBSTITUTIONS

A. No substitutions of equipment or material will be permitted where specific trade names or a manufacturer is listed, unless the Architect, Security Electronics Engineer, and Owner adds them by an addendum.

B. Materials and products specified by name of manufacturer or brand trade name shall be the basis of the bids received unless changed by addendum prior to the bid dates.

C. In the event a contractor wishes to use any materials or products other than those specified, he shall make a written request to the Architect, Security Electronics Engineer, and Owner naming the proposed substitution.

D. All additional costs resulting from the use of an approved substitution shall be borne by the contractor without additional expense to the Owner.

1.7 COORDINATION

A. Coordinate work to ensure efficient and orderly installation of each part of the work. Coordinate sequencing and scheduling of electronic work. Secure time commitments for performing critical construction activities from separate entities responsible the work.

B. Coordinate selection of electronic products for compatibility.

C. Coordinate installation of anchorages and embedment's for electronic work.

D. Coordinate temporary facilities required for electronic work.

E. Coordinate protection of installed electronic work.

F. Coordinate preparation of Project Record Documents for electronic work and integrate information from entities responsible for electronic work to form one combined record.

G. Coordinate preparation of operation and maintenance manuals for electronic work and integrate information from entities responsible for electronic work to form one combined record.

H. Coordination Meetings: Conduct coordination meetings specifically for electronic work at regular intervals.

1.8 WARRANTY

A. The ESC shall warrant the systems and equipment furnished by each under this Section to be free from defects in material and workmanship for a period of one (1) year after substantial completion.

B. The ESC must have full-time employees trained in and devoted to the maintenance and repair of systems and equipment furnished.

C. Additional Programming: The ESC shall include all associated costs for a three (3) month post occupancy system walk through with owner and shall allow for eighty (80) hours of site specific program changes to the system. Programming changes shall occur by request of the owner anytime during the warranty period.

D. The contractor shall furnish and install all firmware upgrades and software patches released during the warranty period for all software furnished and installed as part of the Security Electronics systems. Firmware and software fixes shall be installed as they are released for both the video management system and the door locking control system.

E. The contractor shall complete a field report after each trip and have it signed by the facility leaving a copy with the facility.

F. Contractor shall certify in the Operation and Maintenance manual as well as in each field warranty report that the firmware, software, and hardware are compatible and have been tested as a system for both the video management system and the door locking control system.

## PART 2 - PRODUCTS

2.1 SECURITY SCREWS

A. Equipment: All security equipment specified within divisions 27/28 shall have stainless steel torx-head with center-pin security screws. Security screws are required in all inmate areas. Such areas include but are not limited to corridors, dayrooms, cells, multipurpose rooms, classrooms, storage rooms, interview rooms, loading bays, bathrooms, and search rooms.

B. Alternatives: Additional means of locking or securing devices are as indicated in each section.

2.2 SECURITY COVERS

A. Equipment: All security equipment specified within divisions 27/28 located in inmate areas within reach of inmates, which are not of detention grade because of code requirements, or application shall be protected with security covers. Provide covers sized to completely surround the device without substantially degrading the function. Security covers are required in all inmate areas. Such areas include but are not limited to corridors, dayrooms, cells, multipurpose rooms, classrooms, storage rooms, interview rooms, loading bays, bathrooms, and search rooms.

B. Alternatives: Other options for protecting devices are as indicated in each section or shown on plan details and elevations.

## PART 3 - EXECUTION

RFI 0286 — LVSE Factory Assessment Substitution — See RFI 0286 for Factory Assessment Substitution — 1

3.1 FACTORY ASSESSMENT DEMONSTRATION

A. The ESC shall provide a factory assessment test and demonstration for the security electronic system. This shall be at the ESC's fabrication shop. The ESC shall notify both the security consultant and owner four (4) weeks in advance of the test being scheduled. ~~**The ESC shall cover all travel expenses for one architect, one engineer, and two of the owner's representatives to be present.**~~ 1

1. Provide the all of the TCS stations that will be installed in Central Control and in the housing buildings. This will include the intercom microphone, video spot and sequence monitors. All control functions shall be demonstrated. At least one field device of each type installed shall be active at the time of the test.
2. At a minimum provide an intercom and duress station. Simulate locks with lamps or LED's. Simulate door position switches with commercial DPS or switch.
3. Task group assignment will need to be operational. Demonstrate all utility functions and emergency release. Demonstrate the transfer of task groups between stations.
4. All alarms shall be functional. Examples are the duress pushbutton, UPS, network failure and door alarms.
5. Provide all IP Video monitors to be installed in the facility and connect two cameras of each type in each task group. One camera shall call up when answering a door intercom and the other shall be for general supervision.

6. Demonstrate the IP Camera system and recording call up. Generate at least 5 days of recording on the connected cameras for use in demonstration. Demonstrate three levels of recording quality.
7. Demonstrate the card access system.
8. One week before the factory demonstration, submit to the engineer a detailed schedule and agenda of the test for review and comment.
9. The listed above is a minimal that can be provided. It is preferred to have the entire electronic system operational as one system if possible.

B. If for any reason an additional FAT is required because the Work is incomplete or if any portion of the system fails to function as designed the ESC shall be responsible for paying for the time and expenses for the engineer and owner to re-schedule and re-test the Work. This cost shall include time and expense for each individual of the Security Consulting firm required to return for the re-test. The cost shall be a minimum of $5000.00 per individual occurrence. This cost will include travel time, inspection time and travel expenses. This amount must be paid **prior** to re-scheduling the inspection.

3.2 INSTALLATION

A. Listing: All wiring and raceways shall be listed for the intended installation and installed in strict accordance with the California Electric Code as required by the conditions of where it is installed.

B. Abandoned Wire: All wiring not energized shall be terminated at both ends and labeled for future use. There shall be no abandoned wire.

C. All wiring shall be fully terminated in all racks and cabinets on **screw type terminals**. All wire is to be landed on screw terminal units of size, amperage rating, material, type, and class suitable for service indicated.

D. All wiring/cabling shall be labeled with the system type and the device ID at each end. All labeling shall be by mechanical means. The label shall be generated by a Brady I.D. Plus Pro Printer or equal, and utilize a Brady part# WML-511-292 label or equal. The label used should allow for the clear part of the label to overlap and protect the printed portion of the label from being exposed to damage and/or being rubbed off over time. Hand written labels are not permitted.

E. All wiring outside of equipment rooms is to be in conduit. Coordinate conduit routing with Division 26.

F. Seismic: The entire system shall be installed to meet the seismic requirements for the area.

3.3 INSPECTIONS AND TESTING

A. The General Contractor and ESC shall be responsible for issuing a letter to the Architect and R&N Systems Design confirming that the work is complete and ready for inspection and testing. As an attachment to the letter confirming the work is “complete” and ready for inspection, the ESC must attach a self-generated “field test” report for each device which confirms in detail that the ESC has performed their own inspection and test prior to the inspection by the Architect / Consultant.

B. The inspection shall include Systems, Subsystems, Equipment, and Components. Where these terms are used together or separately, they shall be referred to as "the system". The ESC shall be prepared to test every point for each system.

C. If additional inspections are required because the Work is incomplete at the time of the scheduled inspection or if any portion of the system fails to function as designed the ESC shall be responsible for paying for the time and expenses for the Architect and Security Consultant to re-schedule and re-inspect the Work. This cost shall include time and expense for each individual of the Security Consulting firm required for the re-inspection. The cost shall be a minimum of $5000.00 per individual occurrence. This cost will include travel time, inspection time and travel expenses. This amount must be paid **prior** to re-scheduling the inspection.

D. If additional inspections are required because the Work is incomplete at the time of the scheduled inspection or if any portion of the system fails to function as designed the ESC shall be responsible for paying for the time and expenses for the Owner to re-schedule and re-inspect the Work. This cost shall include time and expense for each individual representing the owner. The cost shall be a minimum of $1000.00 per individual occurrence. This cost will include inspection time. This amount must be paid **prior** to re-scheduling the inspection.

E. The Superintendent, Project Manager, and Owner's Representative shall be present and assist in the inspection / testing of the Work.

F. Substantial completion will not be granted by the engineer until the system is installed and functioning to the Engineer's satisfaction and in accordance with the contract documents. The Engineer has the right to withhold the granting of substantial completion and schedule additional inspection if the system is not installed and functioning in accordance with the contract documents.

3.4 SHAKEDOWN PERIOD

A. Coordinate with the Owner and Construction Manager/General Contractor to establish a shakedown period for the security systems. This shakedown period shall not begin until after "substantial completion" is issued. The shakedown period shall be a minimum of 15 days. If functionality or programming problems occur during the first 15 day, the shakedown period shall be extended for a minimum of two weeks after the systems are functioning dependably.

B. ESC shall be responsible for providing a full time technician at the facility at all times during the shakedown time period to support operation of the facility by the Owner's staff.

C. Maintain a detailed log of all anomalies, malfunction and repairs encountered during the shakedown period. Submit log to the Architect for assessment at the conclusion of the shakedown period.

D. Additional training of Owner's staff may occur during the shakedown period.

3.5 SPARE PARTS

A. The ESC shall deliver all spare parts at the completion of the project. The spare parts shall be clearly marked as to content and packaged for ease of handling by one (1) person without the

use of forklifts or other equipment. The ESC shall obtain a signature from the owner's representative receiving the spare parts.

B. The ESC shall furnish the parts described in each subsection of the specifications.

C. Furnish 2 spare security covers of each type installed.

3.6 TRAINING

A. The ESC shall provide, without additional cost to the owner, training in the operation of the security systems provided. The representatives shall train the Owner's personnel in operation, repair, and upkeep of each system.

B. The ESC shall be responsible for notifying the architect three (3) weeks prior to substantial completion of the total security system that training is scheduled. The ESC will coordinate the number to be trained with the owner's representative.

C. The length of training is directly related to the size and complexity of the detention facility, but in no case shall the security electronics system training be less than forty (40) hours.

D. Course Structure
1. The ESC shall prepare and present to the Architect a detailed course outline that specifies each major training module to be covered. The training program on the security equipment shall include the sequences and instructions for proper use and maintenance of all hardware, locking devices, control, and monitoring systems. The material shall be presented in simple layman's terminology, describe and demonstrate all step-by-step physical operations necessary for proper operation, and detail necessary equipment adjustments. At the time of training, each trainer shall present to the trainees detailed outlines of each training module to be covered and the specific skills and knowledge which the trainee is expected to master within each training module.
2. At a minimum, the training program shall be subdivided into the following training modules:
   a. Operation of the Security System.
   b. Troubleshooting, General Maintenance, Equipment Adjustments, Repair and Replacement of Security System Components.
   c. Operator Controls.
   d. Descriptive modules organized by specification section.

E. The ESC shall videotape each training module. The videotaping does not have to include individual student practice. The ESC in preparing the videotape shall structure it for easy reference by the facility's training officer for future use. Furnish digital copies of the facility training videos in a Windows Media file format (.wmv or equal). Files shall be easily viewable on the TCS media player for training staff.

F. Training Certification
1. Each facility employee shall receive at the conclusion of the security systems training program a certificate certifying his attendance of the total session or portion thereof.
2. ESC shall maintain attendance records of each class.

G. Operation and Maintenance (O&M) manuals:

1. Utilize the Operation and Maintenance manuals prepared for the facility for the training.
2. Review all procedures in the Operation and Maintenance manuals.

H. In addition to the training requirements listed above the ESC shall include all associated cost to provide additional onsite owner training following substantial completion. The additional training shall occur at the three (3) months periods and shall cover topics as referenced above. This training shall be no less than sixteen (16) hours. Coordinate this additional training with the owner.

**END OF SECTION 28 05 00**

## STATEMENT OF QUALIFICATIONS

**Electronically Submit To:**
Frank Niedzwiedz at **FrankN@RNSystemsDesign.com**

**Submission Due Date:**
10 Business Days Prior to Bid Date

| | | |
|---|---|---|
| SUBMITTED BY: | Corporation | ☐ |
| NAME: | Partnership | ☐ |
| ADDRESS: | Individual | ☐ |
| TELEPHONE NO.: | Joint Venture | ☐ |
| FAX NO.: | Other | ☐ |
| PRINCIPAL OFFICE: | | |

RESPONSE MEDIUM: Bind all files and information submitted into a single PDF searchable for keywords. Files less than 5 Megabytes can be emailed. Larger files must be located on an ftp or Box site with an emailed link.

TYPE OF WORK:
Electronic Security Contractor (ESC): The ESC shall be responsible for providing the custom fabricated equipment, programming, and systems integration for all security electronic systems as specified. The ESC shall be responsible for testing and coordinating the final configurations of the system with the owner's representative. Final test and confirmation of proper function must be made by the ESC. The Scope of Work for this contractor will be defined in the drawings and specifications prepared by Kitchell and R&N Systems Design.

The ESC shall furnish at least 5 project references for correctional facilities that have **greater than 100 controlled doors within detention style construction**. ESC may list projects that are completed or actively under construction. Do not list projects completed before 2010. Please specify scope of work for each job reference provided.

Where there is not sufficient space in the form for a complete answer, insert the words "Refer to attached sheet" and add a page copying the referenced question and paragraph number at the top of the page. Each page shall reference one question for clarity.

The ESC shall furnish project references for correctional facilities where the ESC scope of work was in excess of **$500,000.00.**

**1. ORGANIZATION**

1.1 How many years has your organization been in business as an Electronic Security Contractor (ESC)?

1.2 How many years has your organization been in business under its present business name?

1.2.1 Under what other or former names has your organization operated? (Attach additional details with reference to this paragraph number if required.)

| Year | Name of Organization | Principal Owners |
|---|---|---|

1.3 If your organization is a corporation, answer the following:

1.3.1 Date of incorporation:

1.3.2 State of incorporation:

1.3.3 President's name:

1.3.4 Vice-president's name(s):

1.3.5 Secretary's name:

1.3.6 Treasurer's name:

1.3.7 ESOP Companies (list Board of Directors and Trustee)

1.4 If your organization is a partnership, answer the following:

1.4.1 Date of organization:

1.4.2 Type of partnership (if applicable):

1.4.3 Name(s) of general partner(s):

1.5 If your organization is individually owned, answer the following:

1.5.1 Date of organization:

1.5.2 Name of owner:

1.6 If the form of your organization is other than those listed above, describe it and name the principals or owner: : (Attach additional details with reference to this paragraph number if required.)

## 2. LICENSING

2.1 List jurisdictions and trade categories in which your organization is legally qualified to do business, and indicate registration or license numbers, if applicable.

2.2 List license information for the State of California.

2.3 List jurisdictions in which your organization's partnership or trade name is filed.

## 3. EXPERIENCE

Check (√) in the categories of work that your organization normally performs with its own forces.

| Manufacture | Supply | Installation | SECURITY ELECTRONICS |
|---|---|---|---|
| | | | Access Control System |
| | | | Control Processing Equipment & Relay Panels |
| | | | Graphic Annunciated Door Control Panel Systems |
| | | | Computer Control Stations |
| | | | Hardwired Logic Control Systems |
| | | | PLC Control Systems |
| | | | Intercommunication Systems |
| | | | Fire Alarm System |
| | | | Lightning/Surge Protection |
| | | | |
| | | | Nurse Call System |
| | | | Perimeter Detection Systems |
| | | | Personal Alarm/Duress System |
| | | | Vehicle Detection |
| | | | IP Video Management System |
| | | | Video Visitation Systems |
| | | | Video Arraignment Systems |
| | | | Other (Describe) |

3.1 List 5 construction projects for correctional facilities that have **greater than 100 controlled doors within detention style construction**. Projects can be either completed or actively under construction. Do not list projects completed before 2010. (Attach

additional pages giving details with reference to this paragraph number.) Provide the following:

1. Name of project.

2. Name of Owner. (Provide contact name and phone number.)

3. Name of Architect / Engineer. (Provide contact name and phone number.)

4. Name of General Contractor (If applicable) (Provide contact name and phone number.)

5. Contract Amount.

6. Occupancy.

7. List the year the project was/will be completed.

8. List the projects delivery method: (Design-Bid-Build, Design-Build)

3.2 In addition to the projects above, list construction projects the organization currently has in progress with security electronic subcontracts for correctional facilities that have **greater than 100 controlled doors within detention style construction**. Provide the following.

1. Name of project.

2. Name of Owner. (Provide contact name and phone number.)

3. Name of Architect / Engineer. (Provide contact name and phone number.)

4. Name of General Contractor (If applicable) (Provide contact name and phone number.)

5. Contract Amount.

6. Occupancy.

7. List the anticipated year the project will be completed.

8. List the project delivery method: (Design-Bid-Build, Design-Build)

3.4 State annual amount of security electronic work performed during the past five years:

2011:

2012:

2013:

2014:

2015:

3.5 State total worth of security electronic work currently under contract and in progress as of January 1, 2016.

3.6 Claims and Suits. List separately for each category listed above. (If the answer to any of the questions below is yes, please attach details with reference to the paragraph number).

3.6.1 Has your organization ever failed to complete any work awarded to it?

3.6.2 Are there any judgments, claims, arbitration proceedings or suits pending or outstanding against your organization or its officers?

3.6.3 Has your organization filed any law suits or requested arbitration with regard to construction contracts within the last five years?

3.7 Within the last five years, has any officer or principal of your organization ever been an officer or principal in another organization when it failed to complete a construction contract? (If the answer is yes, please attach details.)

**4. PERSONNEL**

4.1 Provide an Attachment referencing this paragraph number, provide the following:

4.1.1 Specifically designate the project manager that will be assigned to this project. This person must have experience in the past 5 years with security correctional facilities having a minimum of **greater than 100 controlled doors within detention style construction**. Provide a brief resume of this person, highlighting their experience.

**5. REFERENCES**

5.1 Architect/Engineer References (list three):

5.1.1 Name:
Contact:
Address:

Telephone:

5.1.2 Name:
Contact:
Address:
Telephone:

5.1.3 Name:
Contact:
Address:
Telephone:

5.2 Owner References at a reference facility knowledgeable of the installation (list three):

5.2.1 Name:
Address:
Telephone:

5.2.2 Name:
Address:
Telephone:

5.2.3 Name:
Address:
Telephone:

**6. SURETY**

6.1 Name of bonding company:

6.2 Name and address of agent:

6.3 Provide a letter from your bonding company that states your current bonding capacity:

**7. FINANCING**

7.1 Bankruptcy

7.1.1 Has your organization filed bankruptcy in the past five (5) years?

If yes, list the year in which bankruptcy was filed.

7.1.2 Has your organization under a previous name or other organizations that you have acquired ever filed bankruptcy?

If yes, list the organization's name and the year in which bankruptcy was filed.

7.1.3 Have any of the key personnel managing the scope of work defined in this qualification been a member of or employed by an entity that filed bankruptcy in the past five years?

If yes, list the organization's name and the year in which bankruptcy was filed.

**8. MANUFACTURER CERTIFICATION:**

8.1 Along with the above required documents, the ESC shall submit any written letters or certifications from equipment manufacturers stating that individual field technicians employed by the ESC have been approved as installers.

The Undersigned certifies that the information provided herein is true and sufficiently complete so as not to be misleading.

**SIGNATURE**

Dated this _____ day of _____2016.

Name of Organization:_____

(Signature) By: _____

Title: _____

(Printed) _____ certifies that the information provided herein is true and sufficiently complete so as not to be misleading.

Subscribed and sworn before me this _____ day of _____2016

Notary Public:_____

(Seal)

My Commission Expires:

# SECTION 28 05 00.1 - UNINTERRUPTIBLE POWER SOURCE

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Scope of Work: Provide Uninterruptible Power Supply (UPS) units to supply 120 volt AC power for all, intercom masters, relay boards, locking controls systems, PLC equipment, IP video equipment, access control systems, video arraignment/visitation systems, and any other security electronics not provided with batteries. All security systems components are required to have a battery backup or be supplied with UPS power.

B. The ESC is responsible for furnishing all of the UPS system components that are required for this project. This is to include UPS units, battery cabinets, and bypass switches. Division 26 is to furnish the distribution panels, power source equipment, distribution feeders, and receptacles. The ESC is to coordinate the installation of the UPS system components as well as the 120 VAC UPS power distribution panel with Division 26.

C. The ESC shall confirm that the security electronics systems are powered from an emergency power source.

D. Refer to SE drawings for UPS location, sizing, and additional information.

E. The ESC as defined in Section 280500 Common Work Results for Electronic Safety and Security shall be responsible for providing and coordinating this system.

### 1.2 SYSTEM DESCRIPTION

A. System Capacity: Size Each UPS system appropriately so that it shall independently deliver power to the connected load for not less than **one (1) hour** in the event of failure of the normal and emergency power source.

B. The individual UPS sizes indicated on the SE drawings are the minimum sizes allowed at each location.

C. Growth capacity: Size units for a minimum growth capacity of 25% at each UPS.

D. Provide UPS system components for new security equipment at the following equipment room locations:
1. SEC Closet A106
2. SEC Closet B150

### 1.3 SUBMITTALS

A. Basic Submittals: Provide submittals as required by the General Conditions.

B. Special Submittal Requirements: In addition to the contract requirements for submittals, provide comprehensive UPS load calculations for each UPS.

1.4 SYSTEMS INTEGRATION

A. Integration: Integrate the UPS system with the PLC system to annunciate and log alarms associated with the UPS in Central Control only.
1. Low voltage.
2. Low battery.
3. High voltage.
4. Inverter power on.
5. Inverter power off.

**PART 2 - PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

A. Eaton Powerware Division

B. Sola Electric

C. American Power Conversion (APC), only for smaller units under 2200VA.

D. TrippLite

2.2 MATERIAL / EQUIPMENT

A. UPS: Provide Powerware 9170 model UPS (or equal) sized accordingly. Provide features as follows:
1. Nominal Input Voltage of 200-240VAC.
2. Operating temperature is from 0° C to 40° C with an R.H. of 5% to 95% without condensation.
3. Overload capacity should be 150% surge and 125% for 10 minutes.
4. Communication shall be through an RS-232 serial port (DB-9).
5. Continuous, no-break power during a complete power outage or momentary power interruption.
6. Hardwired connections from the primary power source to the unit. Hardwired connections from the unit to the UPS distribution panel.
7. UPS and Battery cabinets shall have rollers as to ease with maintenance and to allow for access to the rear and sides of each unit. **Provide hard wire connections using seal tight type conduit and compression fittings to all UPS system equipment.**

B. Bypass Switch: Provide an external bypass isolation switch arrangement to bypass UPS and place load on utility power for maintenance of UPS unit. Switch shall be a Make Before Break (MBB) type unit. No other function will be acceptable.

C. Batteries: The batteries shall be standard sealed lead-acid type, especially designed for UPS use. Furnish the required number of batteries to supply power to the connected load for a period of one (1) hour. The complete system (batteries and UPS system) shall be furnished and guaranteed by the same manufacturer.

D. KVA: Size the UPS and batteries to power all the Security Electronics equipment for **one (1) hour**. The UPS sizes indicated on the plans are minimums that must be provided to allow for owner additions.

E. Surge Suppressor: Furnish and install an Eaton PTE080 surge suppressor (or equal) for monitoring input power to UPS.

## PART 3 - EXECUTION

### 3.1 COORDINATION

A. Preliminary Examination: Coordinate all required distribution panel boards, wiring, and circuit breakers with Division 26.

B. ESC shall provide a spreadsheet listing the ESC's power requirements to the engineer and Division 26. This spreadsheet shall detail at a minimum, the amount, size, and location of power circuits in each room where UPS power is required. The spreadsheet shall include the location where each circuit is terminated and type of outlet required.

C. Construction Examination: Examine the ongoing construction and coordinate all equipment for proper installation allowing for maintenance access to UPS batteries.

D. Structural Examination: Examine locations for UPS placement to ensure the underlying structure will support the UPS and associated battery cabinets to be installed.

### 3.2 INSTALLATION

A. Installation: Install all UPS units following manufacturer's recommendations and instructions in locations indicated on the plans. UPS units shall fit in the space allowed. All UPS equipment locations shall be identified clearly on the submitted drawings. Once reviewed deviations are unacceptable.

B. Connections: Connect all security/detention electronics equipment to the UPS power system. Provide sufficient electrical separation and transient suppression to prevent lock actuation and power fluctuations from affecting any electronic control systems.

C. Listing: All wiring and raceways shall be listed for the intended installation and installed in strict accordance with the California Electric Code as required by the conditions of where it is stalled. This includes but is not limited to ratings for riser, plenum, or wet installations.

D. The ESC shall have the UPS manufacturer's representative field certify that the installation is acceptable and as per manufacturers specifications prior to requesting final inspection. Provide written documentation to include the manufacturer's field report with final testing reports. Include these documents with the project O&M manuals.

E. Seismic: The entire system shall be installed to meet the seismic requirements for the area.

3.3 TRAINING

A. The ESC shall provide, without additional cost to the owner representatives, training in the operation of UPS systems provided. The representatives shall train the Owner's personnel in operation, repair, and upkeep of the system. Refer to Specification section 280500 Part 3.6 Training for additional information.

3.4 SPARE PARTS

A. Furnish to the owner one spare parts kit as recommended by the manufacturer for each type of UPS installed on this project.

B. Spare parts shall be packaged in appropriate protective packing material.

C. Box spare parts for easy storage and clearly identify the contents of each box on all four sides of each container.

3.5 FIELD QUALITY CONTROL

A. Verify and document that each UPS is supplied with properly sized breaker. Verify and document that all alarms are annunciated both visually and audibly at each UPS, and at affected control stations.

B. Provide written test reports documenting all of the above function and features.

**UPS VERIFICATION AND CHECK-OUT FORM**

✓ = OK

**Job #**
**Job Name:**
**Panel #**

| **FIELD TEST CODE:** | | **REPAIR CODE:** | |
|---|---|---|---|
| A - No status change | M - | 1-SSI | Software Test By:_____ Date_____ |
| B - No power UPS | N - | 2-ELECTRICIAN | |
| C - Verify breaker size | O - | 3-IRONWORKER | Hardware Test By:_____ Date_____ |
| D - No alarm locally | P - | 4-CARPENTER | |
| E - No alarm CCS | Q - | 5-OWNER/REP | System Test By:_____ Date_____ |
| F - No emergency generator | R - | 6-ENG | |
| G - No power transfer | S - | 7 - | Design Engineering By:_____ Date_____ |
| H - By Pass switch failure | T - | 8 - | |
| I - Software problem | U - | 9 - | Wiring By:_____ Date_____ |
| J - Not installed | V - | 10 - | |
| K - | W - | 11 - | Field Test By:_____ Date_____ |
| L - | X - | 12 - | |

| | | | | | | | **ON-SITE** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ICON ID#** | **ICON TYPE** | **UPS NO.** | **UPS KVA** | | **SOFT-WARE TEST** | **UPS TEST** | **FIELD TEST CODE** | **REPAIR CODE** | **RE-CHECK "X"** | **FIELD CHECK OUT NOTES** | **PROBLEM RESOLVED (BY/DATE)** |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**END OF SECTION 28 05 00.1**

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November 9, 2016

# SECTION 28 05 00.1 - UNINTERRUPTIBLE POWER SOURCE

## GENERAL

### 1.1 SUMMARY

A. Scope of Work: Provide Uninterruptible Power Supply (UPS) units to supply 120 volt AC power for all, intercom masters, relay boards, locking controls systems, PLC equipment, IP video equipment, access control systems, video arraignment/visitation systems, and any other security electronics not provided with batteries. All security systems components are required to have a battery backup or be supplied with UPS power.

B. The ESC is responsible for furnishing all of the UPS system components that are required for this project. This is to include UPS units, battery cabinets, and bypass switches. Division 26 is to furnish the distribution panels, power source equipment, distribution feeders, and receptacles. The ESC is to coordinate the installation of the UPS system components as well as the 120 VAC UPS power distribution panel with Division 26.

~~**C. The ESC shall confirm that the security electronics systems are powered from an emergency power source.**~~

D. Refer to SE drawings for UPS location, sizing, and additional information.

E. The ESC as defined in Section 280500 Common Work Results for Electronic Safety and Security shall be responsible for providing and coordinating this system.

### 1.2 SYSTEM DESCRIPTION

A. System Capacity: Size Each UPS system appropriately so that it shall independently deliver power to the connected load for not less than **one (1) hour** in the event of failure of the normal ~~**and emergency**~~ power source.

B. The individual UPS sizes indicated on the SE drawings are the minimum sizes allowed at each location.

C. Growth capacity: Size units for a minimum growth capacity of 25% at each UPS.

D. Provide UPS system components for new security equipment at the following equipment room locations:
   1. SEC Closet A106
   2. SEC Closet B150

### 1.3 SUBMITTALS

A. The submittal of this section is to be provided with other section defined in 280500 Common Work Results for Electronic Security and Safety. All sections defined in 280500 are to be submitted at the same time and in accordance with the specification. Refer to that specification for additional information.

B. Special Submittal Requirements: In addition to the contract requirements for submittals, provide comprehensive UPS load calculations for each UPS.

1.4 SYSTEMS INTEGRATION

A. Integration: Integrate the UPS system with the PLC system to annunciate and log alarms associated with the UPS in Central Control only.
1. Low voltage.
2. Low battery.
3. High voltage.
4. Inverter power on.
5. Inverter power off.

1.5 WARRANTY

A. The warranty of this section is to be provided with other section defined in 280500 Common Work Results for Electronic Security and Safety. All sections defined in 280500 are to be submitted at the same time and in accordance with the specification. Refer to that specification for additional information.

**PRODUCTS**

1.6 ACCEPTABLE MANUFACTURERS

A. Eaton Powerware Division

B. Sola Electric

C. American Power Conversion (APC), only for smaller units under 2200VA.

D. TrippLite

1.7 MATERIAL / EQUIPMENT

A. UPS: Provide Powerware 9170 model UPS (or equal) sized accordingly. Provide features as follows:
1. Nominal Input Voltage of 200-240VAC.
2. Operating temperature is from 0° C to 40° C with an R.H. of 5% to 95% without condensation.
3. Overload capacity should be 150% surge and 125% for 10 minutes.
4. Communication shall be through an RS-232 serial port (DB-9).
5. Continuous, no-break power during a complete power outage or momentary power interruption.
6. Hardwired connections from the primary power source to the unit. Hardwired connections from the unit to the UPS distribution panel.
7. UPS and Battery cabinets shall have rollers as to ease with maintenance and to allow for access to the rear and sides of each unit. **Provide hard wire connections using seal tight type conduit and compression fittings to all UPS system equipment.**

B. Bypass Switch: Provide an external bypass isolation switch arrangement to bypass UPS and place load on utility power for maintenance of UPS unit. Switch shall be a Make Before Break (MBB) type unit. No other function will be acceptable.

C. Batteries: The batteries shall be standard sealed lead-acid type, especially designed for UPS use. Furnish the required number of batteries to supply power to the connected load for a period of one (1) hour. The complete system (batteries and UPS system) shall be furnished and guaranteed by the same manufacturer.

D. KVA: Size the UPS and batteries to power all the Security Electronics equipment for **one (1) hour**. The UPS sizes indicated on the plans are minimums that must be provided to allow for owner additions.

E. Surge Suppressor: Furnish and install an Eaton PTE080 surge suppressor (or equal) for monitoring input power to UPS.

## EXECUTION

1.8 COORDINATION

A. Preliminary Examination: Coordinate all required distribution panel boards, wiring, and circuit breakers with Division 26.

B. ESC shall provide a spreadsheet listing the ESC's power requirements to the engineer and Division 26. This spreadsheet shall detail at a minimum, the amount, size, and location of power circuits in each room where UPS power is required. The spreadsheet shall include the location where each circuit is terminated and type of outlet required.

C. Construction Examination: Examine the ongoing construction and coordinate all equipment for proper installation allowing for maintenance access to UPS batteries.

D. Structural Examination: Examine locations for UPS placement to ensure the underlying structure will support the UPS and associated battery cabinets to be installed.

1.9 INSTALLATION

A. Installation: Install all UPS units following manufacturer’s recommendations and instructions in locations indicated on the plans. UPS units shall fit in the space allowed. All UPS equipment locations shall be identified clearly on the submitted drawings. Once reviewed deviations are unacceptable.

B. Connections: Connect all security/detention electronics equipment to the UPS power system. Provide sufficient electrical separation and transient suppression to prevent lock actuation and power fluctuations from affecting any electronic control systems.

C. Listing: All wiring and raceways shall be listed for the intended installation and installed in strict accordance with the California Electric Code as required by the conditions of where it is stalled. This includes but is not limited to ratings for riser, plenum, or wet installations.

D. The ESC shall have the UPS manufacturer’s representative field certify that the installation is acceptable and as per manufacturers specifications prior to requesting final inspection.

Provide written documentation to include the manufacturer's field report with final testing reports. Include these documents with the project O&M manuals.

E. Seismic: The entire system shall be installed to meet the seismic requirements for the area.

1.10 TRAINING

A. The ESC shall provide, without additional cost to the owner representatives, training in the operation of UPS systems provided. The representatives shall train the Owner's personnel in operation, repair, and upkeep of the system. Refer to Specification section 280500 Part 3.6 Training for additional information.

1.11 SPARE PARTS

A. Furnish to the owner one spare parts kit as recommended by the manufacturer for each type of UPS installed on this project.

B. Spare parts shall be packaged in appropriate protective packing material.

C. Box spare parts for easy storage and clearly identify the contents of each box on all four sides of each container.

1.12 FIELD QUALITY CONTROL

A. Verify and document that each UPS is supplied with properly sized breaker. Verify and document that all alarms are annunciated both visually and audibly at each UPS, and at affected control stations.

B. Provide written test reports documenting all of the above function and features.

## UPS VERIFICATION AND CHECK-OUT FORM

✓ = OK

**Job #**
**Job Name:**
**Panel #**

| **FIELD TEST CODE:** | | **REPAIR CODE:** | |
|---|---|---|---|
| A - No status change | M - | 1-SSI | Software Test By:_____ Date_____ |
| B - No power UPS | N - | 2-ELECTRICIAN | |
| C - Verify breaker size | O - | 3-IRONWORKER | Hardware Test By:_____ Date_____ |
| D - No alarm locally | P - | 4-CARPENTER | |
| E - No alarm CCS | Q - | 5-OWNER/REP | System Test By:_____ Date_____ |
| F - No emergency generator | R - | 6-ENG | |
| G - No power transfer | S - | 7 - | Design Engineering By:_____ Date_____ |
| H - By Pass switch failure | T - | 8 - | |
| I - Software problem | U - | 9 - | Wiring By:_____ Date_____ |
| J - Not installed | V - | 10 - | |
| K - | W - | 11 - | Field Test By:_____ Date_____ |
| L - | X - | 12 - | |

| | | | | | | | **ON-SITE** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ICON ID#** | **ICON TYPE** | **UPS NO.** | **UPS KVA** | | **SOFT-WARE TEST** | **UPS TEST** | **FIELD TEST CODE** | **REPAIR CODE** | **RE-CHECK "X"** | **FIELD CHECK OUT NOTES** | **PROBLEM RESOLVED (BY/DATE)** |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**END OF SECTION 28 05 00.1**

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# SECTION 28 05 00.2 - CONDUIT AND RACEWAYS

## PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. General provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

B. All raceway shall be supported in accordance with ASCE 7 Chapter 13.

C. Division 26 is to furnish and install the conduit and raceway system. The ESC, as defined in Section 28 05 00 General Conditions, shall be responsible for coordinating the conduit and raceway system with Division 26.

1.2 SYSTEM DESCRIPTION

A. Conduit: Furnish and install a complete conduit system for ESC equipment. Fully coordinate the installation of conduit system with other trades and the general contractor. All conduit installed in any pre-cast panels will be coordinated with the pre-cast contractor prior to manufacture of panel. Conduit system as shown on the drawings is for reference only. Any changes to the conduit System required to install ESC equipment as specified and APPROVED shall be the responsibility of the ESC. The ESC shall acknowledge in writing the approved conduit routing and size.

B. Pull Boxes: Coordinate the installation of all pull boxes and junction boxes required for the installation of conductors for all ESC equipment.

C. Outlet Boxes: Outlet boxes shall be of the physical size for the device to be mounted therein. Coordinate outlet boxes with equipment.

D. All conduit and security electronics raceways shall be installed as described in the California Electric Code.

E. Electrical boxes with serviceable knockouts are not allowed in accessible areas.

1.3 SUBMITTALS

A. Provide basic submittals as required by Division 27/28 General Conditions and by the General contract requirements.

B. Submit license of master electrician who will supervise all conduit installation.

## PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Carlon

B. Allied

C. Hubbell

D. Appleton

E. Thomas and Betts

F. Steel City

G. Raco Steel Products

H. Quazite

2.2 MATERIAL/EQUIPMENT

A. Conduit: The following are standards to be used when selecting the proper conduit to install.
1. All conduit shall be listed and labeled by Underwriters Laboratories for use as raceway system for electrical conductors.
2. Rigid galvanized conduit shall comply with UL Standard UL 6 and ANSI standard C-80.1.
3. Intermediate metallic conduit shall comply with UL Standard UL 1242.
4. Electric Metallic Tubing shall comply with UL Standard UL 797 and ANSI Standard C-80.3.
5. Rigid Non-metallic electrical conduit shall comply with UL standard UL 651.

B. Pull Box: The following are standards to be used when selecting the proper type of pull boxes to install.
1. Pull boxes and junction boxes shall be UL listed and labeled.
2. Dimension of pull boxes and junction boxes shall not be less than those dimensions required by the California Electrical Code, 2011 Edition, Article 314 for the number, size, and position of conduits entering the box.

C. Outlet Box: All outlet boxes shall be UL listed.

D. Enclosed Metal Wire Way:
1. Ladder-type tray shall consist of rungs spaced 9” apart with widths as indicated on the plans. Remove all burrs and sharp edges from assembled tray.
2. Bend radium shall be 12” or larger.
3. Loading depth shall be 3- inches.
4. Load rating shall be NEMA 8C – 8 foot spacing, 75 pounds per foot.
5. Furnish and install all mounting accessories and related hardware as required for a complete installation.
6. Shall meet the requirements of ASCE 7 for seismic installations.

E. In-ground hand-hole enclosure:
1. Provide security bolts to attach top, Tamper Resistant Penta-Head bolt, stainless steel.
2. Furnish and install enclosure size as required by the number of conduit entering and leaving the enclosure.
3. Enclosure shall be ANSI TIER rating at 22.

4. Lid shall be ANSI TIER rating at 22.

F. Innerduct: Smooth wall 1" ASTM D1248 Polyethlene plastic molding and extrusion material that meets ASTM D3035 dimensional requirements.
   1. Innerduct shall be secured to wall with D-ring or similar strapping method.
   2. Innerduct containing fiber shall terminate in LIU, trough, cabinet, or wire tray.

**PART 3 - EXECUTION**

3.1 CONDUIT INSTALLATION: CONDUITS SHALL BE APPROPRIATE FOR THE INTENDED INSTALLATION.

A. Concrete: Conduits installed within concrete wall panels which are in direct contact with grade or exposed where inmates have direct access shall be galvanized rigid steel (GRS) or intermediate metal conduit (IMC).

B. Security electronic and communication conduit shall NOT be installed within the concrete floor slab. All security electronic and communication conduit shall be installed UNDER the concrete floor slab.

C. Roof: Conduits which penetrate the roof structure shall be galvanized rigid steel (GRS) or intermediate metal conduit (IMC). Seal all penetrations.

D. Earth: Conduits installed in direct contact with the earth shall be Schedule 40, heavy wall PVC.

E. EMT: All other conduit, unless excluded herein, not permitted by the California Electrical Code, or otherwise indicated on the drawings, shall be electrical metallic tubing (EMT).
   1. All EMT fittings are to be steel compression type.
   2. DO NOT use EMT set screw fittings.

F. Different Conduit Types: Conduit types shall not be mixed indiscriminately with other types in the same run, unless specified herein or required by the CEC.

G. Flexible Conduit: Use flexible conduit when required for connections to extension arm mounted adjustable cameras.
   1. Flexible conduit used when required for connection of fixed cameras shall not exceed 18 inches in length. Cameras in inmate areas shall not be connected with flexible conduit.
   2. Maintain ground continuity through flexible conduit with green equipment grounding conductor. Do not use conduit for ground continuity.
   3. Liquid tight conduit shall be used to connect equipment in the kitchen area, laundry area, exterior installations, below access floors connecting data processing and other equipment.
   4. All conduits installed exposed from the finished floor to a minimum height of ten feet above the floor shall be galvanized rigid steel (GRS). **Exposed conduit below 10 feet in inmate areas is not allowed.**

H. Below Grade Raceway Installations: In addition to meeting the requirements above, conduits, under grade shall also conform to the following:

1. Direct Burial Conduit
   a. Install top of conduit 24 inches minimum below finished grade.
   b. Install top of conduit six inches minimum below bottom of building slab.
   c. Install top of conduit 30 inches minimum below grade, below roads and any other paved surfaces.
   d. Where transition is made from below grade PVC installation to a metallic conduit system above grade or slab, make transition with rigid galvanized elbow and extend through slab or above grade with galvanized rigid steel conduit. For corrosion protection, where the elbow penetrates surface, wrap with vinyl all-weather electrical tape or coat with bituminous asphaltic compound, for 6 inches above and below concrete surface.
   e. Install conduit marker tape 6" above all buried conduit.

I. Raceway Installations In Concrete: In addition to meeting the requirements above, conduits in concrete shall also conform to the following:
   1. Conduit shall be run following the most direct route between two points.
   2. Conduit shall not be installed in concrete wall panels which is less than three inches thick or where the outside conduit diameter is larger than 1/3 of the concrete thickness.
   3. Conduits shall not be installed within shear walls unless specifically indicated on the drawings. Conduits shall not be run directly below and parallel with load bearing walls.
   4. Protect each metallic conduit installed 1.5 inch and smaller passing through a concrete slab against corrosion where conduit enters and leaves concrete by wrapping conduit with vinyl all-weather electrical tape or coat with bituminous asphaltic compound.
   5. The maximum projection of conduit stub-up and bushing above slab shall be three inches.
   6. Protect all conduits entering and leaving concrete floor slabs from physical damage during construction.
   7. Provide expansion fittings for all conduits runs exceeding 200 feet or for conduits passing through building expansion joints.
   8. Seal all penetrations through fire and smoke barriers in such a way as to maintain the fire and smoke ratings.
   9. Install pull string in all raceways in concrete as each conduit run is completed.

J. Concealed, above Ceilings, surface mounted and exposed Installations:
   1. Conduit shall be run parallel or at right angles to existing walls, ceilings, and structural members.
   2. Support conduits at intervals not exceeding ten (10) feet and within three (3) feet of each outlet, junction box, cabinet or fitting for all ceiling and installations above ten (10) feet.
   3. Attach individual conduits to structural steel members with beam conduit clamps and to non-metallic structural members with one-hole conduit straps. Exposed conduits suspended from structural members shall be installed with hangar rods and conduit clamp assemblies. Multiple conduits in the same run shall be supported by trapeze type supports suspended from the structure. Do not attach conduits to ceiling suspension system channels or suspension wires. All installations must meet project seismic requirements.
   4. Attach feeder conduits larger than one (1) inch diameter to the building structure on intervals not to exceed ten (10) feet. Attach conduit with conduit beam clamps, one (1) hole conduit straps or trapeze type support in accordance with support systems described for branch circuit conduits.
   5. Conduit support fastening devices.

a. Anchors for solid masonry and concrete shall be self-drilling expansion shields, insert type expansion shield, or lead shields with machine bolts.
b. Fasten support device to wood with wood screws. Nails are not acceptable.
c. Fasten support device to hollow masonry with toggle bolts.
d. Fasten support device to steel with machine screws with bolts and beam clamps.

6. Exposed conduits shall be painted, see painting section of the specifications.
7. Where conduits must pass through structural members, obtain approval of location and size of hole prior to drilling from Architect.
8. Install conduit sleeves in slabs where conduits 2.0 inch and larger pass through. Sleeves shall extend one (1) inch minimum above finished slab. Seal all spare sleeves and between conduits within sleeves to maintain fire rating, to make watertight, and to make smoke-tight.
9. Install all conduits or sleeves penetrating rated fire walls or fire floors to maintain fire rating of wall or floor.
10. Conduits rigidly secured to building structure on opposite sides of a building expansion joint shall be provided with an expansion and deflection coupling. In lieu of an expansion coupling, conduits 2-1/2 inches and smaller may be provided with junction boxes on both sides of the expansion joint connected by 15 inches of slack flexible conduit with bonding jumper.

K. Exposed Raceway at inmate accessible areas mounted below ten (10) feet.
1. Do not install exposed conduit systems in areas normally accessible to inmates unless such installations are specifically indicated on the drawings. Where exposed conduit is indicated on the drawings, all conduits shall be rigid metal and all outlet boxes shall be cast metal type with threaded hubs.
2. Install conduits flat against wall; offsets or "kicks" shall be permitted only to enter outlet box.
3. Support exposed conduits on centers not exceeding 2'0" and within 12" of each outlet box using **two hole conduit straps** attached to surface with non-removable break off security type bolts. Alternately, provide hat channel cover as detailed by the Engineer.

L. All conduits shall be supported in accordance with ASCE 7 Chapter 13.

M. Furnish and install a listed expansion/deflection fitting or other approved means where a raceway crosses a structural joint intended for expansion, contraction, or deflection, used in buildings or other structures as required by the Electric Code in 300.4-H. Furnish and install electrical continuity by bonding jumpers or other means as required by 250.98 of the Electric Code."

N. Seal all penetrations through fire and smoke barriers in such a way as to maintain the fire and smoke ratings. Division 26 shall seal all penetrations through interior non-rated walls using fire caulk.

3.2 SEPARATION

A. Cabling and conduit shall be installed in strict compliance with the California Electric Code and TIA 569.

B. Communication, Class 2, and Class 3 wires and cables shall be separated by at least 2 inches from conductors of any electric light, electric power, Class 1, non-power-limited fire alarm, or medium power network-powered broadband communications circuits.
   1. Separation can be less if communication, Class 2, and Class 3 circuits are completely enclosed in metallic pathways that are properly grounded and bonded per ANSI/TIA-607-B. Walls of the pathway must have a minimum thickness of .04 inches if made of steel or .06 inches if made of aluminum.
   2. Separation can be less if any electric light, electric power, Class 1, non-power-limited fire alarm, or medium power network-powered broadband communications circuits are completely enclosed in metallic pathways that are properly grounded and bonded per ANSI/TIA-607-B. Walls of the pathway must have a minimum thickness of .04 inches if made of steel or .06 inches if made of aluminum.

3.3 PULL BOX INSTALLATION

A. Pull boxes and junction boxes installed in finished spaces shall be flush mounted cabinets provided with trim, hinged door, and flush latch and lock to match panel trim for flush mounted electrical panel board.

B. Pull boxes and junction boxes installed in unfinished spaces shall be galvanized boxes with covers held by screws.

C. Junction boxes installed exposed to the weather shall be watertight NEMA IV.

D. Pull boxes shall be provided where indicated on the drawings and where required to facilitate the installation of conductors. Pull boxes shall be installed exposed only in unfinished spaces, unless otherwise indicated on the drawings, and shall be installed to be fully accessible as required by the California Electrical Code.

E. Splices are not permitted in pull boxes except when approved in writing by the Architect or where shown on the drawings. Pull all wires in a single continuous run between devices and terminating screws.

F. All boxes shall be supported in accordance with ASCE 7 Chapter 13.

3.4 OUTLET BOX INSTALLATION

A. Ceiling: Flush mounted outlet boxes for devices mounted on the ceiling shall be 4" square boxes 1-1/2" deep. Where installed in concrete, outlet box shall be provided with an extension ring and sealed for installation in concrete.

B. Wall: Flush mounted outlet boxes for devices mounted in walls shall be 4" square boxes, 1-1/2" deep with square edge tile type cover.

C. Alternate: Where only one conduit enters box, 3-1/2" deep single gang switch box may be used.

D. Outlet boxes for devices surface mounted on walls or concrete ceiling shall be FS boxes with matching device plate.

E. Where a special purpose device requires a larger outlet box than specified herein, provide outlet box suitable for specific device. These outlet boxes shall be of the same type as specified herein for the installation required.

F. Where a low voltage device is installed in a common box with a line voltage device, provide metal barrier within outlet box to establish two separate compartments.

G. Review architectural drawings for areas where outlets occur within specific architectural or structural features and install outlets as shown on architectural drawings. If not shown, accurately center and align boxes within the architectural feature or detail.

H. Outlet boxes for flush mounted devices shall be set to within 1/8" of finished wall.

I. All boxes shall be supported in accordance with ASCE 7 Chapter 13.

3.5 FIELD QUALITY CONTROL

A. Licensed Electrician: All conduit and raceway for low voltage systems shall be installed by a Master Licensed Electrician.

B. Debris: All conduits, pull boxes, junction boxes, and outlet boxes shall be installed free of concrete, dirt or other debris.

C. Future conductors: All conductors not energized for this project shall be terminated on both ends and labeled for “Future”.

D. Alignment: All conduits shall be installed parallel to walls and ceilings.

E. Bends: All conduit shall be installed to minimize bends and offsets.

F. Inmate areas: Do not install pull boxes, conduits, or junction boxes in space normally accessible to inmates.

G. Seismic: All raceway shall be supported in accordance with ASCE 7 Chapter 13.

**END OF SECTION 28 05 00.2**

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# SECTION 28 05 13 – CONDUCTORS AND CABLES FOR ELECTRONIC SECURITY

## PART 1 - GENERAL

RFI 0150 Security Cabling Clarification
Cat6 Cable is to be provided for Security Cabling

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

B. The ESC as defined in Section 280500 Common Work Results for Electronic Safety and Security shall be responsible for the providing and testing of all security fiber and CAT6A cable related to the ESC's scope of work.

C. The ESC as defined in Section 280500 Common Work Results for Electronic Safety and Security shall be responsible for providing and coordinating the conduit and raceway system.

### 1.2 SUMMARY

A. Furnish, install, and test all wire, cable, optic fiber, patch panels, racks and miscellaneous hardware required pertaining to the ESC's scope of work.

B. All testing is to be performed by a certified experienced tester of a nationally recognized certification organization. Refer to Specification Section 281000.

C. Fiber and CAT6A cable shall be tested and documented as functional before being activated. The ESC shall test and confirm that each CAT6A cable and fiber optic cable is within allowable limits and acceptable for use. For fiber testing refer to Specification Section 281000.

D. Furnish and install Transient Voltage Surge Suppression on all circuits, other than fiber-optic, which leave the building.

### 1.3 SCOPE OF WORK

A. This section includes the minimum requirements for the security network equipment and cable installation. Furnish and install outlet, outlet boxes and Category 6A cable for each IP camera, Touchscreen Control Station (TCS), IP video Station (IP), and Access Control system outlets indicated on the drawings. Furnish and install equipment racks, patch panels, and back boards were indicated on the drawings.

B. Included in this section are the minimum composition requirements and installation methods for the following:
1. Category 6A UTP Patch Panels
2. Vertical Cable Management System
3. Horizontal Cable Management System
4. Modular Jacks – For Category 6A Channels
5. Faceplates – Flush
6. CAT6A Cable
7. Fiber optic cable
8. Fiber optic patch panels.

C. Color scheme:
   1. All Security cabling shall be yellow in color.
   2. All camera cabling shall be green in color.

1.4 QUALITY ASSURANCE

A. All equipment shall be installed neatly and in accordance with manufacturers' specifications. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner or Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated.

B. Material and work specified herein shall comply with the applicable requirements of:
   1. ANSI/TIA/EIA – 568-C: "Commercial Building Telecommunications Cabling Standard."
   2. ANSI/TIA/EIA – 569-B and addenda: "Commercial Building Standard for Telecommunications Pathway and Spaces"
   3. ANSI/TIA/EIA – 526-7: "Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant."
   4. ANSI/TIA/EIA – 526-14A: "Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant."
   5. ANSI/TIA/EIA – 606-A and addenda: "Administration Standard for the Telecommunications Infrastructure of Commercial Buildings"
   6. ANSI/TIA/EIA – 607-B and addenda: "Commercial Building Grounding and Bonding Requirements for Telecommunications
   7. IEC/TR3 61000-5-2 Ed. 1.0 and amendments: "Electromagnetic compatibility (EMC) – Part 5: Installation and mitigation guidelines – Section 2: Earthing and cabling"
   8. ISO/IEC 11801:2000 Ed1.2 and amendments: "Information Technology – Generic cabling for customer premises"
   9. CENELEC EN 50173:2000 and amendments: "Information Technology – Generic cabling systems"
   10. BICSI Telecommunications Distribution Methods Manual
   11. California Electric Code
   12. Contractor must have at least one Registered Communications Distribution Designer RCDD® on staff.

1.5 SUBMITTALS

A. Provide product data for all proposed equipment in accordance with Specification Section 280500.

B. Submit a schedule of all fiber types identifying each fiber. Identify both ends of each optic fiber and CAT 6A cable with a unique label. Label should identify system and termination point at minimum.

RFI 0150 — Security Cable Clarification — Confirm CAT 6 not CAT 6A

C. Submit the testing plan for facility optic fiber.

D. Submit the following certifications:
   1. Current certificate of RCDD®.
   2. Certification in optic fiber testing.

## PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Emtelle US, Fiber Optic Company

B. Corning Cable Systems

C. Commscope

D. Chatsworth Products, Inc. (CPI)

2.2 FIBER OPTIC PATCH PANELS

A. Provide fiber optic patch panels mounted at the top of each PLC or IP video rack as located on the plans.

B. All fiber optic rack mount enclosures shall be equal to Corning. All adapter panels shall be Corning as required for Multimode or Singlemode applications.
1. Corning CCH-02HU Enclosure
2. Corning CCH-01HU Enclosure
3. Corning CCH-CP06-A8 Adapter Panel (LC)
4. Corning CCH-CP06-E6 Adapter Panel (SC)

RFI 0147 — Fiber Termination Details — Terminate with LC/UPC type connectors and fusion spliced

C. Fiber terminations:
1. All multimode fiber terminations for OM3 fiber cabling shall be LC type connectors, Corning Unicam high performance 95-050-99-x or equal. All singlemode fiber terminations for OS2 should be Corning Unicam high performance 95-200-99 or equal. All fiber terminations for the intercom system require ST type connectors equivalent to Corning Unicam 95-050-51-x or equal. All fiber connectors for security electronics systems shall be LC or ST as coordinated with the equipment provider.

2.3 FIBER BUNDLES

A. Equal to Corning FREEDM One tight-buffered indoor/outdoor rated cable part number 036T8F-61180-29 (OM3). Minimum bend radius of individual fiber bundles during installation shall be 4.4".

RFI 0147 — Fiber Termination Details — Terminate with LC/UPC type connectors and fusion spliced

B. Single Mode fiber shall be equal to Corning FREEDM LST Single Mode (OS2) part number 024ESF-T4101D20. Cable shall be rated for the environment it is installed in. Terminate with SC/APC type connectors.

C. The 24 fiber bundle shall have a UV-resistant, flame retardant jacket with water blocking technology for wet installations.

2.4 CATEGORY 6A UTP PATCH PANELS

A. Category 6A Patch Panels
1. Physical Characteristics

a. Panels shall be made of black anodized aluminum in 24-, 48-, and 96- port configurations.
b. Panels shall accommodate a minimum of 24 ports for each rack mount space (1rms = 44.5 mm [1.75 in.]).
c. Panels shall be manufactured with a rolled-edge at the top and bottom for stiffness.
d. Panels shall be made of 8-port adapter modules removable by detaching two screws.
e. Panels shall have modular jacks employing a tri-plane staggered contact array with a flat "hairpin" contact design made of Beryllium copper with a minimum 50-micro-inch gold plating on contact surfaces over 50-100 micro-inch of nickel compliant with FCC part 68.
f. Panels shall be available in both T568A and T568B wiring schemes, install 568 B.
g. Panels shall be equipped with 110-style termination made of fire retardant UL 94V0 rated thermoplastic and tin lead solder plated IDC.
h. Panel circuit boards shall be fully enclosed front and rear for physical protection.
i. Panels shall have port identification numbers on both the front and rear of the panel. Front port identification on the 48 port panels shall be located between the rows of jacks.
j. Panels shall have rear cable support bar for strain relief. Cable support bar shall attach to the rear of the patch panel itself without the use of additional fasteners or screws. All Cat 6A cabling shall be properly strain-relieved according to manufacturers' specifications.
k. Panels shall have self-adhesive, clear label holders and white designation labels provided with the panel for each row of 24 ports. Label all cable to match panel front.
l. Panels shall provide wiring identification & color code and maintain an in-line, paired punch down sequence that does not require the splitting of conductors from individual cable pairs.
m. Panels shall terminate 22-26 AWG solid conductors, maximum insulated conductor outside diameter 0.050".

2. Transmission Characteristics
a. Panels shall be ANSI/TIA/EIA-568 and ISO/IEC 11801 Category 6A compliant.
b. Panels shall be Cenelec EN 50173 compliant.
c. Panels shall be UL LISTED 1863 and CSA certified.
d. Panels shall be made by an ISO 9002 Certified Manufacturer.
e. Panels installed in a 4-connector channel with a Category 6A modular jack, and category 6 patch cords, all from the same manufacturer, and a qualified category 6 cable shall meet or exceed the requirements of Draft 5 of the TIA UTP Systems Task Group PN3727, Category 6A Draft Addendum to the ANSI/TIA/EIA-568 standard.
f. Panels installed in a channel configured as described in section e above, shall exhibit a worst pair channel NEXT loss of at least the following:

| Frequency | NEXT |
|---|---|
| MHz | dB |
| 1.0 | 72.7 |

| | |
|---|---|
| 4.0 | 63.1 |
| 8.0 | 58.2 |
| 10.0 | 56.6 |
| 16.0 | 53.2 |
| 20.0 | 51.6 |
| 25.0 | 50.0 |
| 31.25 | 48.4 |
| 62.5 | 43.4 |
| 100.0 | 39.9 |
| 200.0 | 34.8 |
| 250.0 | 33.1 |

g. Panels installed in a channel configured as described in section e above, shall exhibit a worst pair channel PSNEXT loss of at least the following:

| Frequency | PSNEXT |
|---|---|
| MHz | dB |
| 1.0 | 70.3 |
| 4.0 | 60.6 |
| 8.0 | 55.6 |
| 10.0 | 54.0 |
| 16.0 | 50.6 |
| 20.0 | 49.0 |
| 25.0 | 47.4 |
| 31.25 | 45.7 |
| 62.5 | 40.6 |
| 100.0 | 37.1 |
| 200.0 | 31.9 |
| 250.0 | 30.1 |

h. Panels installed in a channel configured as described in section e above, shall exhibit a worst pair channel Attenuation of not more than the following:

| Frequency | ATTEN |
|---|---|
| MHz | dB |
| 1.0 | 2.1 |
| 4.0 | 4.0 |
| 8.0 | 5.7 |
| 10.0 | 6.3 |
| 16.0 | 8.0 |
| 20.0 | 9.0 |
| 25.0 | 10.1 |
| 31.25 | 11.4 |
| 62.5 | 16.5 |
| 100.0 | 21.2 |
| 200.0 | 31.2 |

| | |
|---|---|
| 250.0 | 35.0 |

i. Panels installed in a channel configured as described in section e above, shall exhibit a worst pair channel ELFEXT loss of at least the following:

| Frequency | ELFEXT |
|---|---|
| MHz | dB |
| 1.0 | 63.2 |
| 4.0 | 51.2 |
| 8.0 | 45.2 |
| 10.0 | 43.2 |
| 16.0 | 39.1 |
| 20.0 | 37.2 |
| 25.0 | 35.3 |
| 31.25 | 33.3 |
| 62.5 | 27.3 |
| 100.0 | 23.2 |
| 200.0 | 17.2 |
| 250.0 | 15.3 |

j. Panels installed in a channel configured as described in section e above, shall exhibit a worst pair channel PSELFEXT loss of at least the following:

| Frequency | PSELFEXT |
|---|---|
| MHz | dB |
| 1.0 | 60.2 |
| 4.0 | 48.2 |
| 8.0 | 42.2 |
| 10.0 | 40.2 |
| 16.0 | 36.1 |
| 20.0 | 34.2 |
| 25.0 | 32.3 |
| 31.25 | 30.3 |
| 62.5 | 24.3 |
| 100.0 | 20.2 |
| 200.0 | 14.2 |
| 250.0 | 10.9 |

k. Panels installed in a channel configured as described in section e above, shall exhibit a channel return loss of at least the following:

| Frequency | Return Loss |
|---|---|
| MHz | DB |
| 1.0 | 21.0 |
| 4.0 | 24.0 |
| 8.0 | 26.5 |
| 10.0 | 24.6 |
| 16.0 | 22.8 |

| | |
|---|---|
| 20.0 | 23.7 |
| 25.0 | 23.5 |
| 31.25 | 22.2 |
| 62.5 | 24.4 |
| 100.0 | 19.2 |
| 200.0 | 17.8 |
| 250.0 | 18.2 |

l. Panels installed in a channel with a qualified Category 6A cable shall exhibit a delay skew of not more than 45 ns/100 m between 1 and 250 MHz.
m. Design Make: Uniprise UNP600 Category 6A Patch Panels.

## 2.5 VERTICAL CABLE MANAGEMENT CHANNELS

A. Furnish and install a vertical cable management system comprised of CPI MCS-EFX Master Cabling System. CPI Model: 40095-703 (6" wide, double-sided). Provide cable management at all equipment rack locations.

B. When a component is specified below as powder coat finished, the surface finish shall meet the following requirements:
1. When tested in accordance with ASTM D 2197, Method A, there shall be no exposed metal or discoloration with a 5.5kg weight.
2. When tested in accordance with ASTM D 3359, Method B, there shall be no flaking.
3. When tested in accordance with ASTM D 522, there shall be no cracking or lifting on a .0125 inch diameter mandrel.
4. When tested in accordance with ASTM D 3363, coating shall withstand a minimum gauge hardness of 2H.
5. When tested in accordance with ASTM D 2794, there shall be no chipping or cracks with an 80 in-lb. direct hit or a 60 in-lb. indirect hit.
6. When tested in accordance with FED-STD-141, method 6192, with 1 kg load and 1000 cycles, there shall be a maximum 80 mg. loss.

## 2.6 HORIZONTAL CABLE MANAGEMENT SYSTEM

A. Horizontal Cable Management System. Provide cable management at all equipment rack locations.
1. CPI Universal Cable Manager (part no: 30530-719).
2. Horizontal cable manager to be installed above and below Cat 6A patch panel.
3. Where there are multiple Cat 6A patch panels, horizontal cable manager to be installed between each Cat 6A patch panel and at the top and bottom of the group of Cat 6A patch panels.
4. Provide openings to pass cables from one side to the other.

B. When a component is specified below as powder coat finished, the surface finish shall meet the following requirements:

1. When tested in accordance with ASTM D 2197, Method A, there shall be no exposed metal or discoloration with a 5.5kg weight.
2. When tested in accordance with ASTM D 3359, Method B, there shall be no flaking.
3. When tested in accordance with ASTM D 522, there shall be no cracking or lifting on a .0125 inch diameter mandrel.
4. When tested in accordance with ASTM D 3363, coating shall withstand a minimum gauge hardness of 2H.
5. When tested in accordance with ASTM D 2794, there shall be no chipping or cracks with an 80 in-lb. direct hit or a 60 in-lb. indirect hit.
6. When tested in accordance with FED-STD-141, method 6192, with 1 kg load and 1000 cycles, there shall be a maximum 80 mg. loss.

## 2.7 MODULAR JACKS

A. Category 6A compliant Jacks - UTP
1. Jacks shall be 8 position un-keyed
2. Each jack shall be an individually constructed unit and shall snap mount in an industry standard keystone opening (.760” x 580”)
3. Jack housings shall be high impact 94 V0 rated thermoplastic
4. Jacks shall have a temperature rating of -10 °C (14°F) to 60°C (140 °F) in conformance with ANSI/TIA/EIA-568-A
5. Jacks shall utilize a 6 layer printed circuit board to control NEXT
6. Jack housings shall fully encase and protect printed circuit boards and IDC fields
7. Contacts will maintain a minimum vertical deflection force of 100 grams
8. Modular jack contacts shall be formed flat for increased surface contact with mated plugs. These contacts shall be arranged on the PC board to provide a tri-plane contact array to maximize contact spacing and minimize crosstalk
9. Modular jack contacts shall be constructed of Beryllium copper for maximum spring force and resilience.
10. Contact Plating shall be a minimum of 50 micro inches of gold in the contact area over 50 micro-inch of nickel, compliant with FCC part 68.5.
11. Jack termination shall be industry standard 110 insulation displacement contact, integral to the jack housing, laid out in 2 parallel arrays of 4 contacts.
12. Jacks shall utilize a paired punch down sequence. Cable pairs shall be maintained up to the IDC, terminating all conductors adjacent to its pair mate to better maintain pair characteristics designed by the cable manufacturer.
13. Jacks shall utilize tin lead plated (60% tin/40%lead) phosphor bronze 110 Insulation displacement contacts.
14. Jacks shall terminate 22-26 AWG stranded or solid conductors.
15. Jacks shall terminate insulated conductors with outside diameters up to .050”
16. Jacks shall be compatible with single conductor 110 impact termination tools
17. Jacks shall be compatible with EIA/TIA 606 color code labeling and accept snap on icons for identification or designation of applications.
18. Jacks shall be available in 6 colors for identification or designation of applications at the workstation or closet.
19. Jacks shall be marked as either T568A or T568B wiring.
20. Jacks shall have an attached color coded wiring instruction label.
21. Jacks shall be supplied with installed dust covers to protect the jack opening and internal elements during installation until the jack is in use.

2.8 FLUSH FACEPLATES

A. Faceplates shall be UL Listed and CSA Certified.

B. Faceplates in control room areas shall be constructed of high impact, 94 V-0 rated thermoplastic.

C. Faceplates in inmate areas shall be constructed of unbreakable nylon.

D. Faceplates shall be 2.75" W x 4.5" H (69.8 mm x 114.3 mm) for single gang and 4.5” X 4.5” (114.3 X 114.3 mm) for double gang

E. Faceplates shall be available to mount one, two, three, four, or six jacks in a single gang, and six or eight jacks in a double gang configuration.

F. Two, three, four and six port faceplates shall be available with port indications for Video and TCS/NCA.

G. Faceplates shall provide for TIA/EIA 606 compliant station labeling.

H. Faceplates shall have plastic covers over the mounting screws that can be replaced with a clear plastic window over a printable paper insert.

I. Coordinate color to match receptacles used in same area with the Division 26/27 contractor.

2.9 CABLE

A. Cable shall be unshielded twisted pair (UTP) listed to Category 6A.

B. Cable shall consist of 4 twisted pairs.

C. Insulated conductors and cables installed in raceways in underground installations shall be listed for use in wet locations. A wet location is defined as an installation underground or in concrete slabs or masonry in direct contact with the earth.

D. Listing: All wiring and raceways shall be listed for the intended installation and installed in strict accordance with the National Electric Code as required by the conditions of where it is installed. This includes but is not limited to ratings for riser, plenum, or wet installations. The ESC must verify that all conduit is sized correctly and in accordance with the NEC.

**PART 3 - EXECUTION**

3.1 INSTALLATION

A. Equipment shall be installed according to manufacturer’s instructions and properly mounted to a security rack, cabinet, bracket or other appropriate mounting device.

B. Panels shall be properly labeled on front and back with the cable number and port connections for each port.

C. Racks shall be assembled such that mounting rails are exactly perpendicular to the base.

D. Racks shall be secured to the floor using appropriate anchors.

E. Racks shall be grounded to the TGB or appropriate building ground using a #6 grounding wire.

F. Faceplates shall be labeled with the appropriate port designations as per the EIA/TIA standard.

G. Future Wiring: All wiring shall be terminated at both ends and labeled.

H. Spare parts shall be packaged in appropriate protective packing material.

3.2 TESTING

A. Panels shall be tested as part of the link or channel for Length, DC continuity, NEXT, PSNEXT, Attenuation, Return Loss, ELFEXT, and PSELFEXT using a level III tester for Category 6A channels.

B. Testers shall be correctly set to test the type and manufacturer of the horizontal cable used in the link or channel being tested, including the correct NVP.

C. A “PASS” indication shall be obtained for all link or channel tests when tested using the appropriate level tester for the appropriate category.

D. Test and confirm each fiber in all fiber optic cables using Tier 2 testing as outlined in TIA 568-C. Provide Test reports to engineer for review. All spare and /or unused fiber shall have a connector attached and be tested as detail in this section and tested.

E. Submit copies of all test reports to the Engineer three weeks before the acceptance test.

F. For multimode optical fiber, perform optical fiber end-to-end attenuation tests in accordance with EIA TIA/EIS-568-B.3 and EIA TIA/EIA-526-14A using an Optical Time Domain Reflectometer (OTDR) to generate a fiber “trace”.

G. For single-mode optical fiber, perform optical fiber end-to-end attenuation tests in accordance with EIA TIA/EIS-568-B.3 and EIA TIA/EIA-526-7 using an OTDR.

H. Reference test cable between the OTDR and the optical fiber shall be of adequate length (ten feet) 10’ to overcome the OTDR dead zone so that the entire optical fiber system can be inspected.

I. Attenuation losses for optical fiber shall not exceed those specified by the fiber manufacturer.

3.3 PROBLEMS

A. All problem or error conditions shall be corrected and retested to provide clean traces of all fibers.

B. Problems requiring correction and retesting include but are not limited to the following:
   1. Fiber Splice – fibers are not to have any splices. They terminate on equipment or patch panels only.
   2. Negative loss reading.
   3. DB Gainer.
   4. Reflective events other than the cable ends.
   5. Excessive Tailing.
   6. Hook on the falling edge of the trace.

C. All Category 6A cable shall be tested in accordance with ANSI/TIA-568-C.2 Commercial Balanced Twisted-Pair Telecommunications Cabling and Components Standard. Every cabling link in the installation shall be tested for:
   1. Wire Map
   2. Length
   3. Insertion Loss
   4. NEXT Loss
   5. PS NEXT Loss
   6. ACR-F Loss
   7. PS ACR-F Loss
   8. Return Loss
   9. Propagation Delay
   10. Delay Skew

3.4 REPORT

A. Compile all corrected signature traces and CAT6A tests into a report that shall be submitted to the Architect and Owner.
   1. The Contractor shall compile and submit one organized test notebook, in hard copy format, as well as a single electronic copy in Portable Document Format (PDF) that includes all required test result summary tables, and OTDR traces and power meter results of each fiber by each cable tested.
   2. The test notebook and electronic copy shall at a minimum, include the following:
      a. Identification number and name of each fiber.
      b. A summary sheet that clearly illustrates length and measured loss versus budgeted loss for each fiber or connected fiber string.
      c. Calculations and notations for each fiber and wavelength that include total loss, measured dB/km loss and any anomalies over 0.1dB.
      d. Identification of each CAT6 cable with a pass rating.

B. Organize the signature traces by system as follows:
   1. Furnish the following separation tabs:
      a. PLC
      b. Intercom/audio
      c. Video
      d. Spare
   2. At the beginning of each tabbed section, verbally describe the testing procedures used including length of launch and reference fiber cables. The verbal description shall include the manufacturer and exact model number of the OTDR used for the testing. List all OTDR tester and related software settings and defaults.

3. The electronic copy of the traces shall be organized with a folder for each tab and all files stored in the appropriate folder.

C. Test Reports: Provide written test reports documenting all of the above with either a narrative for each point or a list of features noting “pass” or “fail”. Submit copies to the Engineer three weeks before acceptance testing.

END OF SECTION 280513

# SECTION 28 05 48 - VIBRATION AND SEISMIC CONTROLS FOR SECURITY SYSTEMS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. General provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

### 1.2 SUMMARY

A. Section Includes
   1. Anchoring and restraints.

B. Related Sections
   1. Section 280500.2 - Security & Communication Conduit / Raceway Systems.
   2. Section 284619 – PLC.

### 1.3 REFERENCES

A. ASTM E2265- Standard Terminology for Anchors and Fasteners in Concrete and Masonry.

### 1.4 SYSTEM DESCRIPTION

A. Design Requirements
   1. Provide seismic components for the following systems:
      a. 280500.1 UPS system
      b. 283100 Access Control System
      c. 282300 IP Video Surveillance
      d. 284600 Touchscreen Control Station
      e. 284619 PLC
   2. Provide seismic restraints for the listed materials and equipment. The attachments shall resist forces to the center of gravity of the component. Criteria shall be the operating weight of the item times 0.5g for horizontal force to be applied in any direction. Wall-mounted or suspended components shall in addition, resist a downward force of 200 pounds minimum added to the operating weight.
   3. The Importance Factor ($I_P$) of the above systems equals 1.5.
   4. From the Structural plans, the applicable seismic design parameters are as follows:
      a. Site Class C.
      b. Occupancy Category III.
      c. Seismic Design Category D.
      d. Refer to S001 to confirm these parameters.

### 1.5 SUBMITTALS

A. Submit under provisions contract documents.

B. Submit proposed system to engineer for review prior to installation.

C. Project Information:

1. Submit seismic support calculations for all electrical equipment and conduit where isolation restraints are supplied.
2. Certification of seismic restraints.
   a. Substantiated by calculations or test reports verified by a professional structural engineer or equipment manufacturer.

D. Shop Drawings
1. Submit seismic restraint installation shop drawing prior to installation.

1.6 QUALITY ASSURANCE

A. Racks and Conduits: ASCE 7 Guidelines, Chapter 13 "Seismic Design Requirements for Nonstructural Components".

B. Anchor Bolts: All anchor bolts shall comply with ASTM A307.

C. Certifications: All Seismic components shall be certified as seismic by the manufacturer or by a delegated design professional as specified in specification section 013300 paragraph 2.3.

**PART 2 - PRODUCTS**

2.1 GENERAL

A. Acceptable Manufacturers:
1. Seismic Control Devices:
   a. Mason Industries.
   b. Vibration Eliminator Co.
   c. Korfund Dynamics Corp.
   d. Amber-Booth Co.
   e. Consolidated Kinetics.
   f. Kinetics Noise Control

B. Furnish and install racks equivalent to Lowell LER-4432 23” wide by 32” deep by 84” high.

C. Provide conduit and equipment anchoring systems as indicated in the Contract Documents.

D. Provide all mounting hardware, support wires, conduits for alignment, eyebolts, bolts, nuts and washers required for equipment mounting and seismic control. Structural blocking/backing and hardware required for installation shall be provided as required by the Delegated Design Submittal.

2.2 ANCHORING AND RESTRAINTS

A. Equipment Anchors:
1. Anchor all equipment in accordance with the approved shop drawings.
2. Contractor shall be responsible for design and acquiring of approval for anchoring of equipment where required by ASCE 7.

B. Conduit Supports:
1. Conduits shall be supported and braced in accordance with ASCE 7 Chapter 13.

2. Conduits individually supported above finished floors with an importance factor of 1.5 and greater than 2.5 inches in diameter shall be provided with seismic restraints as required by ASCE 7, Chapter 13.
3. Trapeze supported conduits with a total weight exceeding 10 lb/ft shall be provided with seismic restraints as required by ASCE 7, Chapter 13.
4. Cable trays must be listed for seismic installation in accordance with ASCE 7, Chapter 13. Securely attach cable to tray at intervals equal to one half the cable tray support spacing.

C. Device Support:
1. Provide independent seismic support system for all boxes not directly anchored to concrete walls or concrete ceilings for the following:
   a. Cameras.

D. Floor Mounted Racks:
1. Furnish and install seismic racks and attach per manufacture's installation instructions.
2. Furnish and install seismic restraints for shelf mounted computers, monitors, and any other component not securely attached to the frame.

## PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturers' written instructions in a manner to achieve full capacity of support.

**END OF SECTION 28 05 48**

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# SECTION 28 10 00 – FIBER OPTIC TESTING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. General provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

### 1.2 SUMMARY

A. Perform and document testing of all optic fiber installed for IP Video, PLC, and security systems.

B. All testing is to be performed by a certified experienced tester of a nationally recognized certification organization. (Fiber Optic Association)

C. The test result shall be a graphic representation of the relative power versus the fiber length called a “signature trace”.

### 1.3 SCOPE OF WORK

A. This section includes the minimum requirements for Tier 2 of TSB-140 testing of the optic fiber installed for all security systems networks.

B. Test multimode optic fibers at both 850 nm and 1300 nm wavelengths.

C. Test single-mode optic fibers at both 1310 nm and 1550 nm wavelengths.

D. Test for continuity and quality of all installed optic fibers. Any deficiencies found shall be corrected by the optic fiber installer and the corrected optic fiber retested and documented.

E. The final fiber signature traces for each optic fiber as corrected shall be included in the O&M manuals turned over to the owner.

### 1.4 QUALITY ASSURANCE

A. All equipment shall be installed neatly and in accordance with manufacturers’ specifications. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner or Owner’s Representative. Equipment and materials shall be of the quality and manufacture indicated.

B. Material and work specified herein shall comply with the applicable requirements of:
   1. ANSI/TIA/EIA – 568-B.1: “Commercial Building Telecommunications Cabling Standard”
   2. ANSI/TIA/EIA – 526-7: “Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant”

3. ANSI/TIA/EIA – 526-14A: "Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant"
4. NFPA 70
5. BICSI Telecommunications Distribution Methods Manual
6. Contractor must have at least one Registered Communications Distribution Designer RCDD® on staff.

1.5 SUBMITTALS

A. Submit testing plan for facility optic fiber with submittals.

B. Submit the following certifications:
1. Current certificate of RCDD®.
2. Certification in optic fiber testing.

**PART 2 - PRODUCTS**

2.1 OPTICAL TIME DOMAIN REFLECTOMETER (OTDR)

A. Utilize a high-resolution OTDR to characterize the power loss and power reflected along optical fibers.

B. The OTDR must operate within the range of 850 ± 30 nm or 1300 ± 20 nm for multimode testing in accordance with ANSI/TIA/EIA-526-14-A.

C. The OTDR must operate within the range of 1300 ± 10 nm or 1550 ± 20 nm for single-mode testing in accordance with ANSI/TIA/EIA-526-7.

**PART 3 - EXECUTION**

3.1 TESTING

A. For multimode optical fiber, perform optical fiber end-to-end attenuation tests in accordance with EIA TIA/EIS-568-B.3 and EIA TIA/EIA-526-14A using an Optical Time Domain Reflectometer (OTDR) to generate a fiber "trace".

B. For single-mode optical fiber, perform optical fiber end-to-end attenuation tests in accordance with EIA TIA/EIS-568-B.3 and EIA TIA/EIA-526-7 using an OTDR.

C. All testing shall be performed with launch cables of proper length for accurate readings.

D. All testing shall be performed with "receive fiber" length of proper length for accurate readings.

E. Attenuation losses shall not exceed those specified by the fiber manufacturer.

3.2 PROBLEMS

A. All problem or error conditions shall be corrected and retested to provide clean traces of all fibers.

B. Problems requiring correction and retesting include but are not limited to the following:
   1. Fiber Splice – fibers are not to have any splices. They terminate on equipment or patch panels only.
   2. Negative loss reading.
   3. DB Gainer.
   4. Reflective events other than the cable ends.
   5. Excessive Tailing.
   6. Hook on the falling edge of the trace.

3.3 REPORT

A. Compile all corrected signature traces into a report that shall be submitted to the Architect and Owner.
   1. The Contractor shall compile and submit one organized test notebook, in hard copy format, as well as a single electronic copy in Portable Document Format (PDF) that includes all required test results summary tables, and OTDR traces and power meter results of each fiber by each cable tested.
   2. The test notebook and electronic copy shall at a minimum, include the following:
      a. Identification number and name of each fiber.
      b. A summary sheet that clearly illustrates length and measured loss versus budgeted loss for each fiber or connected fiber string.
      c. Calculations and notations for each fiber and wavelength that include total loss, measured dB/km loss and any anomalies over 0.1dB.

B. Organize the signature traces by system as follows:
   1. Furnish the following separation tabs:
      a. IP Video
      b. PLC
      c. Intercom/audio
      d. Spare
   2. At the beginning of each tabbed section, verbally described the testing procedures used including length of launch and reference fiber cables. The verbal description shall include the manufacturer and exact model number of the OTDR used for the testing. List all OTDR tester and related software settings and defaults.
   3. The electronic copy of the traces shall be organized with a folder for each tab and all files stored in the appropriate folder.

C. Under each system, identify the point of origination and the point of termination as well as the optic fiber number.

**END OF SECTION 28 10 00**

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# SECTION 28 13 00 - ACCESS CONTROL SYSTEM

## PART 1 - GENERAL

RFI 0093 Control Matrix Clarification
See RFI 0152 for Control Matrix Clarification

### 1.1 RELATED DOCUMENTS

A. General provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

B. The ESC as defined in Section 280500 Common Work Results for Electronic Safety and Security shall be responsible for providing and coordinating this system.

### 1.2 SUMMARY

A. Scope of Work: Provide all components to incorporate locks, readers, and request to exit devices to provide a complete Card access system as indicated on the plans and described herein. The Card Access system shall be similar in form and function to the existing system in the Stanton facility. The card readers must be compatible with the Solano County issued HID access cards. Although such work may not be specifically shown or specified, all supplementary or miscellaneous items appurtenances, and devices incidental to, or necessary for a sound, secure, complete, and compatible installation shall be furnished and installed as part of the work. Any case of error, omission, discrepancy, or lack of clarity shall be promptly identified for clarification prior to the bid due date.

B. The Control Station in Security Booth A120 and the Personal Digital Assistants (PDA) will have monitoring and override capability over the card access system. Refer to Specification Section 284600.1 Control Matrix.

RFI 0081 Access Control System Clarification
Intent is for Card Access to function as an extension of the existing system.

C. Access control panel software shall be Honeywell security manager, no equals. It is to comply with the existing county card reader access control system.

D. Card access is to be provided for access to areas and as indicated on the plans.

### 1.3 SYSTEM DESCRIPTION

A. Access Control: The readers shall provide access by operating the door strike and/or electric lock when a valid card is presented during a valid timer period.

B. A door position switch will indicate the door has been opened by means other than a valid card read or the release by the locking control system.

C. Each door will be provided with a Request to Exit device (REX) to differentiate a valid egress as compared to a forced entry.

D. Provide necessary PLC inputs and outputs per designated card access controller for integration between the locking control system and the card access system.

1.4 KEY CABINET:

A. Furnish and install a Morse Watchman KeyWatcher cabinet for key distribution. Keys shall be dispensed based on the access settings of each staff member as determined by the owner.

B. Provide a KW Touch 9 module cabinet equal to KW-8085 key cabinet in the location identified on Sheet ES201.

C. Provide the owner a four hour training class in setting up the system and aid the owner in setting up the key schedules.

1.5 SUBMITTALS

A. Basic Submittals: Provide submittals as required by 280500 Common Work Results for Electronic Safety and Security and as required by the general contract documents.

B. Hardware: Provide wiring diagrams as coordinated with hardware supplier.

C. Point lists: Provide a point list of each door and all monitored points.

D. Provide documentation from the manufacturer that the ESC is certified to install the Card Access System.

**PART 2 - PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS:

A. Honeywell

B. HID Corporation

2.2 DOOR HARDWARE:

A. Coordinate all connections with door hardware provided by others. Provide power to device from security electronics room UPS.

2.3 CARD ACCESS CABINET AND CONTROLLER (CA):

A. Provide a UL 294 listed Honeywell NetAXS-123 Access Control System (no substitute) where indicated on the plans. System shall consist of the following parts:
   1. NX4S1 Door boards for all of the doors.
   2. PSC-100 or equal Class 2 power supply for powering door boards.
   3. Cabinet tamper switch shall be G.E. Security 3010 series recessed pin plunger model 3012-N (or equal).
   4. One CAT6A cable from one NX4S1 board in a panel to the nearest network switch.
   5. RS485 daisy chain wiring connecting multiple boards in a panel.
   6. Adequately sized NEMA 1 lockable enclosure equal to Hammond 1420 Series Panel Enclosure.
   7. Size cabinet so that UPS power receptacle is enclosed inside cabinet. Provide proper separation between Class 2 wiring, communication wiring, and 120VAC power wiring.

8. Separate power for unlocking doors from the local PLC. Provide the necessary PLC I/O to integrate the card access and the door locking control system. Refer to Detail 2 on ES505 for additional information.

2.4 CARD READER (RDR):

A. Proximity Card Reader: Furnish and install proximity card readers equal to HID ThinLine II readers. Fully coordinate the installation of the card reader with the door hardware provider. As a minimum, the unit shall have the following features:
   1. Sealed in a rugged weatherized polycarbonate UL 94 material.
   2. Wiegand output.
   3. Multicolor LED.

2.5 REQUEST TO EXIT (REX):

A. Furnish and install a request to exit device where indicated on the plans. Request to exit device shall be coordinated with door hardware provider.
   1. Request to exit device with an "M" is a motion detector mounted above the door. Device shall be equal to the Dortronics 6612 Motion Sensor. Install the detection range such that the door is unlocked only when a person approached the door to leave.
   2. Request to exit device noted with a "B" is a push button mounted next to the door equal to the Camden CM-400.

2.6 DOOR POSITION SWITCH:

A. If a Door Position Switch (DPS) is not provided, ESC to furnish and install GE door position switches wired to the card access system to indicate that the door is closed.

2.7 CABLING AND WIRE:

A. Acceptable manufacturers:
   1. Liberty Wire and Cable
   2. Eastman Wire & Cable
   3. West Penn Wire
   4. Belden
   5. Carol
   6. General Cable
   7. Clifford of Vermnont, Inc.
   8. Alpha

B. Wire Size: Furnish and install sufficient wire gauge to limit voltage drop to 5%.

C. Listings: Wiring shall be listed for the installation.

D. Access Terminal Controller Wiring: Furnish and install an Ethernet Category 6A cable from the card access cabinet to the nearest network switch.

E. Card Reader Wiring: Furnish and install a five conductor #20 AWG stranded with overall shielded cable to each card reader.

F. Request to Exit Wiring: Furnish and install a two conductor #20 AWG cable to each request to exit wall switch or motion detector above the door.

G. Door Position Switch Wiring: Furnish and install a two conductor #20 AWG cable to each door position switch.

H. Conductors shall be grouped and laced with nylon tie straps.

I. All power conductors shall be a minimum 14 AWG THWN, 600 volt rated and shall be installed in raceways and equipment enclosures with other conductors within limitations defined by Article 300 of the California Electric Code.

J. Class 2 Circuit Wiring that extends from the electronic control relay terminal trips to the low voltage devices shall be Class 2 as defined by article 725 of the California Electric Code. All control conductors shall be a minimum of 20 AWG, jacketed, control cable. All control cable insulation shall be 600 volt rated.

K. All wiring systems shall be labeled and color-coded with labeling and coding shown on shop drawings.

L. All conductors within junction boxes pull boxes, and equipment enclosures shall be grouped and laced with **VELCRO** tie traps.

M. Control system conductors shall not be spliced.

## PART 3 - EXECUTION

3.1 COORDINATION

A. Preliminary Coordination: Coordinate all required embeds, block-outs, and construction as required to install the devices as indicated on the plans.

B. Hardware: Coordinate connections to hardware provided by others.

3.2 INSTALLATION

A. Coordination: Fully coordinate the card access equipment with all other trades for a complete and operational system.

B. Listing: All wiring and raceways shall be listed for the intended installation and installed in strict accordance with the California Electric Code as required by the conditions of where it is installed.

C. Seismic: The entire system shall be installed to meet the seismic requirements for the area.

3.3 FIELD QUALITY CONTROL

A. Tests: Test that all readers respond correctly to all alarm events as well as unlocking the door on a valid card read.

B. Test Reports: Provide written test reports documenting all of the above with either a narrative for each point or a list of features noting “pass” or “fail”.

3.4 TRAINING

A. The ESC shall provide, without additional cost to the owner, representatives specially trained in the operation of Access Control system provided. The representatives shall train the Owner’s personnel in operation, repair, and upkeep of this system. Refer to Specification section 280500 Part 3.6 Training for additional information.

3.5 SPARES

A. Furnish the following Spares:
   1. One spare reader.
   2. One spare of each type door board installed on the project.
   3. One spare of each power supply installed on the project.

B. Spare parts shall be packaged with appropriate protective packing material.

C. Box spare parts for easy storage and clearly identify the contents of each box on four sides of each box.

**ACCESS CONTROL VERIFICATION AND CHECK-OUT FORM**

✓ = OK

**Job #**
**Job Name:**
**Panel #**

| **FIELD TEST CODE:** | | **REPAIR CODE:** | |
|---|---|---|---|
| A - No status change | M - Reversed | 1-SSI | Software Test By:_____ Date_____ |
| B - No power card reader | N - No event recording | 2-ELECTRICIAN | |
| C - No power to door | O - No power to printer | 3-IRONWORKER | Hardware Test By:_____ Date_____ |
| D - Door won't open | P - | 4-CARPENTER | |
| E - Door won't close | Q - | 5-OWNER/REP | System Test By:_____ Date_____ |
| F - Wrong door opens | R - | 6-ENG | |
| G - Adjust door | S - | 7 - | Design Engineering By:_____ Date_____ |
| H - Doors emergency release SCC | T - | 8 - | |
| I - Adjust DPS | U - | 9 - | Wiring By:_____ Date_____ |
| J - Motion detection failure | V - | 10 - | |
| K - Software problem | W - | 11 - | Field Test By:_____ Date_____ |
| L - Not installed | X - | 12 - | |

| | | | | | | | **ON-SITE** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ICON ID#** | **ICON TYPE** | **STA CALL NO.** | **CA INTLK WITH** | | **SOFT-WARE TEST** | **CA TEST** | **FIELD TEST CODE** | **REPAIR CODE** | **RE-CHECK "X"** | **FIELD CHECK OUT NOTES** | **PROBLEM RESOLVED (BY/DATE)** |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**END OF SECTION 28 13 00**

# SECTION 28 23 00 – IP VIDEO SURVEILLANCE

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Scope of Work: Furnish and install all components to provide a complete, integrated, and fully functional Internet Protocol (IP) camera system as indicated on the plans and described herein. The IP Video Surveillance system shall be similar in form and function to the existing system in the Stanton facility. Although such work may not be specifically shown or specified, all supplementary or miscellaneous items appurtenances, and devices incidental to, or necessary for a sound, secure, complete, and compatible installation shall be furnished and installed as part of the work. Any case of error, omission, discrepancy, or lack of clarity shall be promptly identified for clarification prior to the bid due date

B. The ESC as defined in Section 280500 Common Work Results for Electronic Safety and Security shall be responsible for providing and coordinating this system.

C. The ESC shall provide all local video switches, video servers, video management software, camera licenses, and programming of cameras and network equipment required for a fully functional system.

D. Provide recording of all cameras for a period of 12 months at MPEG4 format. Video storage array shall be a minimum of 120 Terabytes in size under the base bid and an additional 280 Terabytes (400TB total) under Best Value Enhancement 12. Camera recording parameters: minimum 15 frames per second (fps), 4 Common Intermediate Format, & H.264 compression.

E. Cameras are to be recorded at a minimum of 15 frames per second but are subject to change at Owner's discretion. Each camera's fps can be individually adjusted based on location.

F. The video system shall be interfaced with the PLC/TCS system for intercom, systems alarms, duress alarms, and individual camera call up functions.

### 1.2 SYSTEM DESCRIPTION

A. System Capacity: Furnish and install a color IP camera system with the capacity indicated plus 25% spare.

B. Video Management System (VMS): The Video Management System on a central server shall be loaded on a central server

C. Multiplex Video Workstation: Furnish and install color monitors and CPU's to view up to 16 camera views simultaneously or as selected by the operator.

D. Spot Video Workstation: Furnish and install color monitors and CPU's to display a camera activated by alarm, intercom call up, duress alarm, or manual activation.

E. Camera Identification: Uniquely identify each camera by a 16 character, alphanumeric label incorporated into the video signal.

F. IP Camera: Furnish and install all cameras and camera cabling. The IP camera shall provide at least two individually configured simultaneous video streams.

G. Continuous Operation: All cameras, computers, and system components shall be rated for continuous operation.

H. Standards: All cameras and components shall be compliant with ONVIF standard.

I. Fully integrate the IP video system with the Door Locking Control PLC and Intercom systems.

J. Video Storage: ESC shall furnish and install a video storage array sized at 120TB base bid (and 280TB under Best Value Enhancement 12 to provide 400TB) to provide video storage for all of the IP video cameras. Refer to Camera Schedule for minimum frame rate and resolution.

K. Perimeter cameras shall go into an alarm state when a person approaches the perimeter fence within the cameras' field of view. The alarmed camera shall be instantly displayed on the multiplexed monitor at the local workstation. Two camera views on each multiplexed monitor shall be used for displaying site cameras that are in alarm. The operator shall acknowledge the alarm by clicking on the camera view. ESC shall provide the programing and testing of this feature of the camera system.

1.3 SUBMITTALS

A. Basic Submittals: Provide submittals as required by Section 280500 Common Work Results for Electronic Safety and Security and as required by the general contract documents.

1.4 SYSTEMS INTEGRATION

A. Alarm Call-up: Cameras covering a duress button shall automatically display live video on the controlling spot monitor whenever the duress button is activated.

B. Intercom Call-up: Cameras covering an intercom station shall automatically display live video on the controlling spot monitor whenever the intercom is selected by the controlling Touchscreen Control Station (TCS).

**PART 2 - PRODUCTS**

2.1 ACCEPTABLE IP VIDEO MANUFACTURERS

A. Acceptable hardware manufactures IP Video equipment:
1. Bosch Cameras (No substitute)
2. Genetec (VMS) Video Management System (No Substitute)

2.2 SYSTEM PARAMETERS

A. Manufacturing Standards: All components shall be manufactured to ONVIF standards.

B. All components shall incorporate the following:

1. UL listed for the intended purpose.
2. Vandal resistant housing.

C. Network Features: All components operate over Ethernet switches, Cat 6A cabling and optic fiber. All components shall incorporate the following:

1. Compatible with Internet Protocol Version 4 (IPv4) and Version 6 (IPv6).
2. Support both fixed and dynamically assigned IP addresses.
3. Shall have the ability to limit maximum bandwidth to a selected value.

2.3 IP VIDEO CAMERAS

A. Furnish and install where indicated in the camera schedule interior IP cameras equal to Bosch Flexidome HD model NIN-63013-A3 series with cast aluminum housings and polycarbonate dome and 1280x720 resolution.
1. Vandal resistant construction IK10 impact resistant.

B. Furnish and install where indicated in the camera schedule interior IP cameras equal to Bosch HD model NIN-63023-A3 series with cast aluminum housings and polycarbonate dome and 1920x1080 resolution.

1. Vandal resistant construction IK10 impact resistant.
2. Powered over Ethernet.
3. Pendant mount cameras below duct work and lighting to provide an unobstructed view.

C. Furnish and install a 360 degree camera equal to Bosch Flexidome IP 5000 MP camera.

1. Vandal resistant construction IK10 impact resistant.
2. Powered over Ethernet.

D. Furnish and install where indicated in the camera schedule exterior 5 MP cameras for the perimeter equal to Bosch NBN-80052-BA Dinion IP Starlight 8000 MP with 2992x1680 resolution
1. Vandal resistant construction IK10 impact resistant.
2. Powered over Ethernet.
3. Tinted lenses on all exterior camera housings.
4. Outdoor IP66 rated housing equivalent to UHO PoE Outdoor Camera Housing, UHO-POE-10
5. Bosch UHO-PoE-10 with LTC 9213/01 pole mount.
6. Optional 30 images per second frame rate.
7. Video Analytics that alert staff when a person is within 10’ of the perimeter fence. ESC is to provide necessary hardware, software, camera license, and any auxiliary equipment required to provide this function.

E. Exterior units shall be rated IP66 against weather for outdoor mounting.

F. Camera Pole: Furnish and install camera poles providing mounting heights as indicated on the plans and in the camera schedule. Poles shall be manufactured by ABC Control Systems of Buena Park, CA and match those installed at Stanton.

2.4 IP VIDEO MONITOR WORKSTATIONS

A. Workstation Computer: At a minimum, furnish and install a Bosch MHW-WZ4R4-HEUS (or equal) computer with all required hardware and software as indicated on the plans.

B. Workstation and Spot Monitors: Furnish and install a 22 inch monitor equal to the Bosch UML-223-90 where indicated on the plans.

C. Multiplexed Monitors: Furnish and install a 32 inch monitor equal to the Bosch UML-323-90 where indicated on the plans.

D. Furnish and install a computers and monitors for each video workstation and each video review location.
   1. IP.A is Security Booth A120

2.5 IP VIDEO CONTROLS

A. Furnish and install latest version Genetec Video Management Software. Version shall be Security Center 5.4 edition or later. Furnish Omnicast Pro software for broadcasting signal to PDAs. Furnish and install all licenses required for the cameras, PDAs, and workstations indicated.

B. Furnish and install an IP Video Storage Array equal to Bosch/NetApp E2700 dual controller series with a minimum of 2 60 bay expansions. Video storage array shall be a minimum of 120TB base bid (and 280TB to provide 400TB under Best Value Enhancement 12) in size. Record camera video according to the parameters listed in the camera schedule. Video shall be stored for 12 months. In addition, provide the following features:
   1. Provide RAID 6 storage configuration
   2. System shall be scalable. Provide expansion units equal to Bosch high density 60 bay expansion units with 4 TB hard drives.
   3. Provide active storage for all of the cameras installed in the project.
   4. Provide space in an additional empty rack for future expansion.
   5. The system shall provide "watermarks" to ensure the video has not been modified.

C. Furnish and install local Ethernet switches for the video system in each building's camera rack and the main server rack as required for the final number of cameras to be installed. The Ethernet switch shall be equal to Cisco WS-C2960XR-24PS-I 24 port Gigabit Switch with 370 Watts of Power over Ethernet. PoE shall be available on all ports. Provide 2 1000Base-SX-SFP modules for 4 strands of OM4 fiber back to the Building A core switch in SEC closet A106.

D. Furnish and install an aggregating switch equal to Cisco WS-C3850-24S-24SFP switch in main SEC closet A106. Furnish and install optic fiber SFP ports (for connections to remote edge switches use 2 1000Base-SX-SFP modules, for connection to recording network provide C3850-NM-2-10G with SFP 10G-SR modules). Provide local switches equal to Cisco WS-C3850-24P-S with rear stack wise and power wise redundancy for power cameras in building 4. Furnish and install all power supplies, hardware, and software required for a fully functional system.

E. Furnish and install a video server equal to Bosch model MHW-S380R9-SCUS.

F. Furnish and install a Lantronix UDS1100 Media Converter (or equal) for the ASCII interface between the PLC and IP video network.

2.6 TRANSIENT SURGE SUPPRESSION

A. Acceptable manufacturers are as follows:
1. Northern Technologies Incorporated
2. DITEK
3. PolyPhaser Corporation
4. Transtector

B. Furnish and install surge suppression on all power connections to exterior cameras equal to Northern Technologies TCS-HWR.

C. Furnish and install surge suppression for exterior camera locations using Cat6A equal to DTK-Cat6A series with POE.

2.7 FIBER OPTIC MODULES

A. Furnish and install dedicated multimode optic fiber between Video Ethernet switches and remote exterior cameras. Fiber shall be equal to Corning FREEDM 002T8F-31180-29. Furnish and install quantity of optic fibers required plus 25% spare.

B. Furnish and install a Comnet Ethernet 2 port media converter CNGE2MC or equal for each individual pole mounted camera. The unit shall be located in the security electronics equipment rack (VID). If two channels is necessary use CNGE22MC.

C. Furnish and install a hardened Comnet Ethernet 2 port media with PoE converter CNGE2MCPOEM or equal for each individual pole mounted camera. The unit shall be located in the camera pole power cabinet.

D. Furnish and install a hardened Comnet Ethernet industrial grade PoE switch equal to the CNFE4+1SMSM2POE for pole locations with three cameras.

2.8 CABLING AND WIRE

A. Acceptable manufacturers:
1. Commscope Uniprise Cat 6A cable.
2. Commscope Uniprise Cat 6A cable jumpers.
3. “Wet Rated” shall be equal to CommScope Uniprise 6NF4-i cable.
4. “Non Wet Rated” shall be CommScope Uniprise 65N4+ cable.

B. Wire Size: Furnish and install sufficient wire gauge to limit voltage drop to 5%.

C. Camera Power Wiring: Interior cameras will be Powered over Ethernet (PoE). Furnish and install 120 VAC UPS power for cameras connected by optic fiber. Coordinate the location and installation of 120 VAC UPS power with Division 26.

D. IP Camera Wiring: Furnish and install category 6A cabling from each IP video device to the nearest switch.

E. Category 6A cable for all cameras shall be GREEN in color.

F. All factory patch cords shall be GREEN in color.

2.9 EQUIPMENT ENCLOSURES

A. The IP Video system equipment shall be mounted in seismic rated rack. Furnish and install racks equal to CPI Seismic Frame series Cabinet.

B. Each workstation computer shall be provided with low profile metal cabinet to house the computer. Furnish each CPU with a model CPU-1 or CPU-2 cabinet as manufactured by Computer Security Products. Furnish and install the following as a minimum:
1. Fully vented steel doors.
2. Lockable Enclosure.
3. Welded side panels with handles.
4. Equipment rack noted here is not required if millwork is fabricated with ventilated and lockable storage area for CPU's.

2.10 FABRICATION

A. Assemble all components in a neat and orderly fashion.

B. Identify camera with text approved by the owner.

2.11 CAMERA POLE

A. Furnish and install a camera pole and base at each pole mounted camera shown on the site plan. The camera signal shall be over optic fiber to the pole enclosure. Furnish and install a ground rod at each camera pole.

B. Top part of anchor bolts shall be galvanized per ASTM A-153 and made of steel rod having a minimum yield strength of 55,000 psi. Submit finish to the architect for approval.

C. Furnish and install a hand hole and Full Base Cover.

D. Furnish and install all hardware required to mount the equipment enclosure and camera as indicated in the plans and details.

E. Assemble all components in a neat and orderly fashion.

2.12 CAMERA POLE POWER CABINET

A. Furnish and install camera pole power cabinet equal to Hoffman A20H16ALP, NEMA 4 rated enclosure (20"H x 16"H x 6"D). Mount PoE Fiber Media Converter, Fiber Media Converter, TVSS (TCS-HWR), fuse terminal with (2) Amp fuse, terminals, receptacle, and ground buss bar. Division 26 shall furnish and install a 120 VAC UPS Power circuit to each camera power cabinet. Owner to furnish padlock to lock the enclosure. Refer to sheet ES100, details 4 and 6 on sheet ES602.

## PART 3 - EXECUTION

3.1 COORDINATION

A. Preliminary Coordination: Coordinate all required embeds and block-outs as required to install the cameras as indicated on the plans.

B. Construction Examination: Monitor ongoing construction and coordinate with other trades so that a clear line of site of the area to be viewed is maintained for each camera.

C. Structural Examination: Examine locations for camera mounts and poles to ensure the supporting structures will carry camera mounts and devices to be installed.

3.2 INSTALLATION

A. Conduit: All conduits are to be concealed.

B. Cable: All connecting cables to cameras shall be concealed in the mount or installed with flexible conduit. Flexible conduit not allowed in inmate housing areas.

C. Anchoring: All mounts shall be anchored to the walls or structures as indicated in the installation manuals.

D. Special Boxes: Furnish and install special back boxes in a timely manner for field installation while adequate access is available.

E. Titles: Program camera identifications and intercom call up titles as approved by the Owner.

F. Field Wiring: The wiring that extends from the electronic control relay terminal strips to the locks, lights, etc. shall be class 1, 2, or 3 as defined by Article 725 of the California Electric Code.

3.3 FIELD QUALITY CONTROL

A. Testing: All cameras shall be tested and viewed from each scheduled monitor after installation is complete.

B. Integration Testing: Check that all integrated events call up the appropriate camera.

C. Test Reports: Furnish written test reports to the engineer prior to final inspection documenting all of the above. See example form below.

**VIDEO SURVEILLANCE VERIFICATION AND CHECK-OUT FORM**

✓ = OK

Job #
Job Name:
Panel #

| FIELD TEST CODE: | | REPAIR CODE: | |
|---|---|---|---|
| A - No status change | M - | 1-SSI | Software Test By:_____ Date_____ |
| B - Won't call up with alarm | N - | 2-ELECTRICIAN | |
| C - Poor vIdeo | O - | 3-IRONWORKER | Hardware Test By:_____ Date_____ |
| D - No video | P - | 4-CARPENTER | |
| E - Out of focus | Q - | 5-OWNER/REP | System Test By:_____ Date_____ |
| F - PTZ does not function | R - | 6-ENG | |
| G - No power to camera | S - | 7 - | Design Engineering By:_____ Date_____ |
| H - Reversed CCTV Camera call- | T - | 8 - | |
| I - Software problem | U - | 9 - | Wiring By:_____ Date_____ |
| J - Monitor failure | V - | 10 - | |
| K - Multiplex/Quad failure | W - | 11 - | Field Test By:_____ Date_____ |
| L - Not installed | X - | 12 - | |

| | | | | | | | ON-SITE | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ICON ID# | ICON TYPE | C/U CAM. NO. | CCTV INTLK. WITH | CELL CCTV VIDEO | SOFT-WARE TEST | HARD-WARE TEST | FIELD TEST CODE | REPAIR CODE | RE-CHECK "X" | FIELD CHECK OUT NOTES | PROBLEM RESOLVED (BY/DATE) |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

D. Program camera identifications and intercom call up titles as approved by the owner.

E. Field test each perimeter test camera by approaching the fence from each direction.

3.4 SOFTWARE

A. Furnish a single Adobe Acrobat PDF file detailing all passwords for each IP Video system.

B. Furnish documents listed in 3.4 A at project completion.

3.5 ADJUSTING AND CLEANING

A. View Adjustment: Use a portable monitor to adjust the cameras for the best possible camera coverage. Final adjustments shall be reviewed and approved by the owner.

**B. Fully coordinate the final location of all cameras to prevent camera views being blocked by light fixtures, HVAC fixtures, and all other obstructions.**

3.6 TRAINING

A. The ESC shall provide, without additional cost to the owner representatives, training in the operation of Video Surveillance systems provided. The representatives shall train the Owner's personnel in operation, repair, and upkeep of the Video Surveillance and custom recording settings. Refer to Specification section 280500 Part 3.6 Training for additional information.

3.7 SPARES

A. Dome Camera: Furnish (2) spare cameras of each type installed on the project.

B. PTZ Camera: Furnish (1) spare camera of each type installed on the project.

C. Corner Mounted Camera: Furnish (1) spare camera of each type installed on the project.

D. Dome Housings: Furnish (2) spare dome bubbles for each type installed on the project.

E. Workstation: Furnish one spare workstation with monitor.

F. Spare parts shall be packaged with appropriate protective packing material.

G. Box spare parts for easy storage and clearly identify the contents of each box on all four sides of each box.

**END OF SECTION 28 23 00**

November 9, 2016

# SECTION 28 23 00 – IP VIDEO SURVEILLANCE

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Scope of Work: Furnish and install all components to provide a complete, integrated, and fully functional Internet Protocol (IP) camera system as indicated on the plans and described herein. The IP Video Surveillance system shall be similar in form and function to the existing system in the Stanton facility. Although such work may not be specifically shown or specified, all supplementary or miscellaneous items appurtenances, and devices incidental to, or necessary for a sound, secure, complete, and compatible installation shall be furnished and installed as part of the work. Any case of error, omission, discrepancy, or lack of clarity shall be promptly identified for clarification prior to the bid due date

B. The ESC as defined in Section 280500 Common Work Results for Electronic Safety and Security shall be responsible for providing and coordinating this system.

C. The ESC shall provide all local video switches, video servers, video management software, camera licenses, and programming of cameras and network equipment required for a fully functional system.

D. Provide recording of all cameras for a period of 12 months at MPEG4 format. Video storage array shall be a minimum of 120 Terabytes in size under the base bid and an additional 280 Terabytes (400TB total) under Best Value Enhancement 12. Camera recording parameters: minimum 15 frames per second (fps), 4 Common Intermediate Format, & H.264 compression.

E. Cameras are to be recorded at a minimum of 15 frames per second but are subject to change at Owner's discretion. Each camera's fps can be individually adjusted based on location.

F. The video system shall be interfaced with the PLC/TCS system for intercom, systems alarms, duress alarms, and individual camera call up functions.

### 1.2 SYSTEM DESCRIPTION

A. System Capacity: Furnish and install a color IP camera system with the capacity indicated plus 25% spare.

B. Video Management System (VMS): The Video Management System on a central server shall be loaded on a central server

C. Multiplex Video Workstation: Furnish and install color monitors and CPU's to view up to 16 camera views simultaneously or as selected by the operator.

D. Spot Video Workstation: Furnish and install color monitors and CPU's to display a camera activated by alarm, intercom call up, duress alarm, or manual activation.

E. Camera Identification: Uniquely identify each camera by a 16 character, alphanumeric label incorporated into the video signal.

F. IP Camera: Furnish and install all cameras and camera cabling. The IP camera shall provide at least two individually configured simultaneous video streams.

G. Continuous Operation: All cameras, computers, and system components shall be rated for continuous operation.

H. Standards: All cameras and components shall be compliant with ONVIF standard.

I. Fully integrate the IP video system with the Door Locking Control PLC and Intercom systems.

J. Video Storage: ESC shall furnish and install a video storage array sized at 120TB base bid (and 280TB under Best Value Enhancement 12 to provide 400TB) to provide video storage for all of the IP video cameras. Refer to Camera Schedule for minimum frame rate and resolution.

K. Perimeter cameras shall go into an alarm state when a person approaches the perimeter fence within the cameras' field of view. The alarmed camera shall be instantly displayed on the multiplexed monitor at the local workstation. Two camera views on each multiplexed monitor shall be used for displaying site cameras that are in alarm. The operator shall acknowledge the alarm by clicking on the camera view. ESC shall provide the programing and testing of this feature of the camera system.

1.3 SUBMITTALS

A. The submittal of this section is to be provided with other sections defined in 280500 Common Work Results for Electronic Security and Safety. All sections defined in 280500 are to be submitted at the same time and in accordance with the specification. Refer to that specification for additional information.

1.4 SYSTEMS INTEGRATION

A. Alarm Call-up: Cameras covering a duress button shall automatically display live video on the controlling spot monitor whenever the duress button is activated.

B. Intercom Call-up: Cameras covering an intercom station shall automatically display live video on the controlling spot monitor whenever the intercom is selected by the controlling Touchscreen Control Station (TCS).

1.5 WARRANTY

A. The warranty of this section is to be provided with other sections defined in 280500 Common Work Results for Electronic Security and Safety. All sections defined in 280500 are to be submitted at the same time and in accordance with the specification. Refer to that specification for additional information.

1.6 OWNER TRAINING

A. The owner training of this section is to be provided with other sections defined in 280500 Common Work Results for Electronic Security and Safety. All sections defined in 280500 are to be submitted at the same time and in accordance with the specification. Refer to that specification for additional information.

**PART 2 - PRODUCTS**

2.1 ACCEPTABLE IP VIDEO MANUFACTURERS

A. Acceptable hardware manufactures IP Video equipment:
1. Bosch Cameras (No substitute)
2. Genetec (VMS) Video Management System (No Substitute)

2.2 SYSTEM PARAMETERS

A. Manufacturing Standards: All components shall be manufactured to ONVIF standards.

B. All components shall incorporate the following:

1. UL listed for the intended purpose.
2. Vandal resistant housing.

C. Network Features: All components operate over Ethernet switches, Cat 6A cabling and optic fiber. All components shall incorporate the following:

1. Compatible with Internet Protocol Version 4 (IPv4) and Version 6 (IPv6).
2. Support both fixed and dynamically assigned IP addresses.
3. Shall have the ability to limit maximum bandwidth to a selected value.

2.3 IP VIDEO CAMERAS

A. Furnish and install where indicated in the camera schedule interior IP cameras equal to Bosch Flexidome HD model NIN-63013-A3 series with cast aluminum housings and polycarbonate dome and 1280x720 resolution.
1. Vandal resistant construction IK10 impact resistant.

B. Furnish and install where indicated in the camera schedule interior IP cameras equal to Bosch HD model NIN-63023-A3 series with cast aluminum housings and polycarbonate dome and 1920x1080 resolution.

1. Vandal resistant construction IK10 impact resistant.
2. Powered over Ethernet.
3. Pendant mount cameras below duct work and lighting to provide an unobstructed view.

C. Furnish and install a 360 degree camera equal to Bosch Flexidome IP 5000 MP camera.
1. Vandal resistant construction IK10 impact resistant.
2. Powered over Ethernet.

RFI 0091 *Security Camera Quality*

*Samsung 8010V is an acceptable substitution at no additional cost*

D. Furnish and install where indicated in the camera schedule exterior 5 MP cameras for the perimeter equal to Bosch NBN-80052-BA Dinion IP Starlight 8000 MP with 2992x1680 resolution
   1. Vandal resistant construction IK10 impact resistant.
   2. Powered over Ethernet.
   3. Tinted lenses on all exterior camera housings.
   4. Outdoor IP66 rated housing equivalent to UHO PoE Outdoor Camera Housing, UHO-POE-10
   5. Bosch UHO-PoE-10 with LTC 9213/01 pole mount.
   6. Optional 30 images per second frame rate.
   7. Video Analytics that alert staff when a person is within 10' of the perimeter fence. ESC is to provide necessary hardware, software, camera license, and any auxiliary equipment required to provide this function.

E. Exterior units shall be rated IP66 against weather for outdoor mounting.

F. Camera Pole: Furnish and install camera poles providing mounting heights as indicated on the plans and in the camera schedule. Poles shall be manufactured by ABC Control Systems of Buena Park, CA and match those installed at Stanton.

2.4 IP VIDEO MONITOR WORKSTATIONS

A. Workstation Computer: At a minimum, furnish and install a Bosch MHW-WZ4R4-HEUS (or equal) computer with all required hardware and software as indicated on the plans.

B. Workstation and Spot Monitors: Furnish and install a 22 inch monitor equal to the Bosch UML-223-90 where indicated on the plans.

C. Multiplexed Monitors: Furnish and install a 32 inch monitor equal to the Bosch UML-323-90 where indicated on the plans.

D. Furnish and install a computers and monitors for each video workstation and each video review location.
   1. IP.A is Security Booth A120

2.5 IP VIDEO CONTROLS

A. Furnish and install latest version Genetec Video Management Software. Version shall be Security Center 5.4 edition or later. Furnish Omnicast Pro software for broadcasting signal to PDAs. Furnish and install all licenses required for the cameras, PDAs, and workstations indicated.

B. Furnish and install an IP Video Storage Array equal to Bosch/NetApp E2700 dual controller series with a minimum of 2 60 bay expansions. Video storage array shall be a minimum of 120TB base bid (and 280TB to provide 400TB under Best Value Enhancement 12) in size. Record camera video according to the parameters listed in the camera schedule. Video shall be stored for 12 months. In addition, provide the following features:
   1. Provide RAID 6 storage configuration
   2. System shall be scalable. Provide expansion units equal to Bosch high density 60 bay expansion units with 4 TB hard drives.
   3. Provide active storage for all of the cameras installed in the project.

4. Provide space in an additional empty rack for future expansion.
5. The system shall provide "watermarks" to ensure the video has not been modified.

C. Furnish and install local Ethernet switches for the video system in each building's camera rack and the main server rack as required for the final number of cameras to be installed. The Ethernet switch shall be equal to Cisco WS-C2960XR-24PS-1 24 port Gigabit Switch with 370 Watts of Power over Ethernet. PoE shall be available on all ports. Provide 2 1000Base-SX-SFP modules for 4 strands of OM4 fiber back to the Building A core switch in SEC closet A106.

D. Furnish and install an aggregating switch equal to Cisco WS-C3850-24S-24SFP switch in main SEC closet A106. Furnish and install optic fiber SFP ports (for connections to remote edge switches use 2 1000Base-SX-SFP modules, for connection to recording network provide C3850-NM-2-10G with SFP 10G-SR modules). Provide local switches equal to Cisco WS-C3850-24P-S with rear stack wise and power wise redundancy for power cameras in building 4. Furnish and install all power supplies, hardware, and software required for a fully functional system.

RFI 0086 — BLDG A&B - Status Fiber Clarification
Furnish and install single mode backbone b/n BLDG A and B as specified.

E. Furnish and install a video server equal to Bosch model MHW-S380R9-SCUS.

F. Furnish and install a Lantronix UDS1100 Media Converter (or equal) for the ASCII interface between the PLC and IP video network.

2.6 TRANSIENT SURGE SUPPRESSION

A. Acceptable manufacturers are as follows:
1. Northern Technologies Incorporated
2. DITEK
3. PolyPhaser Corporation
4. Transtector

B. Furnish and install surge suppression on all power connections to exterior cameras equal to Northern Technologies TCS-HWR.

C. Furnish and install surge suppression for exterior camera locations using Cat6A equal to DTK-Cat6A series with POE.

2.7 FIBER OPTIC MODULES

**A. Furnish and install dedicated multimode optic fiber between Video Ethernet switches and remote exterior cameras. Fiber shall be equal to Corning FREEDM 002T8F-31180-29. ~~Furnish and install quantity of optic fibers required plus 25% spare.~~ Refer to drawings for fiber required and spares.**

B. Furnish and install a Comnet Ethernet 2 port media converter CNGE2MC or equal for each individual pole mounted camera. The unit shall be located in the security electronics equipment rack (VID). If two channels is necessary use CNGE22MC.

C. Furnish and install a hardened Comnet Ethernet 2 port media with PoE converter CNGE2MCPOEM or equal for each individual pole mounted camera. The unit shall be located in the camera pole power cabinet.

D. Furnish and install a hardened Comnet Ethernet industrial grade PoE switch equal to the CNFE4+1SMSM2POE for pole locations with three cameras.

2.8 CABLING AND WIRE

A. Acceptable manufacturers:
1. Commscope Uniprise Cat 6A cable.
2. Commscope Uniprise Cat 6A cable jumpers.
3. “Wet Rated” shall be equal to CommScope Uniprise 6NF4-i cable.
4. “Non Wet Rated” shall be CommScope Uniprise 65N4+ cable.

B. Wire Size: Furnish and install sufficient wire gauge to limit voltage drop to 5%.

C. Camera Power Wiring: Interior cameras will be Powered over Ethernet (PoE). Furnish and install 120 VAC UPS power for cameras connected by optic fiber. Coordinate the location and installation of 120 VAC UPS power with Division 26.

D. IP Camera Wiring: Furnish and install category 6A cabling from each IP video device to the nearest switch.

E. Category 6A cable for all cameras shall be GREEN in color.

F. All factory patch cords shall be GREEN in color.

2.9 EQUIPMENT ENCLOSURES

A. The IP Video system equipment shall be mounted in seismic rated rack. Furnish and install racks equal to CPI Seismic Frame series Cabinet.

B. Each workstation computer shall be provided with low profile metal cabinet to house the computer. Furnish each CPU with a model CPU-1 or CPU-2 cabinet as manufactured by Computer Security Products. Furnish and install the following as a minimum:
1. Fully vented steel doors.
2. Lockable Enclosure.
3. Welded side panels with handles.
4. Equipment rack noted here is not required if millwork is fabricated with ventilated and lockable storage area for CPU’s.

2.10 FABRICATION

A. Assemble all components in a neat and orderly fashion.

B. Identify camera with text approved by the owner.

2.11 CAMERA POLE

A. Furnish and install a camera pole and base at each pole mounted camera shown on the site plan. The camera signal shall be over optic fiber to the pole enclosure. Furnish and install a ground rod at each camera pole.

B. Top part of anchor bolts shall be galvanized per ASTM A-153 and made of steel rod having a minimum yield strength of 55,000 psi. Submit finish to the architect for approval.

C. Furnish and install a hand hole and Full Base Cover.

D. Furnish and install all hardware required to mount the equipment enclosure and camera as indicated in the plans and details.

E. Assemble all components in a neat and orderly fashion.

2.12 CAMERA POLE POWER CABINET

A. Furnish and install camera pole power cabinet equal to Hoffman A20H16ALP, NEMA 4 rated enclosure (20"H x 16"H x 6"D). Mount PoE Fiber Media Converter, Fiber Media Converter, TVSS (TCS-HWR), fuse terminal with (2) Amp fuse, terminals, receptacle, and ground buss bar. Division 26 shall furnish and install a 120 VAC UPS Power circuit to each camera power cabinet. Owner to furnish padlock to lock the enclosure. Refer to sheet ES100, details 4 and 6 on sheet ES602.

## PART 3 - EXECUTION

3.1 COORDINATION

A. Preliminary Coordination: Coordinate all required embeds and block-outs as required to install the cameras as indicated on the plans.

B. Construction Examination: Monitor ongoing construction and coordinate with other trades so that a clear line of site of the area to be viewed is maintained for each camera.

C. Structural Examination: Examine locations for camera mounts and poles to ensure the supporting structures will carry camera mounts and devices to be installed.

3.2 INSTALLATION

A. Conduit: All conduits are to be concealed.

B. Cable: All connecting cables to cameras shall be concealed in the mount or installed with flexible conduit. Flexible conduit not allowed in inmate housing areas.

C. Anchoring: All mounts shall be anchored to the walls or structures as indicated in the installation manuals.

D. Special Boxes: Furnish and install special back boxes in a timely manner for field installation while adequate access is available.

E. Titles: Program camera identifications and intercom call up titles as approved by the Owner.

F. Field Wiring: The wiring that extends from the electronic control relay terminal strips to the locks, lights, etc. shall be class 1, 2, or 3 as defined by Article 725 of the California Electric Code.

3.3 FIELD QUALITY CONTROL

A. Testing: All cameras shall be tested and viewed from each scheduled monitor after installation is complete.

B. Integration Testing: Check that all integrated events call up the appropriate camera.

C. Test Reports: Furnish written test reports to the engineer prior to final inspection documenting all of the above. See example form below.

**VIDEO SURVEILLANCE VERIFICATION AND CHECK-OUT FORM**

✓ = OK

Job #
Job Name:
Panel #

| FIELD TEST CODE: | | REPAIR CODE: | |
|---|---|---|---|
| A - No status change | M - | 1-SSI | Software Test By:_____ Date_____ |
| B - Won't call up with alarm | N - | 2-ELECTRICIAN | |
| C - Poor vIdeo | O - | 3-IRONWORKER | Hardware Test By:_____ Date_____ |
| D - No video | P - | 4-CARPENTER | |
| E - Out of focus | Q - | 5-OWNER/REP | System Test By:_____ Date_____ |
| F - PTZ does not function | R - | 6-ENG | |
| G - No power to camera | S - | 7 - | Design Engineering By:_____ Date_____ |
| H - Reversed CCTV Camera call- | T - | 8 - | |
| I - Software problem | U - | 9 - | Wiring By:_____ Date_____ |
| J - Monitor failure | V - | 10 - | |
| K - Multiplex/Quad failure | W - | 11 - | Field Test By:_____ Date_____ |
| L - Not installed | X - | 12 - | |

| | | | | | | | ON-SITE | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ICON ID# | ICON TYPE | C/U CAM. NO. | CCTV INTLK. WITH | CELL CCTV VIDEO | SOFT-WARE TEST | HARD-WARE TEST | FIELD TEST CODE | REPAIR CODE | RE-CHECK "X" | FIELD CHECK OUT NOTES | PROBLEM RESOLVED (BY/DATE) |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

D. Program camera identifications and intercom call up titles as approved by the owner.

E. Field test each perimeter test camera by approaching the fence from each direction.

3.4 SOFTWARE

A. Furnish a single Adobe Acrobat PDF file detailing all passwords for each IP Video system.

B. Furnish documents listed in 3.4 A at project completion.

3.5 ADJUSTING AND CLEANING

A. View Adjustment: Use a portable monitor to adjust the cameras for the best possible camera coverage. Final adjustments shall be reviewed and approved by the owner.

**B. Fully coordinate the final location of all cameras to prevent camera views being blocked by light fixtures, HVAC fixtures, and all other obstructions.**

3.6 TRAINING

A. The ESC shall provide, without additional cost to the owner representatives, training in the operation of Video Surveillance systems provided. The representatives shall train the Owner's personnel in operation, repair, and upkeep of the Video Surveillance and custom recording settings. Refer to Specification section 280500 Part 3.6 Training for additional information.

3.7 SPARES

A. Dome Camera: Furnish (2) spare cameras of each type installed on the project.

~~**B. PTZ Camera: Furnish (1) spare camera of each type installed on the project.**~~

C. Corner Mounted Camera: Furnish (1) spare camera of each type installed on the project.

D. Dome Housings: Furnish (2) spare dome bubbles for each type installed on the project.

E. Workstation: Furnish one spare workstation with monitor.

F. Spare parts shall be packaged with appropriate protective packing material.

G. Box spare parts for easy storage and clearly identify the contents of each box on all four sides of each box.

**END OF SECTION 28 23 00**

# SECTION 28 31 00 - FIRE DETECTION AND ALARM SYSTEM

## PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 21 00 00 - Fire Suppression.

1.2 DESCRIPTION:

A. The fire alarm system shall comply with requirements of NFPA Standard 72 with CA ammendments for Protected Premises Signaling Systems except as modified and supplemented by this specification. The system shall be electrically supervised and monitor the integrity of all conductors.

B. The fire alarm system shall be manufactured by an ISO 9001:2008 certified company and meet the requirements of BS EN9001: ANSI/ASQC Q9001-1994.

C. The FACP and peripheral devices shall be manufactured 100% by a single U.S. manufacturer (or division thereof). It's acceptable for peripheral devices to be manufactured outside of the U.S. by a division of the U.S. based parent company.

D. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and the installation shall be in compliance with the UL listing.

E. The installing company shall employ NICET (minimum Level II Fire Alarm Technology) technicians on site to guide the final checkout and to ensure the systems integrity.

1.3 GUARANTY:

A. The fire alarm control panel, voice panels and any head-end equipment shall have a manufacturer's warranty of a minimum of 3 years.

1.4 POST CONTRACT MAINTENANCE:

A. Complete maintenance and repair service for the fire detection system shall be available from a factory trained authorized representative of the manufacturer of the major equipment for a period of five (5) years after expiration of the guaranty.

1.5 APPLICABLE STANDARDS AND SPECIFICATIONS:

A. The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards, if applicable.

B. National Fire Protection Association (NFPA) - USA:

| | |
|---|---|
| No. 12 | Extinguishing Systems (low and high) |
| No. 13 | Sprinkler Systems |
| No. 15 | Water Spray Systems |
| No. 72 | National Fire Alarm Code |
| No. 70 | National Electric Code |
| No. 90A | Air Conditioning Systems |
| No. 101 | Life Safety Code |

C. Underwriters Laboratories Inc. (UL) - USA:

| | |
|---|---|
| No. 268 | Smoke Detectors for Fire Protective Signaling Systems |
| No. 864 | Control Units for Fire Protective Signaling Systems |
| No. 217 | Smoke Detectors, Single and Multiple Station |
| No. 228 | Door Closers - Holders for Fire Protective Signaling Systems |
| No. 268A | Smoke Detectors for Duct Applications |
| No. 521 | Heat Detectors for Fire Protective Signaling Systems |
| No. 464 | Audible Signaling Appliances |
| No. 38 | Manually Actuated Signaling Boxes |
| No. 1481 | Power Supplies for Fire Protective Signaling Systems |
| No. 346 | Waterflow Indicators for Fire Protective Signaling Systems |
| No. 1076 | Control Units for Burglar Alarm Proprietary Protective Signaling Systems |
| No. 1971 | Visual Notification Appliances |
| No. 2017 | Standard for General-Purpose Signaling Devices and Systems |
| No.60950 | Safety of Information Technology Equipment |

D. Local and State Building Codes.

E. All requirements of the Authority Having Jurisdiction (AHJ).

1.6 APPROVALS:

A. The system shall have proper listing and / or approval from the following nationally recognized or regional agencies:

| | |
|---|---|
| UL | Underwriters Laboratories, Inc |
| ULC | Underwriters Laboratories Canada |
| FM | Factory Mutual |
| CSFM | California State Fire Marshal |

B. The system shall be certified for seismic applications in accordance with the International Building Code (IBC).

1.7 SUBMITTALS

A. Fire Alarm Product Data:
   1. Submit technical information consisting of marked-up catalog sheets of each specified device inserted in a 3-ring binder in the same order as the devices appear in these Specifications.
      a. Mark the appropriate specification reference number in the upper right-hand corner of each catalog sheet.
      b. For devices that may not be specified in these Specifications but are required to provide the system functions specified, include those catalog sheets and shop drawings at the end of the submittal binder.
   2. Provide California State Fire Marshal listing numbers for each piece of equipment submitted.
   3. Submit manufacturer's certification that the submitted equipment will meet or exceed the site-specific system network performance requirements.

B. Submit qualifications of individuals responsible for overseeing the installation of the Fire Alarm System.

C. California State Fire Marshal (CSFM) Submittal:
   1. Incorporate all addenda and bulletins issued to Contractor into electronic files.
   2. Submit complete California State Fire Marshal (CSFM) submittal based on Contractor's Contract Drawings (including addenda and bulletins); and the reviewed Fire Alarm Product Data Submittal. Submit the following:
      a. All drawings and diagrams; which must include Contractor's title block, complete with drawing title, Contractor's name and address, date including revisions, and preparer's and reviewer's initials.
      b. All plan and shop drawings shall use the symbols identified in NFPA 170 Standard for Fire Safety and Emergency Symbols.
      c. Reviewed set of Fire Alarm Product Data that includes stamp of Engineer of Record.
      d. Complete system bill of material with peripheral device back box size information, part numbers, and device mounting height information.
      e. Complete equipment fabrication descriptions and dimensions of equipment cabinets. For each building, indicate the equipment cabinet size(s) required to accommodate the specific equipment required to perform the specified functions.
      f. Detailed system operational description, with all specification differences and deviations clearly noted and marked.
      g. Riser diagram that individually depicts all control panels, annunciators, addressable devices and notification appliances. Field addressable devices and notification appliances may be grouped together by specific circuit.
      h. FACP point-to-point wiring diagrams, specific for each building. Show all interconnecting wiring of components within the FACP and the termination of all initiating and signaling circuits.
      i. Complete 1/8" = 1'-0" scale floor plan drawing locating all system devices, and elevation drawing of all equipment at Fire Control Station.
         1) Floor plans must indicate accurate locations for all control and peripheral devices as well as raceway size and routing, junction boxes, and conductor size and quantity in each raceway.
         2) All notification appliances must be provided with a candela rating and circuit address that corresponds to that depicted on Riser Diagram.

3) If individual floors need to be segmented to accommodate 1/8" scale requirements, Key Plans and break lines must be provided on plans in an orderly and professional manner.
4) End-of-line resistors (and values) must be depicted.

j. Control panel wiring and interconnection schematics.
1) Drawings must depict internal component placement and all internal and field termination points.
2) Drawings must provide detail indicating where conduit penetrations must be made to avoid conflicts with internally mounted batteries.
3) For each additional data-gathering panel, provide separate control panel drawing which clearly indicates designation, service and location of control enclosure.

k. Battery calculations: Battery calculations must include the specified spare capacity. Final battery sizes, based on calculations, must be indicated.

l. Complete voltage drop calculations that clearly indicate quantity of devices, device part numbers, supervisory current draw, alarm current draw, voltage drop, and totals for all categories.

m. System (Load and Battery) calculations for each system power supply and control panel, providing power for notification appliance circuits, auxiliary control circuits, and all circuits that draw power from any system power supply.
1) Battery calculations must reflect all control panel components, remote annunciator, and auxiliary relay current draws.

n. Wiring connection diagrams for each device to be installed or connected by Contractor.

3. All drawings must be reviewed and signed by an individual having a minimum NICET 3 certification in fire protection engineering technology, subfield of fire alarm systems.
4. Incorporate Engineer and Owners Representative review comments and submit package to CSFM.
5. Indicate on CSFM approved drawings all comments or revisions which were not indicated on original Contract Drawings.
6. After CSFM approval, transmit two electronic media sets, seven bond copies of shop drawings, each bearing the CSFM stamp of approval, to Owners Representative.
7. System to be installed and inspected utilizing CSFM approved drawings, not original Contract Drawings.

D. Fire Alarm Device Nomenclature Submittal:
1. Submit list of all fire alarm devices by Building name, Building number and device number indicated on approved CSFM drawings to the Engineer and Owners Representative. Include system nomenclature restrictions.

**PART 2 - PRODUCTS**

2.1 MAIN FIRE ALARM CONTROL PANEL OR NETWORK NODE

A. Main FACP or network node shall be a NOTIFIER Model NFS-320 and shall contain a microprocessor based Central Processing Unit (CPU) and power supply in an economical space saving single board design. The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent addressable smoke and thermal (heat) detectors, addressable modules, printer, annunciators, and other system controlled devices.

2.2 SYSTEM CAPACITY AND GENERAL OPERATION

A. The FACP shall be capable of communicating on Noti-Fire-Net over a Local Area Network (LAN) or Wide Area Network (WAN) utilizing a peer-to-peer, inherently regenerative communication format and protocol. The network shall support communication speed up to 100 Mb and support up to 200 panels / nodes per network.

B. Each network node shall provide, or be capable of 318 intelligent / addressable devices per SLC loop.

C. The Notification Appliance Circuits shall be programmable to Synchronize with System Sensor, Gentex and Wheelock Notification Appliances.

D. The system shall include a full featured operator interface control and annunciation panel that shall include a backlit Liquid Crystal Display (LCD), individual color coded system status LEDs, and an alphanumeric keypad with easy touch rubber keys for the field programming and control of the fire and gas detection system.

E. The system shall be programmable, configurable, and expandable in the field without the need for special tools, PROM programmers or PC based programmers. It shall not require replacement of memory ICs to facilitate programming changes.

F. The system shall allow the programming of any input to activate any output or group of outputs. Systems that have limited programming (such as general alarm), have complicated programming (such as a diode matrix), or require a laptop personal computer are not considered suitable substitutes.

G. The FACP shall support up to 20 logic equations, including "and," "or," and "not," or time delay equations to be used for advanced programming. Logic equations shall require the use of a PC with a software utility designed for programming.

H. The FACP or each network node shall provide the following features:
   1. Drift compensation to extend detector accuracy over life. Drift compensation shall also include a smoothing feature, allowing transient noise signals to be filtered out.
   2. Detector sensitivity test, meeting requirements of NFPA 72.
   3. Maintenance alert, with two levels (maintenance alert/maintenance urgent), to warn of excessive smoke detector dirt or dust accumulation.
   4. Up to nine sensitivity levels for alarm, selected by detector. The alarm level range shall be 0.5 to 2.35 percent per foot for photoelectric detectors, 0.5 to 2.5 percent per foot for ionization detectors, 0.5 to 4.0 percent per foot for acclimate detectors and 1.0 to 4.0 percent per foot for multi-criteria (IntelliQuad and IntelliQuad PLUS) detectors . The system shall also support sensitive advanced detection laser detectors with an alarm level range of .02 percent per foot to 2.0 percent per foot. The system shall also include up to nine levels of Pre-alarm, selected by detector, to indicate impending alarms to maintenance personnel.
   5. The ability to display or print system reports.
   6. Alarm verification, with counters and a trouble indication to alert maintenance personnel when a detector enters verification 20 times.

I. PAS presignal, meeting NFPA 72 requirements.

1. Self-optimizing pre-alarm for advanced fire warning, which allows each detector to learn its particular environment and set its prealarm level to just above normal peaks.
2. Cross zoning with the capability of counting: two detectors in alarm, two software zones in alarm, or one smoke detector and one thermal detector.
3. Control-by-time for non-fire operations, with holiday schedules.
4. Day / night automatic adjustment of detector sensitivity.
5. Device blink control for sleeping areas.

J. The FACP shall be capable of coding main panel node notification circuits in March Time (120 PPM), Temporal (NFPA 72 A-2-2.2.2), and California Code. Panel notification circuits (NAC 1,2,3 and 4) shall also support Two-Stage operation, Canadian Dual Stage (3 minutes) and Canadian Dual Stage (5 minutes). Two stage operation shall allow 20 Pulses Per Minute (PPM) on alarm and 120 PPM after 5 minutes or when a second device activates. Canadian Dual stage is the same as Two-Stage except will only switch to second stage by activation of Drill Switch 3 or 5 minute timer. The panel shall also provide a coding option that will synchronize specific strobe lights designed to accept a specific "sync pulse."

K. For flexibility and to ensure program validity, an optional Windows(TM) based program utility shall be available. This program shall be used to off-line program the system with batch upload/download, and have the ability to upgrade the manufacturers (FLASH) system code changes. This program shall also have a verification utility, which scans the program files, identifying possible errors. It shall also have the ability to compare old program files to new ones, identifying differences in the two files to allow complete testing of any system operating changes. This shall be in compliance with the NFPA 72 requirements for testing after system modification.
   1. This utility shall provide the ability to create and print NFPA style Test and Inspection reports
   2. This utility shall provide the ability to create and print Device Maintenance information

L. The 80-character display keypad shall be an easy to use QWERTY type keypad, similar to a PC keyboard. This shall be part of the standard system and have the capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels shall be provided to prevent unauthorized system control or programming.

M. Each FACP or FACP network node shall support one SLC. Each SLC interface shall provide power to and communicate with up to 159 intelligent detectors (ionization, photoelectric, multi-criteria, thermal, laser, fire/CO) and 159 intelligent modules (monitor, control, relay, releasing) for a loop capacity of 318 devices. SLC shall be capable of NFPA 72 Style 4, Style 6, or Style 7 (Class A or B) wiring.

N. CPU shall receive analog information from all intelligent detectors to be processed to determine whether normal, alarm, pre-alarm, or trouble conditions exist for each detector. The software shall automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. The analog information shall also be used for automatic detector testing and for the automatic determination of detector maintenance requirements.

2.3 SERIAL INTERFACES

A. The system shall include two serial EIA-232 interfaces. Each interface shall be a means of

connecting UL Listed Information Technology Equipment (ITE) peripherals.

B. EIA-232 interface shall be used to connect an UL-Listed 40 or 80 column printer. Printers that are not UL-Listed are not considered acceptable substitutes.

C. The system shall include an EIA-485 port for the serial connection of optional annunciators and remote LCD displays.

D. The EIA-485 interface may be used for network connection to a proprietary-receiving unit.

2.4 SPECIFIC SYSTEM OPERATIONS

A. Smoke Detector Sensitivity Adjust: A means shall be provided for adjusting the sensitivity of any or all addressable intelligent detectors in the system from the system keypad. Sensitivity range shall be within the allowed UL window and have a minimum of 9 levels.

B. Alarm Verification: Each of the intelligent addressable smoke detectors in the system may be independently selected and enabled to be an alarm verified detector. The alarm verification delay shall be programmable from 0 to 60 seconds and each detector shall be able to be selected for verification. The FACP shall keep a count of the number of times that each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.

C. Point Disable: Any addressable device may be enabled or disabled through the system keypad.

D. Point Read: The system shall be able to display or print the following point status diagnostic functions:
1. Device status
2. Device type
3. Custom device label
4. View analog detector values
5. Device zone assignments

E. System History Recording and Reporting: The fire alarm control panel shall contain a history buffer that will be capable of storing up to 800 events. Up to 200 events shall be dedicated to alarm and the remaining events are general purpose. Systems that do not have dedicated alarm storage, where events are overridden by non-alarm type events, are not suitable substitutes. Each of these activations will be stored and time and date stamped with the actual time of the activation. The contents of the history buffer may be manually reviewed, one event at a time, or printed in its entirety. The history buffer shall use non-volatile memory. Systems that use volatile memory for history storage are not acceptable substitutes.

F. Automatic Detector Maintenance Alert: The fire alarm control panel shall automatically interrogate each intelligent detector and shall analyze the detector responses over a period of time. If any intelligent detector in the system responds with a reading that is above or below normal limits, then the system will enter the trouble mode, and the particular detector will be annunciated on the system display, and printed on the optional printer. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.

G. Pre-Alarm Function: The system shall provide two levels of pre-alarm warning to give advance notice of a possible fire situation. Both pre-alarm levels shall be fully field adjustable. The first level shall give an audible indication at the panel. The second level shall give an audible indication and may also activate control relays. The system shall also have the ability to activate local detector sounder bases at the pre-alarm level, to assist in avoiding nuisance alarms.

H. Software Zones: The FACP shall support 142 independent programmable software zones.

I. Multiple agent releasing zones: The system shall support up to 10 releasing zones to protect against 10 independent hazards. Releasing zones shall provide up to three cross-zone and four abort options to satisfy any local jurisdiction requirements.

J. The fire alarm control panel shall include a walk test feature. It shall include the ability to test initiating device circuits and notification appliance circuits from the field without returning to the panel to reset the system. Operation shall be as follows:
   1. Alarming an initiating device shall activate programmed outputs, which are selected to participate in walk test, for 3 seconds.
   2. Introducing a trouble into the initiating device shall activate the programmed outputs for 8 seconds.
   3. All devices tested in walk test shall be recorded in the history buffer.

2.5 COMMUNICATORS:

A. The UDACT shall be compact in size, mounting in a standard module position of the fire alarm control cabinet. Optionally, the UDACT shall have the ability for remote mounting, up to 6,000 feet from the fire alarm control panel. The wire connections between the UDACT and the control panel shall be supervised with one pair for power and one pair for multiplexed communication of overall system status. Systems that utilize relay contact closures are not acceptable.

B. The UDACT shall include connections for dual telephone lines (with voltage detect), per UL/NFPA/FCC requirements. It shall include the ability for split reporting of panel events up to three different telephone numbers.

C. The UDACT shall be capable of transmitting events in 4+2, SIA, and Contact ID.

D. Communication shall include vital system status such as:
   1. Independent Zone (Alarm, trouble, non-alarm, supervisory)
   2. Independent Addressable Device Status
   3. AC (Mains) Power Loss
   4. Low Battery and Earth Fault
   5. System Off Normal
   6. 12 and 24 Hour Test Signal
   7. Abnormal Test Signal (per UL requirements)
   8. EIA-485 Communications Failure
   9. Phone Line Failure

E. The UDACT shall support independent zone/point reporting when used in the Contact ID

format. In this format the UDACT shall support transmission of up to 3,064 points. This enables the central station to have exact details concerning the origin of the fire or response emergency.

F. The UDACT shall be capable of being programmed with the same programming utility as the host FACP, and saved, edited and uploaded and downloaded using the utility. UDACT shall be capable of being programmed online or offline. The programming utility shall also support upgrading UDACT operating firmware.

G. The UDACT shall be capable of generating Central Station reports providing detailed programming information for each point along with the central station point address.

H. An IP or IP/GSM Communicator option shall be available to interface to the UDACT and be capable of transmitting signals over the internet/intranet or Cellular (GSM) network to a compatible receiver.

2.6 GATEWAY & WEBSERVER OPTIONS

A. Webserver: The system shall support a webserver allowing remote connection via the Internet or Intranet. Authorized users will have the ability to view panel/network history, event status and device properties. The webserver shall also support sending event information via email or text to up to 50 registered users, the webserver shall be available from the fire alarm control panel manufacturer.

2.7 SYSTEM COMPONENTS & ADDRESSABLE DEVICES

A. General
1. Addressable devices shall use simple to install and maintain decade, decimal address switches. Devices shall be capable of being set to an address in a range of 001 to 159.
2. Addressable devices, which use a binary-coded address setting method, such as a DIP-switch, are not an allowable substitute. Addressable devices that require the address be programmed using a special tool or programming utility are not an allowable substitute.
3. Detectors shall be intelligent (analog) and addressable, and shall connect with two wires to the fire alarm control panel Signaling Line Circuits.
4. Addressable smoke and thermal detectors shall provide dual alarm and power/polling LEDs. Both LEDs shall flash green under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady red illumination by the control panel, indicating that an alarm condition has been detected. If required, the LED flash shall have the ability to be removed from the system program. An output connection shall also be provided in the base to connect an external remote alarm LED.
5. The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. The panel on a time-of-day basis shall automatically adjust sensitivity.
6. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72.
7. The detectors shall be ceiling mount and shall include a separate teist-lock base with tamper proof feature.

8. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.
9. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).
10. Detectors will operate in an analog fashion, where the detector simply measures its designed environment variable and transmits an analog value to the FACP based on real-time measured values. The FACP software, not the detector, shall make the alarm/normal decision, thereby allowing the sensitivity of each detector to be set in the FACP program and allowing the system operator to view the current analog value of each detector.
11. Addressable devices shall store an internal identifying code that the control panel shall use to identify the type of device.
12. A magnetic test switch shall be provided to test detectors and modules. Detectors shall report an indication of an analog value reaching 100% of the alarm threshold.
13. Addressable modules shall mount in a 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box. An optional surface mount Lexan enclosure shall be available.
14. Addressable manual fire alarm boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status; NOTIFIER model # NBG-12LX They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key. The key used to reset the pull station must be the same as the key used to lock and unlock the FACP door(s).
15. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.
16. Manual fire alarm boxes shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches (44 mm) or larger.

B. Intelligent Multi Criteria Acclimating Detector: The intelligent multi-criteria Acclimate® Plus™ detector shall be an addressable device, NOTIFIER model # FAPT-851, that is designed to monitor a minimum of photoelectric and thermal technologies in a single sensing device. The design shall include the ability to adapt to its environment by utilizing a built-in microprocessor to determine its environment and choose the appropriate sensing settings. The detector design shall allow a wide sensitivity window, no less than 1 to 4% per foot obscuration. This detector shall utilize advanced electronics that react to slow smoldering fires and thermal properties all within a single sensing device.
   1. The microprocessor design shall be capable of selecting the appropriate sensitivity levels based on the environment type it is in (office, manufacturing, kitchen etc.) and then have the ability to automatically change the setting as the environment changes (as walls are moved or as the occupancy changes).
   2. The intelligent multi criteria detection device shall include the ability to combine the signal of the thermal sensor with the signal of the photoelectric signal in an effort to react hastily in the event of a fire situation. It shall also include the inherent ability to distinguish between a fire condition and a false alarm condition by examining the characteristics of the thermal and smoke sensing chambers and comparing them to a database of actual fire and deceptive phenomena.

C. Intelligent Thermal Detectors: The intelligent thermal detectors shall be NOTIFIER FST- series addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-

of-rise element rated at 15 degrees F (9.4 degrees C) per minute. A high heat thermal detector rated at 190 degrees Fahrenheit shall also be available. The thermal detectors shall connect via two wires to the fire alarm control panel signaling line circuit.

D. Intelligent Duct Smoke Detector: The smoke detector housing shall accommodate an intelligent photoelectric detector that provides continuous analog monitoring and alarm verification from the panel. When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken to change over air handling systems to help prevent the rapid distribution of toxic smoke and fire gases throughout the areas served by the duct system. The Intelligent Duct Smoke Detector shall support the installation of addressable Photoelectric detector capable or being tested remotely. The Intelligent Duct Detector housing shall be model # DNR(W) and the remote test capable photoelectric smoke detector shall be NOTIFIER model # FSP-851R.

E. Addressable Dry Contact Monitor Module
1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to one of the fire alarm control panel SLCs. The addressable monitor module shall be NOTIFIER model # FMM-1 (Class A or B) or FMM-101 (Class B)
2. The IDC zone shall be suitable for Style D/Class A or Style B/Class B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
3. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4 inch (70 mm) x 1-1/4 inch (31.7 mm) x 1/2 inch (12.7 mm). This version need not include Style D or an LED.
4. For multiple dry contact monitoring a module shall be available that provides 10 Style B or 5 Style D input circuits; NOTIFIER model # XP10-M.

F. Two Wire Detector Monitor Module
1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional 2-wire smoke detectors or alarm initiating devices (any N.O. dry contact device); NOTIFIER model # FZM-1.
2. The IDC zone may be wired for Class A or B (Style D or Style B) operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
3. For multiple 2-wire smoke detector circuit monitoring a module shall be available that provides 6 Style B/Class A or 3 Style D/Class B input circuits; NOTIFIER model # XP6-MA.

G. Addressable Control Module
1. Addressable control modules shall be provided to supervise and control the operation of one conventional circuit of compatible Notification Appliances, 24 VDC powered, polarized audio/visual notification appliances; NOTIFIER model # FCM-1
2. The control module NAC may be wired for Style Z or Style Y (Class A/B) with a current rating of 2 Amps for Style Z and 3 Amps for Style Y;
3. Audio/visual power shall be provided by a separate supervised circuit from the main fire alarm control panel or from a supervised UL listed remote supply.
4. For multiple circuit control a module shall be available that provides 6 Style Y (Class B) or 3 Style Z (Class A) control circuits; NOTIFIER model # XP6-C.

H. Addressable Relay Module:
1. Addressable Relay Modules shall be available for HVAC control and other network building functions; NOTIFIER model # FRM-1.
2. The module shall provide two form C relays rated at up to 3 Amps resistive and up to 2.0 Amps inductive.
3. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary devices energize at the same time on the same pair of wires.
4. For multiple relay control a module shall be available that provides 6 programmable Form-C relays; NOTIFIER model # XP6-R.

I. SpectrAlert Advance Speakers
1. The Speaker appliance shall be System Sensor SpectrAlert Advance or equal. The speaker shall be listed to UL 1480 for Fire Protective Signaling Systems. It shall be a dual-voltage transformer speaker capable of operation at 25.0 or 70.7 nominal Vrms. The speaker shall have a frequency range of 400 to 4,000 Hz and shall have an operating temperature between 32°F and 120°F. It shall mount to a 4 x 4 x 2 1/8-inch back box.
2. A universal mounting plate shall be used for mounting ceiling and wall speaker products. The notification appliance circuit and amplifier wiring shall terminate at the universal mounting plate.
3. Speakers shall be plug-in and shall have the ability to check wiring continuity via a shorting spring on the universal mounting plate. The shorting spring shall also provide tamper resistance via an open circuit if the device is removed. Speaker design shall isolate speaker components to reduce ground fault incidents.
4. The speaker shall have power taps (from ¼ watt to 2 watts) and voltage that are selected by rotary switches. All models shall have a maximum sound output of 86 dB at 10 feet and shall incorporate an open back construction.
5. All notification appliances shall be backward compatible.

J. SpectrAlert Advance Speaker Strobes
1. The Speaker Strobe appliance shall be System Sensor SpectrAlert Advance or equal. The speaker strobe shall be listed to UL 1971 and UL 1480 and be approved for fire protective signaling systems. It shall be a dual-voltage transformer speaker strobe capable of operation at 25.0 or 70.7 nominal Vrms. The speaker shall have a frequency range of 400 to 4,000 Hz and shall have an operating temperature between 32°F and 120°F. It shall mount to a 4 x 4 x 2 1/8-inch back box.
2. A universal mounting plate shall be used for mounting ceiling and wall speaker strobe products. The notification appliance circuit and amplifier wiring shall terminate at the universal mounting plate. Also, SpectrAlert Advance speaker strobes and the Sync•Circuit™ Module MDL3 accessory, if used, shall be powered from a non-coded notification appliance circuit output and shall operate on a nominal 12 or 24 volts (includes fire alarm panels with built in sync). When used with the Sync•Circuit Module MDL3, 12-volt rated notification appliance circuit outputs shall operate between 8.5 and 17.5 volts; 24-volt rated notification appliance circuit outputs shall operate between 16.5 to 33 volts. If the notification appliances are not UL 9th edition listed with the corresponding panel or power supply being used, then refer to the compatibility listing of the panel to determine maximum devices on a circuit.
3. Speaker strobes shall be plug-in and shall have the ability to check wiring continuity via a shorting spring on the universal mounting plate. The shorting spring shall also provide tamper resistance via an open circuit if the device is removed. Speaker strobe design shall

isolate speaker components to reduce ground fault incidents.

4. The speaker strobe shall have power taps (from ¼ watt to 2 watts) and voltage that are selected by rotary switches. All models shall have a maximum sound output of 86 dB at 10 feet and shall incorporate an open back construction. The strobe shall consist of a xenon flash tube with associated lens/reflector system and operate on either 12V or 24V. The strobe shall also feature selectable candela output, providing options for 15 or 15/75 candela when operating on 12V and 15, 15/75, 30, 75, 110, or 115 when operating on 24V. The strobe shall comply with NFPA 72 and the Americans with Disabilities Act requirement for visible signaling appliances, flashing at 1 Hz over the strobe's entire operating voltage range.
5. All notification appliances shall be backward compatible.
6. Strobe lights shall meet the requirements of the ADA, UL Standard 1971and be fully synchronized.

**PART 3 – EXECUTION**

3.1 INSTALLATION:

A. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.

B. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

C. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

D. Manual fire alarm boxes shall be suitable for surface mounting or semi-flush mounting as shown on the plans, and shall be installed not less than 42 inches (1067 mm), nor more than 48 inches (122 mm) above the finished floor.

3.2 TEST:

A. The service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment shall be provided to technically supervise and participate during all of the adjustments and tests for the system. All testing shall be in accordance with NFPA 72.

B. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.

C. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.

D. Verify activation of all waterflow switches.

E. Open initiating device circuits and verify that the trouble signal actuates.

F. Open and short signaling line circuits and verify that the trouble signal actuates.

G. Open and short notification appliance circuits and verify that trouble signal actuates.

H. Ground all circuits and verify response of trouble signals.

I. Check presence and audibility of tone at all alarm notification devices.

J. Check installation, supervision, and operation of all intelligent smoke detectors using the walk test.

K. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.

L. When the system is equipped with optional features, the manufacturer's manual shall be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

3.3 FINAL INSPECTION:

A. At the final inspection, a factory-trained representative of the manufacturer of the major equipment shall demonstrate that the system functions properly in every respect.

3.4 INSTRUCTION:

A. Instruction shall be provided as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.

B. The contractor and/or the systems manufacturer's representatives shall provide a typewritten "Sequence of Operation."

**END OF SECTION 28 31 00**

# SECTION 28 46 00 – TOUCHSCREEN CONTROL STATION

## PART 1 - GENERAL

RFI 0093 Control Matrix Clarification
See RFI 0152 for Control Matrix Clarification

### 1.1 SUMMARY

A. Scope of work: Furnish and install all components for a Touchscreen Control Station (TCS) integrated with security systems as indicated on the plans and described herein. The Touchscreen Control Station shall be the primary operator interface.

B. The ESC as defined in Section 280500 Common Work Results for Electronic Safety and Security shall be responsible for providing and coordinating this system.

### 1.2 SYSTEM DESCRIPTION

A. Touchscreen Control Station (TCS): The Touchscreen Control Station shall be a computer terminal with the appropriate cards and programming incorporated into an integrated unit to serve as an operator interface. The system shall be similar in form and function to the existing system in the Stanton facility. Although such work may not be specifically shown or specified, all supplementary or miscellaneous items appurtenances, and devices incidental to, or necessary for a sound, secure, complete, and compatible installation shall be furnished and installed as part of the work. Any case of error, omission, discrepancy, or lack of clarity shall be promptly identified for clarification prior to the bid due date. Refer to Specification section 284600.1 for the operations controlled by each TCS station.

B. Basic Operation: All areas of the buildings will be graphically represented displaying all monitored and controlled icons as required for proper operation. The graphics for the TCS shall fit the screen size, configuration and icon functions as described below. **The orientation/direction of each map must match the orientation as related to the operator at each TCS station location.**

C. Task Groups: Control and monitoring functions shall be assigned to a TCS through task groups. A task group is a logical association of points assigned to a particular TCS where multiple TCS units are provided in a single control room. Assigning a task group to a particular TCS will prevent that point from being controlled by another TCS.

D. Personal Digital Assistant (PDA): Control and monitoring functions shall be assigned to a PDAs through task groups. PDAs shall be integrated with the ATIMS Jail Management System (JMS). Integration with JMS to include photograph, name, inmate number, housing, alert code, gang affiliation, keep always, and floor status. JMS shall be available on TCS and PDAs. TCS and PDA shall include an onscreen icon at the site and room level that when selected will display inmate information for all inmates on site or within a room. PDAs shall only control the building they are in at the time. Refer to Specification section 284600.1 for the operations controlled by each PDA station.

E. Graphic Plans: The TCS uses graphic representations of various facility areas to describe events as they occur. Each graphic is to be a 1/8” scaled depiction of each area. Graphics are

to be sized for proper operation of control icons and useful building representations. All graphic screens shall be labeled as detailed in this section.

1. Key Plan: A facility key plan will be available on all graphic screens. Selecting an area of the key plan will call up a graphic of the area providing control icons and more detailed building information. Icons as described below will be located on the plan to graphically locate where in the facility the controlled item is installed. The area plans are the second level of graphic zoom.
2. Detail Window: Detail plan windows shall be provided for any section of the graphic plan where there is a high concentration of controls making it impossible to properly indicate all icons. This shall be the third and last level of graphical zoom.

## 1.3 GLOBAL FUNCTION OPERATIONS

A. All electrically controlled hardware and security subsystems devices as indicated herein shall provide status and control by use of symbolic icons and status indicators. All control icons (switch functions) that are used shall be of a size that will facilitate a positive selection point; the minimum size of 0.5 inches square shall be required. All status indicators shall be a minimum of three-sixteenths inch in diameter or a large, square or rectangle symbol may be used at an equal size. All symbols shall provide status by its color and/or associated text, both the control icons and its associated status indicators. Global function icons shall be located on the bottom of each graphic screen. These icons, if active, shall control global functions for the associated graphically displayed area.

B. Log-on: Selecting this icon shall cause a pop-up window to appear. Located within this window there shall be a text prompt requesting the operator to enter their password and user name. The system shall confirm the password and username. If they match the stored list of usernames and passwords, the system site screen shall be displayed and a valid log on event shall be recorded on the event recorder and data log. The operator will then have access to those functions assigned to entered username and password. If the username and password do not match the stored list of usernames and passwords, the system shall display a text window with “Log On Failed” and return to the main log on screen. The failure will be stored as an event on the event recorder and data log.

C. Log-off: Selecting this icon shall cause a pop-up verification window to appear on top of the graphically displayed area. Located within this window there shall be a text prompt requesting the correction officer if they wish to proceed with the Log Off function. Also located within the window shall be two icons. One shall have the text “YES” and one shall have the text “NO”. Selecting the icon with the text “NO” shall cause the verification window to be removed from the screen and the system shall return to normal operation. Selecting the icon with the text “YES” shall cause the verification window to be removed from the screen and shall cause the current operator to be logged out of the TCS. The display shall return to the primary log-on screen awaiting a new operator to log-in on this console.

D. Identifying Graphic Screen labels TCS graphics screens shall have labels for the following critical areas at a minimum:
   1. Cells
   2. Control rooms
   3. Electrical/Security Electronics rooms
   4. Communication rooms (IDF/MDF)

5. Mechanical rooms
6. Admin. areas

E. TCS graphics and labels shall be provided for all devices including:
1. Controlled doors
2. Monitored Doors
3. Intercoms
4. Site gates
5. Cameras
6. Duress stations
7. Loop Detectors

F. TCS system screens shall include the following features:
1. Each identifying label shall have a fixed value that may be used for programming and cannot be changed by the operator.
2. Each identifying label shall have an alternate value provided by the owner. This field shall be up to 10 alphanumeric characters long, cannot be used for programming purposes and can be changed by the owner with the proper password.
3. Provide a toggle on the utilities screen to toggle between the two label sets.
4. The initial alternate labels shall be programmed by the contractor as approved by the owner.
5. The selected label shall be a part of the point identifier when listed on the screen or logged for reporting.
6. The utility screen shall allow the operator to print a list of points with both labels.

1.4 SYSTEM UTILITIES

A. Selecting this icon shall cause the system to switch to the System Management Screen. The functions located on this screen will be based upon the access level that the current operator has obtained. Specialized functions will be disabled and grayed out if the access level is not acceptable. The Systems Management Screen shall consist of, but are not limited to these functions:
1. Configure Users
2. Change Password
3. TCS Calibration
4. Set Date and Time

B. The system utilities operation shall be menu driven with an instructive help-menu.

1.5 SITE PLAN

A. Selecting this icon shall cause the system to display a graphic screen, which displays the entire site plan.

1.6 AREA MAPS

A. Selecting this icon shall cause the system to display a graphic screen, which displays the entire area in which the system is viewing at that time. This is to allow the operator a quick method to access another detail section within that area.

B. Task group assignment shall be accomplished through the area maps. Task group assignment shall be activated by enter the correct password on any central control TCS.

1.7 TCS SCREEN COMPONENTS

A. Active Graphic Screen: The Active Graphic Screen shall display the active part of the building with the appropriate icons and status indicators. This shall be where most of the operator to system interface occurs. Maximize this area for each screen.

B. System Alarm Control: There shall be an area of the Active Graphic Screen that displays the highest priority system alarms. Display a minimum of four events simultaneously. The operator shall be able to scroll through all active alarms. There shall not be any limitation on the number of active alarms that a TCS can display. As each alarm is processed, corrected, or reset, it shall be removed from the System Alarm Line.

C. Intercom Control: Intercom calls shall be displayed on a separate area from alarms. Display a minimum of four calls with the ability to scroll through all active calls. Refer to the intercom section of this specification for additional information. There shall not be any limitation on the number of active intercom calls that a TCS can handle. As each call is processed or reset, it shall be removed from the Intercom Control area.

D. Pop-up Window: A pop-up window is a graphic that is displayed when a particular event occurs. Refer to the description and function for each item for additional information.

E. Icon: An Icon is a graphic that is displayed whenever the appropriate screen is called. Refer to the description and function for each item for additional information.

1.8 LOCKING OPERATIONS

A. Door Position Status Icon (Monitored Only):
1. Description: The Icon shall consist of a door graphic that indicates that the door is secured via a color change. This icon shall be visible whenever the screen is selected.
2. Function: The Door Position Status Icon background shall illuminate red when the door is unsecured and shall be gray when the door is secured. In addition, graphically depict that the door is closed when secured and open when unsecured.
3. Distribution: Provide an icon for each monitored only door on each screen.
4. Alarm: Since these are used for security electronics rooms, pharmacy, and records rooms, the opening of this door shall register an alarm on the TCS alarm line of the active screen.

B. Interlock Group Status:
1. Description: A yellow circle with a yellow line to each door that is part of the interlock group. In the center of the circle shall be a number. The number shall be “0” when not in interlock override. This icon shall be visible whenever the screen is selected.
2. Function: When the interlock override is active, the counter will count down from 10 to 0 seconds. Anytime during this timer period, doors in the interlock group may be unlocked.
3. Distribution: Provide an interlock group status for each set of interlocked doors shown on the screen.

C. Interlock Override Icon:

1. Description: A pop-up verification window with the text prompt, "YOU ARE ABOUT TO OVERRIDE A SECURITY INTERLOCK GROUP, ARE YOU SURE". Also located within this window there shall be two icons, one shall have the text "YES" and one shall have the text "NO". This Icon shall be visible only when an operator attempts to override a security interlock group.
2. Function: A pop-up verification window shall appear whenever a door in an interlock group is unlocked and a second door is selected. Selecting the icon with the text "NO" shall cause the verification window to be removed from the screen and the system shall return to normal operation. Selecting the icon with the text "YES" shall cause the verification window to be removed from the screen and shall cause the indicator within the Interlock Override Function icon to change to count down from 10 to 0. When the override time limit is reached, the system shall return to normal.
3. Distribution: Provide Interlock override icons for each interlock group on the screen.

D. Swing Door Icon:

1. Description: The Swing Door Icon shall consist of a square button with a swing door graphic that indicates that the door is secured by both graphic change and color change. The button shall appear raised and appear to depress when clicked to unlock the door. Unlocking a swing door shall be a **single button** command **except at high security risk doors.** This shall have a **two-step** unlock function. Provide a pop-up verifying that you are about to unlock a high security door.
2. This swing door icon shall be visible whenever the screen containing the swing door is selected.
3. Function: Selecting the icon will depress the button and apply power to unlock the related door. The Swing Door Icon background shall illuminate red when the door is unsecured and shall be gray when the door is secured. In addition, graphically depict that the door is closed when secured and open when unsecured.
4. Distribution: Provide an icon for each controlled swing door on the each screen. Provide a monitoring icon for any controlled doors that are not controlled from the screen.

E. Vehicle Gate Icon:

1. Description: The Vehicle Gate Icon shall consist of three **square** buttons for each gate. The buttons shall be labeled "OPEN' STOP" and "CLOSED" in black text on a gray background and perform the indicated function. The button shall appear raised and appear to depress when clicked to open the gate. There shall be a separate icon that indicates the Vehicle Gate is secured by both graphic change and color change. This icon shall be visible whenever the screen is selected.
2. Function: Selecting the "OPEN" icon will depress the button and apply power to open the gate. Selecting the "STOP" icon will depress the button and remove all power from the gate. Selecting the "CLOSE" icon will depress the button and apply power to close the gate. The Slider Icon background shall illuminate red when the door is unsecured and shall be gray when the door is secured. In addition, graphically depict the slider gate as closed when secured and open when unsecured. Clicking the button a second time shall apply power to the close function of the slider.
3. Distribution: Provide a vehicle gate icon for each controlled vehicle gate on the screen. Provide a monitoring icon for any controlled doors that is not controlled from this screen.

F. Emergency Release:

1. Description: Provide a separate screen for the EMERGENCY RELEASE functions for the facility. Provide an icon for each area with "EMERGENCY RELEASE" in black text on gray background. This icon shall be visible on the TCS only when the screen is selected. When active, the background will change from gray to red and flash.
2. Function: Selecting this icon shall cause a pop-up verification window to appear on top of the graphically displayed area. Located within this window there shall be a text prompt requesting that the operator confirm the request before proceeding with the text "You have requested to unlock ALL doors in this area, ARE YOUR SURE?" Also located within this window there shall be two icons, one shall have the text "RELEASE" and one shall have the text "CANCEL". Selecting the icon with the text "CANCEL" shall cause the verification window to be removed from the screen and the system shall return to normal operation. Selecting the icon with the text "RELEASE" shall cause the verification window to be removed from the screen and shall hold all locks in the area open, other than enclosed control rooms. Control rooms are not to be released upon selection of emergency release. The emergency release button shall flash and an audible and visual indication shall be displayed on the TCS in the area released. If the verification window is not confirmed after 5 seconds, the function shall automatically cancel and the system shall return to normal. To reset the emergency release, select the flashing "Emergency Release" icon and select "CANCEL" on the verification window. The Emergency Release function shall override all group assignments, interlocks, and other programming features that would exclude a door from opening under normal operations. Emergency release is a staggered function in that doors are released in groups of three, not all doors simultaneously. **The emergency release function in a selected smoke zone releases all controlled doors except a control room door within 60 seconds.** If the emergency release is canceled before the staggered cycle completes, the system shall discontinue unlocking doors and shall relock the doors previously unlocked.
3. Distribution: There shall be one emergency release icon for each area at a minimum and for each building.
4. ESC to include in their bid the cost to modify the Emergency Release programing following the final testing, as directed by the owner/engineer.

G. High Security Risk:

1. Description: A pop-up window to appear on top of the graphically displayed area with the text "HIGH SECURITY RISK". Located within this window there shall be a text prompt "You have requested to unlock an EXTERIOR door in this area. ARE YOUR SURE?" Also located within this window there shall be two icons in the, one shall have the text "RELEASE" and the other shall have the text "CANCEL". This Icon shall be visible only when called for under 'Function'.
2. Function: Selecting an unlock icon to unlock an exterior door shall cause a pop-up verification window as described above to appear. Selecting the icon with the text "CANCEL" shall cause the verification window to be removed from the screen and the system shall return to normal operation. Selecting the icon with the text "RELEASE" shall cause the verification window to be removed from the screen and unlock the selected door. If the verification window is not confirmed after 5 seconds, the function shall automatically cancel and the system shall return to normal.
3. Distribution: Refer to Specification section 284600.1 Control Matrix.

H. Door Open Too Long Icon:

1. Description: A pop-up window with black text on a red back ground with a leader line to the appropriate door. Multiple leader lines can identify multiple doors or a separate pop-up can be programmed for each depending on program simplicity. This Icon shall be visible only when called for under 'Function'.
2. Function: The status icon, which will illuminate and flash red with an audible tone to indicate a security door, is opened too long. Selecting the silence icon shall silence the audible tone and illuminate the status icon a steady red. The status icon shall disappear when the security door returns to normal operation.
3. When a circulating door is opened, a timer will start on the PLC. If the door is not secured before the timer expires, then a 'Door Open Too Long' alarm will sound at central control and register on the alarm line.
4. The alarm event will be recorded with Door ID Time and Date.
5. Securing the door will automatically reset the timer. If the alarm has already been activated, then securing the door will clear the alarm and no other operator action is required.
6. Central control can acknowledge the alarm and allow it to continue as allowed by Operations policy and procedures. If the 'Door Open Too Long' alarm is acknowledged and allowed to continue unsecured, then the alarm will resound at central control in 15 minutes.
7. Each circulating door shall have its own unique timer.
8. The 'Door Open Too Long' alarm function will be suspended during Emergency Release since doors are supposed to be held open until Emergency Release is canceled. Once canceled, door open timers will start for all doors not secured.
9. The timer alarm function shall not apply to cell doors.
10. Doors that are provided with a door position switch and only monitored, but not controlled will also be provided with 'Door Open Too Long' timers.
11. All information above will be stored as part of the SQL database.
12. Distribution: Provide a status icon on the computer control station screen to indicate that security doors used for circulation or monitored only are opened and have not been secured within a preset time value ranging from 0 to 999 seconds.
13. Alarm: This condition shall register an alarm on the TCS alarm line of the active screen.

I. Changing the Time Values

1. The TCS will provide a utility screen to enter all timer values for all doors described in the form of a graphic map. The graphic map will be the same map used for door control and annunciation with the timer value displayed at each door.
2. Only the Administration access level password can change the timer values.
3. Operator level users cannot change the timer values.
4. The timer value will range from 0 to 999 seconds.
5. The utility screen will keep a running average of the length of time each door remains open to aid in door timer management.
6. The utility screen will provide a 'Copy to All' function to copy a timer setting to all timers currently displayed on the screen.

J. Door Keyed "Alarm"

1. Exterior and circulating doors are not to be keyed open. There shall be an alarm generated in central control when a circulating door is opened by any means other than a command from the PLC.

2. Provide a status icon on the computer control station to indicate security doors used for circulation or monitored doors that have been opened by a door key. Selecting the silence icon shall silence the audible tone and illuminate the status icon a steady red. The status icon shall disappear when the security door returns to normal operation.

1.9 PDA OPERATIONS

A. Furnish and install all components to provide hand held PDA control of the new buildings similar in form and function to the existing PDA system in the nearby Stanton facility. Although such work may not be specifically shown or specified, all supplementary or miscellaneous items appurtenances, and devices incidental to, or necessary for a sound, secure, complete, and compatible installation shall be furnished and installed as part of the work. Any case of error, omission, discrepancy, or lack of clarity shall be promptly identified for clarification prior to the bid due date. The PDA shall at a minimum have the features described as follows.

B. Startup: There shall be two icons on the startup screen. One icon launches the door control application. The other icon is for the ATIMS jail management system application provided by others.

C. Log-on: Selecting the door control application shall launch the log-on screen. User names and passwords shall be the same as for the TCS station. Log-on shall be similar in form and function to the Touchscreen Log-on described in Section 1.3.

D. JMS System: There shall be an icon that launches the JMS application from the PDA. The PDAs must also be able to launch the the JMS from a controlled browser. The PDAs must meet Federal Information Processing Standard (FIPS) requirements. The system shall incorporate mobile device security software such as Mobile Iron.

E. TCS Stations shall have the ability to shut down Wireless Access Points by zone. Wireless Access Points shall not be controlled from PDAs. TCS shall be able to disable/enable all PDAs. The PDAs shall be able to disable their own device, but not other PDAs.

F. Main Screen: The main screen is divided into three parts.
   1. Building Menu on top
   2. The Door Menu in the middle
   3. The Controls Menu on the bottom.

G. Building Menu contains icons for Building A, Building B, the Jail Management System, and a duress icon to disable the PDA. The icons should be light gray unless activated. The Building icon that is available in the current table location shall appear in a darker color.
   1. Selecting the Building A icon populates the Door menu with the doors in building A.
   2. Selecting the Building B icon populates the Door menu with the doors in building B.
   3. Selecting the JMS icon closes the application and sends the user to the JMS application.

4. Selecting the Duress icon causes a confirmation screen to appear. If the closes the PDA application and disables the PDA until it is reset from the local TCS station.

H. Door Menu contains icons for the doors in the building.
1. Doors appear Red if unsecure.
2. Doors appear Grey if secure.
3. A Blue bar will appear across the icon if an intercom call is coming/waiting from the associated intercom.
4. A Green bar will appear if the PDA is connected to the associated intercom.
5. The Door Icon will appear yellow if opening the door would violate an interlock condition.

I. Control Menu contains icons that allow the user to control an icon from the Door menu once it is selected. The various controls are as follows:
1. "Open" for opening a selected door.
2. "Open/stop/close" for any gates that are controlled.
3. "Call" for connecting to the selected intercom.
4. "Push to Talk" for talking while connected with an intercom station. The push to talk button must be held down while talking.
5. "Clear" to disconnect an intercom or Dorr icon.
6. "Water" to turn off/on water.
7. "Lights" to turn off/on lights.
8. "Power" to turn on/off power.
9. "Group" to group a series of doors for a group release.
10. "Lock Down" will leave all of the doors locked so that an access card will not be able to open a door.

## 1.10 INTERCOM OPERATIONS

A. Intercom Control Queue: There shall be a group of control icons used to select, answer and reset audio communications between an intercom and the TCS. This group shall be as follows:
1. Description: Provide a call list or Queue that identifies as a minimum the last four calls with the call time for each. Provide controls to scroll up of down through the Queue. Provide a "CONNECT" icon, a "GO TO NEXT" icon and a "DISCONNECT" icon as a minimum.
2. Function: Queue shall be sized to display a minimum of four active calls. There shall be no limit to the number of calls allowed in the system on a TCS.
3. Distribution: Provide an intercom Queue on each TCS.

B. Intercom Station Call:
1. Description: Provide a speaker symbol on a button.
2. TCS operator Function: Selecting an intercom station icon shall open a talk path between the operator's TCS and the associated intercom station. The intercom icon shall illuminate yellow. There shall be no audible tone at the field intercom station allowing the TCS operator to covertly listen to the station. The TCS operator can activate the press-to-talk switch on the microphone to speak to the station. Selecting the intercom station icon a second time shall close the talk path and the status icon shall extinguish.

3. Station call-in Function: Pressing the field call station button shall annunciate at the controlling TCS by flashing the associated field intercom icon in alternating colors with an audible voice annunciation stating "Intercom call." Selecting an intercom station icon shall open a talk path between the operator and the associated intercom station. The associated status icon shall illuminate yellow. Selecting an intercom station icon a second time shall close the talk path and the status icon shall extinguish.
4. Distribution: Provide an icon for each intercom station.

C. Officer Station to Control Room Communications: Same as intercom station to TCS operation described above.

D. Rollover: Once an intercom call button has been pressed, the PLC will start a timer. If after 10 minutes an intercom has not been answered by the local station assigned the intercom task group, Central Control will be alerted that the intercom has been unanswered.

E. Call Button:
1. Description: Provide a round icon for each call button. Icon shall be gray under normal operation. When call button is pressed the icon shall turn YELLOW in color and remain yellow until the reset button has been activated as to clear the call.
2. All call buttons shall be logged on the ERC system.
3. Distribution: Provide round icon on TCS station.

## 1.11 AUXILIARY OPERATIONS

A. General Alarm Condition: There shall be a status icon, which will illuminate and flash red with an audible tone to indicate a device initiated alarm condition. Selecting the silence icon shall silence the audible tone and illuminate the status icon a steady red. The status icon shall disappear when the device returns to normal operation. The following conditions are able to initiate general alarm conditions.
1. Emergency Power Status
2. Staff Duress Status
3. Controller Fault

B. Synchronized Digital Clock System: Provide a digital clock on all TCS's. The digital clock shall be a minimum of 0.5 inches high by 1.25 inches long. The digital clock shall have the capability of displaying both twenty-four (24) hour (military time) and twelve hour formats. Mode and time settings will be through the system utilities function. Accuracy of the synchronized digital clock system shall be within +/- one (1) minute within a thirty (30) day period.

C. Staff Duress System: Activation of a duress station will cause:
1. Annunciation on the central control TCS.
2. A red icon to appear and an audible tone will sound.
3. If there is a local TCS, the TCS will be shut down.
4. Central control will have to reactivate the local TCS once the station has been reset.
5. Each activation will be logged on the central control event recording system (ERC).
6. Camera associated shall automatically call up.
7. Provide a duress icon on each local TCS. This should be located at the top right hand side of the screen. This will function the same as a duress station mounted on the wall.

D. Enable/Disable Function:
1. Provide an icon on the Central Control TCS to enable/disable any local TCS. This should be located in each control room or location of the TCS on the map. This will log on the ERC each time this function is activated.

E. Door Alarm Shunt Icon:
1. Description: Provide a gray button with “Door Alarm Shunt” in black text. The button shall appear to be raised.
2. Function: Clicking on the "Door Alarm Shunt" shall cause the button to momentarily depress and silence the audible "Door Open to Long" or "Door Keyed Open" alarm. The visual indicator shall remain.
3. Distribution: Provide one Door Alarm shunt for each door on an Administrator password protected screen.

F. Fixed Camera Call-Up:
1. Description: Provide a black outline of a camera on a gray button. When activated, the background shall change to blue. The camera should graphically match the orientation of fixed cameras.
2. Function: Clicking on the camera icon shall, change the background to blue, and display the camera video on the spot monitor associated with the TCS displaying the camera.
3. Distribution: Provide a Fixed Camera Icon for each camera controlled from the TCS.

G. Water Control:
1. Description: Provide a black outline of a faucet on a gray button that appears raised. When activated, the background shall change to blue.
2. Function: Clicking on the faucet icon shall depress the button and change the background to blue and turn on the holding cell water. Clicking it a second time will cause it to return to grey and turn off the water.
3. Distribution: Provide one water icon for the one water valve of each holding cell.
4. ESC to provide cable, and wiring to control electrical valve. Coordinate with all trades to control water as indicated on the drawings.

H. Duress Silence Icon:
1. Description: Provide a gray button with “SILENCE” in black text. The button shall appear to be raised.
2. Function: Clicking on the silence icon shall cause the button to momentarily depress and silence the audible tone. The visual indicator shall remain. Alarms from duress stations cannot be silenced until they are reset at the device.
3. Distribution: Provide one silence icon on each screen.

I. Reset Switch:
1. Description: Provide a gray button with “RESET” in black text. The button shall appear to be raised. .
2. Function: Clicking on the reset icon shall cause the button to momentarily depress. Silenced alarms shall be cleared from the system. Duress station alarms cannot be reset until they are reset at the station alarming device.
3. Distribution: Provide one reset icon on each screen.

J. System Utilities
1. Selecting this icon shall cause the system to switch to the System Management Screen.
2. Provide controls to set the time and date.

K. UPS System Alarms:
1. UPS alarm shall be a pop-up window generated in central control TCS, display in the alarm queue and will have an audible tone to indicate a device initiated alarm condition (refer to Specification Section 280500.1). Provide the UPS initiated alarm conditions as listed below:
   a. UPS Active or 120 VAC Power Failure
   b. Low Battery.
   c. Low Voltage.
   d. Inverter Power.
   e. Trouble.
2. Selecting the silence icon shall silence the audible tone. The status shall disappear when the device returns to normal operation.
3. This will log on the ERC each time this function is activated.

L. PLC Network Communication Alarms:
1. PLC network alarm shall be a pop-up window generated in central control TCS, display in the alarm queue and will have an audible tone to indicate a device initiated alarm condition (refer to Specification Section 284619, 2.1, C). Provide the PLC network initiated alarm conditions as listed below:
   a. Communication Failure.
   b. Communication Power Failure.
2. Selecting the silence icon shall silence the audible tone. The status shall disappear when the device returns to normal operation.
3. This will log on the ERC each time this function is activated.

M. TVSS Alarms:
1. TVSS alarm shall be a pop-up window generated in central control TCS, display in the alarm queue and will have an audible tone to initiate a device initiated alarm condition (refer to Specification Section 284619, 2.5). Provide the TVSS initiated alarm conditions as listed below:
   a. 120 VAC TVSS (Failure).
   b. 208 VAC TVSS (Failure).
2. Selecting the silence icon shall silence the audible tone. The status shall disappear when the device return to normal operation.
3. This will log on the ERC each time this function is activated.

N. Priority levels:
1. The system shall provide 25 levels of alarm priorities. Alarms and events shall be displayed by priority.
2. All alarm points shall be logged to the Alarm Log with the following minimum information:
   a. Time and date of alarm activation
   b. Alarm point name (Owner configured)
   c. Time and date of acknowledgment
   d. Time and date of reset

e. Operator handling alarm

O. Motion Detectors:
1. Description: Provide a round gray button with “MD” in black text. The button shall appear to be raised. When motion is detected, the icon shall change colors to red and an audio alarm shall sound. The camera associated with the alarm shall call up on the stations spot monitor.
2. Function: Clicking on the MD icon shall cause the button to momentarily depress and silence the audible tone. The visual indicator shall remain. Selecting the icon again shall reset the device.
3. Distribution: Provide one motion detection icon for each device.
4. Motion detectors shall have a scheduler feature that allows each device to be active only during certain hours. The schedule shall only be accessible by administrative level users. Users shall have the ability to schedule the devices individually or all at once. Scheduler shall have a 24 hour clock with each day of the week represented. The schedule shall carry over the previous week to week unless changed by the user.
5. The motion detector shall not register alarms during a time when it is scheduled to be inactive.

## 1.12 TASK GROUP

A. Definition: A task group is a logical grouping of points that can be assigned to multiple TCS stations. Refer to Specification Section 284600.1 Control Matrix for Task Groups.

## 1.13 IP VIDEO OPERATION

A. All cameras shall be displayed on the Central Control TCS stations only. These shall be by room location and camera number.

B. Activating the associated icon will call up the appropriate camera on the spot monitor for viewing by the operator.

C. Camera monitoring intercom stations shall automatically display on the spot monitor when the intercom station is selected at the related TCS.

D. Owner to provide camera titling prior to final programming of the camera and monitor system.

## 1.14 VOICE ANNOUNCE

A. The TCS shall provide a voice announcement of the following events. The announcement is by event type not by point as follows:
1. Intercom calls to the TCS shall be preceded by a voice announcement "Intercom Call.”
2. Duress Stations shall be preceded by a voice announcement "Duress.”
3. Call button shall be preceded by a voice announcement “ Incoming Call.”
4. Emergency release caution windows shall be annunciated by "Warning! You are attempting to open all the doors in the area. Escape is possible. Please confirm.”
5. Interlock override caution windows shall be annunciated by "Warning! You are attempting to override a security sally port. Escape is possible. Please confirm.”

1.15 SUBMITTALS

A. Provide basic submittals as required by Section 280500 Common Work Results for Electronic Safety and Security and by the General Contract requirements.

B. In addition, submit color prints of all graphic screens for approval.

C. Also submit a list of all reportable alarm points.

D. Submit a flow chart or site map showing the relationship of all proposed screens.

1.16 SYSTEMS INTEGRATION

A. Integrated Systems:
1. IP Video System.
2. Door locking control system.
3. Intercom system.
4. The PLC system.
5. UPS system.
6. Card Access systems

B. Event Priority Level: The operator shall always have control and can manually activate any icon displayed at any time. The following priority applies only to the automatic call up of events for the system and the "Select" icon described above under Interactive Alarm/Audio Handling and Operation. Events shall be given the following priority:
1. Staff Duress Alarms
2. Perimeter system alarms
3. Intercom Calls
4. Door alarms,
5. Communication failure alarms
6. Transient Voltage Surge Suppression Troubles

1.17 TCS CONTROL AND MONITORING SYSTEM:

A. Provide and program all necessary TCS selection zones and required graphic lay-out displays on the different monitors to control specified devices as follows:
1. The system shall be capable of changing to a called screen within one second.
2. The system must generate a command from the TCS to the remote PLC within 500 milliseconds of receiving the selection on the screen.
3. The TCS shall be updated with point status from the PLC every 500 milliseconds.
4. Failure of a TCS shall not disturb PLC communications with other control consoles.
5. The TCS system shall have a means to prevent image burn-in on the CRT when the system control panel has been inactive for more than 2 minutes. Any movement of the trackball should return to the last active screen.
6. Access to the TCS system shall be password protected and all operators shall log into the system. The system shall allow for a minimum of 16 different access levels. Users can log in from a keyboard or directly on the screen.
7. Data Logging: All alarms and critical actions are recorded to the hard drive.
   a. Critical actions initiated at any station are reported to the data logging system. Such reports shall consist of a time and date tag, activity description, station tag and the

operator logged on to the system. Special alarms and conditions shall be reported in a similar manner. Critical actions are defined as follows:

1) Duress alarm activation.
2) Transient Voltage Suppressor failure on protected 120 VAC security circuits.
3) Emergency Release activation.
4) Refer to specification section 284600.2 for other actions to be logged.

b. The data logging system shall maintain and store files from which reports may be generated. The Data Logger shall purge old files after a preset time.

c. The log files will be stored on the hard drive and kept for a predetermined amount of time. The owner shall have the option to archive data files to CDs.

## PART 2 - PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

A. Acceptable Manufacturers

1. Basis of Design: Status Automation, Abbotsford, BC; 604-859-1892
2. Accurate Controls, Ripon, WI; 920-748-6603.
3. CML Security, Erie, CO: 720-466-3650
4. Com-Tec, Inc., Greenville, WI; 920-749-2840.
5. Cornerstone Security Electronics, Decatur. AL; 256-560-4207
6. Metroplex Control Systems, San Antonio TX; 210-495-5245.
7. Sierra Detention Systems, Brighton, CO 303-278-6879

### 2.2 EQUIPMENT

A. Furnish and install a complete, locking and control system with annunciation and control of all security subsystems utilizing touchscreen graphic controls with integrated Programmable Logic Controls. Provide all labor, equipment, materials, software, and supervision to install, calibrate, adjust, document and test the total system.

B. The locking control system shall control all electrically controlled hardware, motorized gates and other security subsystem devices. The system shall monitor and annunciate the status condition of all electrically equipped hardware, doors, gates and security subsystem control conditions, security conditions, call-in signals and other functions as described herein. The system shall interface with other security subsystems for control and annunciation as indicated.

### 2.3 SYSTEM CONFIGURATION:

A. The Interactive TCS Station consists of a Touchscreen monitor and a computer, which shall be connected to the Programmable Logic Controller (PLC) via a local area network. The PLC shall communicate with the TCS Station on an independent, closed network.

1. Touchscreen Control Station Consoles (TCS): The TCS shall serve as the graphic based operator interface between the corrections officer and the facility's locking controls system and the security subsystems as specified herein.
2. Programmable Logic Control System (PLC): The PLC shall provide all necessary logic transactions required to implement the functions and features of the locking control

system and the security subsystem as specified herein. The PLC shall be distributive in nature and a standard product of one manufacture.

2.4 SYSTEM PERFORMANCE GUIDELINES:

A. The interaction time lag between selecting the control icon, i.e., key icon, at any given TCS and the controlled point activation, (i.e., the lock), shall be no greater than one second (1 sec).

B. The interaction time lag between a controlled point activating and any given TCS's response either by activation of an audible alarm and/or the associated icon changing state (color) shall be no greater than one second (1 sec).

C. The interaction time lag between recalling any floor plan at any given TCS shall be no greater than one second (1 sec).

2.5 MINIMUM HARDWARE REQUIREMENTS:

RFI 0090 — *Security Touchscreen Monitor Clarification* — *Elo 2200L Touchscreen is an acceptable equal.* 1

A. Each TCS shall consist of the following:
1. An IBM™ compatible computer with an Intel™ Xeon class E5 microprocessor chip set or equivalent. The operating speed shall be a minimum of 3.5 GHz, 16GB DDR4 SDRAM and a minimum of 8MB of Cache shall be provided.
2. The latest Operating System version from Microsoft. The Operating System shall be compatible with all software and approved during the submittal process.
3. One primary 500GB SATA 3.0Gb/s Hard Drive.
4. All necessary boards for integration to local area network, PLC's, sound system, etc., shall be provided.
5. Minimum 16X DVD-ROM Read/Write CD/DVD drive.
6. Gigabyte Network Interface Card.
7. TCS stations shall have an ELO "32" model 3243L Touchmonitor or equal. Unit shall provide the following features:
    a. 100 Watts or less power consumption.
    b. Operating temperature range of 41 to 95 degrees Fahrenheit.
    c. Provide custom adjustable tilt mount. Refer to Architecturals. 1

B. Each TCS shall be provided with an optical mouse. Features shall be as follows:
1. Two customizable buttons.
2. IBM PC compatible.
3. USB or PS/2 port connection.
4. Scroll wheel.

C. Each TCS shall be provided with desk paging microphone equal to Astatic model 878HL with the following features as a minimum:
1. Frequency response of 40 to 20,000 Hz.
2. Omnidirectional microphone.
3. Push to talk momentary switch.
4. Drivers and interface boards required for control of intercom system.

D. Each TCS shall be provided with multimedia speakers equal to Sony model SRS-A212 with the following features as a minimum:

1. Response bandwidth of 90-20000 Hz.
2. 3.6 Watt RMS power output.
3. Power on/off and volume controls.
4. Active amplification.
5. Hardware as required for intercom audio and TCS voice audibles.

E. The combination of the microphone in 2.5 C and the speakers in 2.5 D above, shall provide the intercom M.I.S. as defined in section 275123.

F. Each TCS shall be provided with a Workrite Ergonomics Fixed mount CPU holder equivalent to their Fixed Mount 920 CPU Holder. Mount these to the underside of the ergonomic desk in Security Booth A120.

2.6 PDA REQUIREMENTS

A. Furnish and install a PDA device equivalent to the Samsung Galaxy Tablet A. The Tablet A will be the base of the PDA design. Each PDA shall consist of the following:

1. The operating system shall be the latest version of the Andriod Lollipop.

2. The tablet should have a wireless protocol of 802.11 a/b/g/n.

3. The tablet should have a battery life of at least 7 hours.

4. The tablet should be no bigger than 9".

5. The internal memory should be at least 1.5GB of RAM and 16 GB of ROM.

2.7 FIBER OPTIC MODULES

A. Furnish and install all fiber optic modules required for proper system operation.

B. Modules to be located in a common module rack located next to the fiber optic distribution panel in each security electronics room.

2.8 MINIMUM SOFTWARE BASE REQUIREMENTS

A. The software will be an *Off-the-Shel*f package available through a distributor network. The *Off-the-Shelf* software will be programmed and tailored to the specified functions and features described herein and shown on the drawings. **Approved manufacturer of software is GE Cimplicity or InduSoft.** All I/O server software packages shall standard in nature and be from one of the two approved software manufacturers listed below. If an I/O package (i.e. KepWare, TopServer…..) is used other than from the approved list, it shall be sent to the engineer for approval prior to being used to develop any programming. **Custom or Proprietary software code will not be approved.** The software will convey an accurate floor plan of all areas, which require display on the monitor. The software will utilize the maximum resolution and colors of the monitor to enhance and simplify the displayed control and status information. Fast orientation and ergonomics will be the goal of all graphic displays.

B. The software will provide log-on security password protection for all TCS's. There shall be a minimum of sixteen (16) levels of access, expandable. The software will provide a database for users. This database shall support a minimum of two hundred fifty six (256) users, expandable.

C. The software shall provide on-line utilities, accessed through the System Utilities function icon. These utilities shall provide the operator with the ability to edit and update required databases, system operating variables, report configuration and generation, alarm tags and point descriptions, etc. These utilities shall be protected by security levels and password requirements.

D. The software will automatically align and adjust the monitor display during the boot-up sequence of the TCS without interaction of the correction officer.

E. All software licenses shall be transferred to the Owner at completion of the project. This shall include, but not be limited to all original installation disks, software manuals, equipment manuals, etc., all project specific application software shall be transferred at the end of warranty period. The use of removable software licenses is prohibited.

F. The software license utilized shall be loaded directly onto each station. The use of a removable or "hard key" style license is not acceptable.

G. All application programming interfaces (APIS), Middleware, device drivers, dynamic-link libraries (DLL, GNU, etc. files), firmware, executable files, and all other software used as a part of the software/firmware/hardware framework shall be open source and non-proprietary. The contractor is to provide in the submittal a software architectural model detailing the HMI-PLC-DEVICE software architecture.

H. Once installed the owner shall be able to modify the GUI software for any system application changes, modifications, updates, troubleshooting, and/or repairs.

2.9 SPARE PARTS

A. Furnish one spare computer and monitor to match what is provided for a typical TCS station.

## PART 3 - EXECUTION

1.1 INSTALLATION

A. Coordination With Other Trades: The contractor shall coordinate the work of this section with that of other Divisions as required to ensure that the entire work of this project will be carried out in an orderly, complete and coordinated fashion.

B. Millwork: Completely coordinate cable and raceway access with millwork provider at each TCS location.

C. Field Wiring: The wiring that extends from the electronic control relay screw terminal strips to the locks, lights, etc. shall be class 1, 2, or 3 as defined by Article 725 of the California Electric Code. All conductors shall be 14 gauge or larger THHN or THWN, 600 volt rated,

and shall be installed in raceways and equipment enclosures with other conductors, within limitations defined by Article 725 of the California Electric Code.

1. Installation: Dress wires and cables to provide a neat and orderly appearance within all enclosures, equipment racks, cabinets, and consoles by routing in snap-cover, plastic wiring duct. In locations where wiring duct is not feasible, organize by cable clamping, dressing and tie-wrapping.
2. Strain Relief: Relieve strain on all loose wire bundles using tie-wrap, supports fastened with machine screws or bolts. Do not use self-adhesive type supports.
3. Shrink Tubing: Neatly form cable ends and apply shrinkable tubing to shielded cables or where necessary to secure the insulation against fraying or raveling.
4. Edge Protection: Install edge protection materials on edges, holes, lips of ducts, or any other place where wires or cables cross sharp metallic edges.
5. Service Loops: Allow sufficient service loops where conductors leave cabinet or transition to door mounted electronics.
6. Splicing: Field wiring shall not be spliced. All wiring shall be continuous from the field device to the termination in the control panel.
7. Future Wiring: All wiring not utilized in the current configuration shall be terminated at both ends and labeled for “Future” use.

D. Ground System: Connection to grounds for Transient Voltage Surge Suppressors shall be 1 ohms or less. All grounds shall be installed as required by the CEC.

E. Ground Wire: Furnish and install a ground wire sized as required by the CEC in all conduits containing conductors carrying voltages above 30 volts rms.

F. Listing: All wiring and raceways shall be listed for the intended installation and installed in strict accordance with the California Electric Code as required by the conditions of where it is stalled. This includes but is not limited to ratings for risers, plenum, or wet installations.

1.2 PROGRAMMING

A. Library: The TCS programming shall utilize a library of reusable, programmed modules. Programming a function will consist of submitting a point list to the appropriate program module and acting on the results.

B. Testing: All programming will be completely tested and debugged in the factory before being sent to the site for installation. Each response for each point shall be tested by an actual device or by software manipulation.

C. Personnel: All programmers developing software for the TCS systems shall be experienced programmers completely trained in the operation of the computers involved. The software shall be tested by competent programmers other than the developers.

1.3 FABRICATION

A. All cables between PLC and TCS shall be provided with quick disconnect connectors for ease of trouble-shooting and service.

B. All field wiring shall be landed on appropriately labeled terminal strips.

C. All wiring shall be cabled or neatly bundled and secured to the housing with wire ties and internal wire ducts.

1.4 TRAINING

A. The ESC shall provide without additional cost to the owner representatives specially trained in the operation of the Touchscreen systems provided. The representatives shall train the Owner's personnel in operation, repair, and upkeep of the PLC and custom relay cabinets.

B. The ESC shall be responsible for notifying the architect five (5) weeks prior to substantial completion of the total security system that training is scheduled. The ESC will coordinate the number to be trained with the owner's representative. The Touchscreen training will be provided in conjunction with the PLC training as these systems are integrated with each other.

C. The length of training shall be at least four hours long and be presented to all shifts.

D. Course Structure
   1. The ESC shall prepare and present to the Architect a detailed course outline that specifies each major training module to be covered. The training program on the security equipment shall include the sequences and instructions for proper use and maintenance of all hardware, locking devices, control and monitoring systems and panels. The material content shall be in simple layman's terminology, describe and demonstrate all step-by-step physical operations necessary for proper operation and necessary equipment adjustments. At the time of training, each trainer shall present to the trainees detailed outlines of each training module to be covered and the specific skills and knowledge which the trainee is expected to master within each training module.
   2. At a minimum the training program shall be subdivided into the following training modules:
      a. Troubleshooting, General Maintenance, Equipment Adjustments, Repair and Replacement of Security System Components.
      b. Operator Controls.
      c. Descriptive modules organized by specification section.
      d. Review of panel as built plans and submittals.
      e. Review of Operation and Maintenance Manuals.
      f. Review of all contact telephone numbers.
      g. Review of all warranties.

E. The ESC shall record each training module. The recording does not have to include individual student practice. The ESC in preparing the recording shall structure it for easy reference by the facility's training officer for future use. Furnish to the owner DVD's or tape as required by the owner.

F. Training Certification
   1. Each facility employee shall receive at the conclusion of the security systems training program a certificate certifying his attendance of the total session or portion thereof.
   2. ESC shall maintain attendance records of each class.

G. In addition to the training requirements listed above the ESC shall include all associated cost to provide additional onsite owner training following substantial completion. The additional training shall occur at the three (3) months periods and shall cover topics as referenced in paragraph "D" above. Coordinate this additional training with the owner.

1.5 FIELD QUALITY CONTROL

A. All functions specified shall be individually activated and the result documented.

B. All functions shall be demonstrated for the Owner and Consultant's representative.

**TCS VERIFICATION AND CHECK-OUT FORM**

✓ = OK

**Job #**
**Job Name:**
**Panel #**

| **FIELD TEST CODE:** | | **REPAIR CODE:** | |
|---|---|---|---|
| A - No status change | M - Poor audio | 1-SSI | Software Test By:_____ Date_____ |
| B - Won't show secure | N - No audio | 2-ELECTRICIAN | |
| C - No power to door | O - Out of focus | 3-IRONWORKER | Hardware Test By:_____ Date_____ |
| D - Door won't open | P - No picture | 4-CARPENTER | |
| E - Door won't close | Q - Call button sticks | 5-OWNER/REP | System Test By:_____ Date_____ |
| F - Door needs alignment | R - Reversed | 6 -ENG | |
| G - Wrong door opens | S - Software problem | 7 - | Design Engineering By:_____ Date_____ |
| H - Adjust DPS | T - Not installed | 8 - | |
| I - Adjust roller bolt | U - | 9 - | Wiring By:_____ Date_____ |
| J - File strike plate | V - | 10 - | |
| K - Adjust lock | W - | 11 - | Field Test By:_____ Date_____ |
| L - No latch back | X - | 12 - | |

| | | | | | | | ON-SITE | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ICON ID#** | **ICON TYPE** | **C/U CAM. NO.** | **DOOR INTLK WITH** | **CELL GRP. REL.** | **SOFT-WARE TEST** | **HARD-WARE TEST** | **FIELD TEST CODE** | **REPAIR CODE** | **RE-CHECK "X"** | **FIELD CHECK OUT NOTES** | **PROBLEM RESOLVED (BY/DATE)** |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

1.6 SOFTWARE

A. For each TCS, furnish to the owner uniquely identified:
1. One (1) copy of the programming and source code of the application software on a CD or DVD. This copy shall have all programmer comments, variable names, and mnemonics included.
2. Complete and accurate set of programming work sheets filled out with the final configuration for each system.
3. One (1) back-up CD or DVD with programmer's notes and source code. Each disk will be labeled with the project name, programs, programmer, and revision date.

B. Furnish a single Adobe Acrobat PDF file detailing all passwords for each TCS. This file shall also identify the following by system and panel:
1. The file name of each program required for restoration of each failed TCS.
2. The passwords required for each TCS as well as required programs.
3. The name of the programmers for each custom program.
4. The date of the last program change.

C. Furnish documents listed in 3.4 A-B at project completion. Furnish a new set with all revisions after the completion of changes during the Warranty. This shall include any changes that occur during the 3 month post occupancy walkthrough period as specified in 280500, 1.8-C.

**END OF SECTION 28 46 00**

# SECTION 28 46 00 – TOUCHSCREEN CONTROL STATION

RFI 0093 Control Matrix Clarification
See RFI 0152 for Control Matrix Clarification

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Scope of work: Furnish and install all components for a Touchscreen Control Station (TCS) integrated with security systems as indicated on the plans and described herein. The Touchscreen Control Station shall be the primary operator interface.

B. The ESC as defined in Section 280500 Common Work Results for Electronic Safety and Security shall be responsible for providing and coordinating this system.

### 1.2 SYSTEM DESCRIPTION

A. Touchscreen Control Station (TCS): The Touchscreen Control Station shall be a computer terminal with the appropriate cards and programming incorporated into an integrated unit to serve as an operator interface. The system shall be similar in form and function to the existing system in the Stanton facility. Although such work may not be specifically shown or specified, all supplementary or miscellaneous items appurtenances, and devices incidental to, or necessary for a sound, secure, complete, and compatible installation shall be furnished and installed as part of the work. Any case of error, omission, discrepancy, or lack of clarity shall be promptly identified for clarification prior to the bid due date. Refer to Specification section 284600.1 for the operations controlled by each TCS station.

B. Basic Operation: All areas of the buildings will be graphically represented displaying all monitored and controlled icons as required for proper operation. The graphics for the TCS shall fit the screen size, configuration and icon functions as described below. **The orientation/direction of each map must match the orientation as related to the operator at each TCS station location.** 1

C. Task Groups: Control and monitoring functions shall be assigned to a TCS through task groups. A task group is a logical association of points assigned to a particular TCS where multiple TCS units are provided in a single control room. Assigning a task group to a particular TCS will prevent that point from being controlled by another TCS.

D. Personal Digital Assistant (PDA): Control and monitoring functions shall be assigned to a PDAs through task groups. PDAs shall be integrated with the ATIMS Jail Management System (JMS). Integration with JMS to include photograph, name, inmate number, housing, alert code, gang affiliation, keep always, and floor status. JMS shall be available on TCS and PDAs. TCS and PDA shall include an onscreen icon at the site and room level that when selected will display inmate information for all inmates on site or within a room. PDAs shall only control the building they are in at the time. **PDAs shall be interchangeable between the 2 different buildings so that an officer may use any of the 10 tablets in either building.** Refer to Specification section 284600.1 for the operations controlled by each PDA station.

E. Graphic Plans: The TCS uses graphic representations of various facility areas to describe events as they occur. Each graphic is to be a 1/8” scaled depiction of each area. Graphics are



RFI 0256 LVSE Peer Review Clarifications 1
Task Groups no longer apply.

to be sized for proper operation of control icons and useful building representations. All graphic screens shall be labeled as detailed in this section.

1. Key Plan: A facility key plan will be available on all graphic screens. Selecting an area of the key plan will call up a graphic of the area providing control icons and more detailed building information. Icons as described below will be located on the plan to graphically locate where in the facility the controlled item is installed. The area plans are the second level of graphic zoom.
2. Detail Window: Detail plan windows shall be provided for any section of the graphic plan where there is a high concentration of controls making it impossible to properly indicate all icons. This shall be the third and last level of graphical zoom.

## 1.3 GLOBAL FUNCTION OPERATIONS

A. All electrically controlled hardware and security subsystems devices as indicated herein shall provide status and control by use of symbolic icons and status indicators. All control icons (switch functions) that are used shall be of a size that will facilitate a positive selection point; the minimum size of 0.5 inches square shall be required. All status indicators shall be a minimum of three-sixteenths inch in diameter or a large, square or rectangle symbol may be used at an equal size. All symbols shall provide status by its color and/or associated text, both the control icons and its associated status indicators. Global function icons shall be located on the bottom of each graphic screen. These icons, if active, shall control global functions for the associated graphically displayed area.

B. Log-on: Selecting this icon shall cause a pop-up window to appear. Located within this window there shall be a text prompt requesting the operator to enter their password and user name. The system shall confirm the password and username. If they match the stored list of usernames and passwords, the system site screen shall be displayed and a valid log on event shall be recorded on the event recorder and data log. The operator will then have access to those functions assigned to entered username and password. If the username and password do not match the stored list of usernames and passwords, the system shall display a text window with “Log On Failed” and return to the main log on screen. The failure will be stored as an event on the event recorder and data log.

C. Log-off: Selecting this icon shall cause a pop-up verification window to appear on top of the graphically displayed area. Located within this window there shall be a text prompt requesting the correction officer if they wish to proceed with the Log Off function. Also located within the window shall be two icons. One shall have the text “YES” and one shall have the text “NO”. Selecting the icon with the text “NO” shall cause the verification window to be removed from the screen and the system shall return to normal operation. Selecting the icon with the text “YES” shall cause the verification window to be removed from the screen and shall cause the current operator to be logged out of the TCS. The display shall return to the primary log-on screen awaiting a new operator to log-in on this console.

D. Identifying Graphic Screen labels TCS graphics screens shall have labels for the following critical areas at a minimum:
   1. Cells
   2. Control rooms
   3. Electrical/Security Electronics rooms
   4. Communication rooms (IDF/MDF)
   5. Mechanical rooms
   6. Admin. areas

E. TCS graphics and labels shall be provided for all devices including:
   1. Controlled doors
   2. Monitored Doors
   3. Intercoms
   4. Site gates
   5. Cameras
   6. Duress stations
   7. Loop Detectors

F. TCS system screens shall include the following features:
   1. Each identifying label shall have a fixed value that may be used for programming and cannot be changed by the operator.
   2. Each identifying label shall have an alternate value provided by the owner. This field shall be up to 10 alphanumeric characters long, cannot be used for programming purposes and can be changed by the owner with the proper password.
   3. Provide a toggle on the utilities screen to toggle between the two label sets.
   4. The initial alternate labels shall be programmed by the contractor as approved by the owner.
   5. The selected label shall be a part of the point identifier when listed on the screen or logged for reporting.
   6. The utility screen shall allow the operator to print a list of points with both labels.
   7. Provide the ability to “Lock Down” to lock out the Card Access system the same way provided on the PDAs.

1.4 SYSTEM UTILITIES

A. Selecting this icon shall cause the system to switch to the System Management Screen. The functions located on this screen will be based upon the access level that the current operator has obtained. Specialized functions will be disabled and grayed out if the access level is not acceptable. The Systems Management Screen shall consist of, but are not limited to these functions:
   1. Configure Users
   2. Change Password
   3. TCS Calibration
   4. Set Date and Time

B. The system utilities operation shall be menu driven with an instructive help-menu.

1.5 SITE PLAN

A. Selecting this icon shall cause the system to display a graphic screen, which displays the entire site plan.

1.6 AREA MAPS

A. Selecting this icon shall cause the system to display a graphic screen, which displays the entire area in which the system is viewing at that time. This is to allow the operator a quick method to access another detail section within that area.

B. Task group assignment shall be accomplished through the area maps. Task group assignment shall be activated by enter the correct password on any central control TCS.

1.7 TCS SCREEN COMPONENTS

A. Active Graphic Screen: The Active Graphic Screen shall display the active part of the building with the appropriate icons and status indicators. This shall be where most of the operator to system interface occurs. Maximize this area for each screen.

B. System Alarm Control: There shall be an area of the Active Graphic Screen that displays the highest priority system alarms. Display a minimum of four events simultaneously. The operator shall be able to scroll through all active alarms. There shall not be any limitation on the number of active alarms that a TCS can display. As each alarm is processed, corrected, or reset, it shall be removed from the System Alarm Line.

C. Intercom Control: Intercom calls shall be displayed on a separate area from alarms. Display a minimum of four calls with the ability to scroll through all active calls. Refer to the intercom section of this specification for additional information. There shall not be any limitation on the number of active intercom calls that a TCS can handle. As each call is processed or reset, it shall be removed from the Intercom Control area.

D. Pop-up Window: A pop-up window is a graphic that is displayed when a particular event occurs. Refer to the description and function for each item for additional information.

E. Icon: An Icon is a graphic that is displayed whenever the appropriate screen is called. Refer to the description and function for each item for additional information.

1.8 LOCKING OPERATIONS

A. Door Position Status Icon (Monitored Only):
1. Description: The Icon shall consist of a door graphic that indicates that the door is secured via a color change. This icon shall be visible whenever the screen is selected.
2. Function: The Door Position Status Icon background shall illuminate red when the door is unsecured and shall be gray when the door is secured. In addition, graphically depict that the door is closed when secured and open when unsecured.
3. Distribution: Provide an icon for each monitored only door on each screen.
4. Alarm: Since these are used for security electronics rooms, pharmacy, and records rooms, the opening of this door shall register an alarm on the TCS alarm line of the active screen.

B. Interlock Group Status:
1. Description: A yellow circle with a yellow line to each door that is part of the interlock group. In the center of the circle shall be a number. The number shall be “0” when not in interlock override. This icon shall be visible whenever the screen is selected.
2. Function: When the interlock override is active, the counter will count down from 10 to 0 seconds. Anytime during this timer period, doors in the interlock group may be unlocked.
3. Distribution: Provide an interlock group status for each set of interlocked doors shown on the screen.

C. Interlock Override Icon:
1. Description: A pop-up verification window with the text prompt, “YOU ARE ABOUT TO OVERRIDE A SECURITY INTERLOCK GROUP, ARE YOU SURE”. Also located within this window there shall be two icons, one shall have the text “YES”

and one shall have the text "NO". This Icon shall be visible only when an operator attempts to override a security interlock group.

2. Function: A pop-up verification window shall appear whenever a door in an interlock group is unlocked and a second door is selected. Selecting the icon with the text "NO" shall cause the verification window to be removed from the screen and the system shall return to normal operation. Selecting the icon with the text "YES" shall cause the verification window to be removed from the screen and shall cause the indicator within the Interlock Override Function icon to change to count down from 10 to 0. When the override time limit is reached, the system shall return to normal.
3. Distribution: Provide Interlock override icons for each interlock group on the screen.

D. Swing Door Icon:
1. Description: The Swing Door Icon shall consist of a square button with a swing door graphic that indicates that the door is secured by both graphic change and color change. The button shall appear raised and appear to depress when clicked to unlock the door. Unlocking a swing door shall be a **single button** command **except at high security risk doors.** This shall have a **two-step** unlock function. Provide a pop-up verifying that you are about to unlock a high security door.
2. This swing door icon shall be visible whenever the screen containing the swing door is selected.
3. Function: Selecting the icon will depress the button and apply power to unlock the related door. The Swing Door Icon background shall illuminate red when the door is unsecured and shall be gray when the door is secured. In addition, graphically depict that the door is closed when secured and open when unsecured.
4. Distribution: Provide an icon for each controlled swing door on the each screen. Provide a monitoring icon for any controlled doors that are not controlled from the screen. Doors can be monitored from multiple screens, but should only be controlled from one screen and one computer station if multiple stations are used.

E. Vehicle Gate Icon:
1. Description: The Vehicle Gate Icon shall consist of three **square** buttons for each gate. The buttons shall be labeled "OPEN' STOP" and "CLOSED" in black text on a gray background and perform the indicated function. The button shall appear raised and appear to depress when clicked to open the gate. There shall be a separate icon that indicates the Vehicle Gate is secured by both graphic change and color change. This icon shall be visible whenever the screen is selected.
2. Function: Selecting the "OPEN" icon will depress the button and apply power to open the gate. Selecting the "STOP" icon will depress the button and remove all power from the gate. Selecting the "CLOSE" icon will depress the button and apply power to close the gate. The Slider Icon background shall illuminate red when the door is unsecured and shall be gray when the door is secured. In addition, graphically depict the slider gate as closed when secured and open when unsecured. Clicking the button a second time shall apply power to the close function of the slider.
3. Distribution: Provide a vehicle gate icon for each controlled vehicle gate on the screen. Provide a monitoring icon for any controlled doors that is not controlled from this screen.

F. Emergency Release:
1. Description: Provide a separate screen for the EMERGENCY RELEASE functions for the facility. Provide an icon for each area with "EMERGENCY RELEASE" in black

text on gray background. This icon shall be visible on the TCS only when the screen is selected. When active, the background will change from gray to red and flash.

2. Function: Selecting this icon shall cause a pop-up verification window to appear on top of the graphically displayed area. Located within this window there shall be a text prompt requesting that the operator confirm the request before proceeding with the text "You have requested to unlock ALL doors in this area, ARE YOUR SURE?" Also located within this window there shall be two icons, one shall have the text "RELEASE" and one shall have the text "CANCEL". Selecting the icon with the text "CANCEL" shall cause the verification window to be removed from the screen and the system shall return to normal operation. Selecting the icon with the text "RELEASE" shall cause the verification window to be removed from the screen and shall hold all locks in the area open, other than enclosed control rooms. Control rooms are not to be released upon selection of emergency release. The emergency release button shall flash and an audible and visual indication shall be displayed on the TCS in the area released. If the verification window is not confirmed after 5 seconds, the function shall automatically cancel and the system shall return to normal. To reset the emergency release, select the flashing "Emergency Release" icon and select "CANCEL" on the verification window. The Emergency Release function shall override all group assignments, interlocks, and other programming features that would exclude a door from opening under normal operations. Emergency release is a staggered function in that doors are released in groups of three, not all doors simultaneously. **The emergency release function in a selected smoke zone releases all controlled doors except a control room door within 60 seconds.** If the emergency release is canceled before the staggered cycle completes, the system shall discontinue unlocking doors and shall relock the doors previously unlocked.
3. Distribution: There shall be one emergency release icon for each area at a minimum and for each building.
4. ESC to include in their bid the cost to modify the Emergency Release programing following the final testing, as directed by the owner/engineer.

G. High Security Risk:
1. Description: A pop-up window to appear on top of the graphically displayed area with the text "HIGH SECURITY RISK". Located within this window there shall be a text prompt "You have requested to unlock an EXTERIOR door in this area. ARE YOUR SURE?" Also located within this window there shall be two icons in the, one shall have the text "RELEASE" and the other shall have the text "CANCEL". This Icon shall be visible only when called for under 'Function'.
2. Function: Selecting an unlock icon to unlock an exterior door shall cause a pop-up verification window as described above to appear. Selecting the icon with the text "CANCEL" shall cause the verification window to be removed from the screen and the system shall return to normal operation. Selecting the icon with the text "RELEASE" shall cause the verification window to be removed from the screen and unlock the selected door. If the verification window is not confirmed after 5 seconds, the function shall automatically cancel and the system shall return to normal.
3. Distribution: Refer to Specification section 284600.1 Control Matrix.

H. Door Open Too Long Icon:
1. Description: A pop-up window with black text on a red back ground with a leader line to the appropriate door. Multiple leader lines can identify multiple doors or a separate

pop-up can be programmed for each depending on program simplicity. This Icon shall be visible only when called for under 'Function'.

2. Function: The status icon, which will illuminate and flash red with an audible tone to indicate a security door, is opened too long. Selecting the silence icon shall silence the audible tone and illuminate the status icon a steady red. The status icon shall disappear when the security door returns to normal operation.
3. When a circulating door is opened, a timer will start on the PLC. If the door is not secured before the timer expires, then a 'Door Open Too Long' alarm will sound at central control and register on the alarm line.
4. The alarm event will be recorded with Door ID Time and Date.
5. Securing the door will automatically reset the timer. If the alarm has already been activated, then securing the door will clear the alarm and no other operator action is required.
6. Central control can acknowledge the alarm and allow it to continue as allowed by Operations policy and procedures. If the 'Door Open Too Long' alarm is acknowledged and allowed to continue unsecured, then the alarm will resound at central control in 15 minutes.
7. Each circulating door shall have its own unique timer.
8. The 'Door Open Too Long' alarm function will be suspended during Emergency Release since doors are supposed to be held open until Emergency Release is canceled. Once canceled, door open timers will start for all doors not secured.
9. The timer alarm function shall not apply to cell doors.
10. Doors that are provided with a door position switch and only monitored, but not controlled will also be provided with 'Door Open Too Long' timers.
11. All information above will be stored as part of the SQL database.
12. Distribution: Provide a status icon on the computer control station screen to indicate that security doors used for circulation or monitored only are opened and have not been secured within a preset time value ranging from 0 to 999 seconds.
13. Alarm: This condition shall register an alarm on the TCS alarm line of the active screen.
14. Set all Door Open Too Long/Prop values to 60 seconds unless stated otherwise.

I. Changing the Time Values

1. The TCS will provide a utility screen to enter all timer values for all doors described in the form of a graphic map. The graphic map will be the same map used for door control and annunciation with the timer value displayed at each door.
2. Only the Administration access level password can change the timer values.
3. Operator level users cannot change the timer values.
4. The timer value will range from 0 to 999 seconds.
5. The utility screen will keep a running average of the length of time each door remains open to aid in door timer management.
6. The utility screen will provide a 'Copy to All' function to copy a timer setting to all timers currently displayed on the screen.

J. Door Keyed "Alarm"

1. Exterior and circulating doors are not to be keyed open. There shall be an alarm generated in central control when a circulating door is opened by any means other than a command from the PLC.

2. Provide a status icon on the computer control station to indicate security doors used for circulation or monitored doors that have been opened by a door key. Selecting the silence icon shall silence the audible tone and illuminate the status icon a steady red. The status icon shall disappear when the security door returns to normal operation.

1.9 PDA OPERATIONS

A. Furnish and install all components to provide hand held PDA control of the new buildings similar in form and function to the existing PDA system in the nearby Stanton facility. Although such work may not be specifically shown or specified, all supplementary or miscellaneous items appurtenances, and devices incidental to, or necessary for a sound, secure, complete, and compatible installation shall be furnished and installed as part of the work. Any case of error, omission, discrepancy, or lack of clarity shall be promptly identified for clarification prior to the bid due date. The PDA shall at a minimum have the features described as follows.

B. Startup: There shall be two icons on the startup screen. One icon launches the door control application. The other icon is for the ATIMS jail management system application provided by others.

C. Log-on: Selecting the door control application shall launch the log-on screen. User names and passwords shall be the same as for the TCS station. Log-on shall be similar in form and function to the Touchscreen Log-on described in Section 1.3.

D. JMS System: There shall be an icon that launches the JMS application from the PDA. The PDAs must also be able to launch the the JMS from a controlled browser. The PDAs must meet Federal Information Processing Standard (FIPS) requirements. The system shall incorporate mobile device security software such as Mobile Iron.

E. TCS Stations shall have the ability to shut down Wireless Access Points by zone. Wireless Access Points shall not be controlled from PDAs. TCS shall be able to disable/enable all PDAs. The PDAs shall be able to disable their own device, but not other PDAs.

F. Main Screen: The main screen is divided into three parts.
   1. Building Menu on top
   2. The Door Menu in the middle
   3. The Controls Menu on the bottom.

G. Building Menu contains icons for Building A, Building B, the Jail Management System, and a duress icon to disable the PDA. The icons should be light gray unless activated. The Building icon that is available in the current table location shall appear in a darker color.
   1. Selecting the Building A icon populates the Door menu with the doors in building A.
   2. Selecting the Building B icon populates the Door menu with the doors in building B.
   3. Selecting the JMS icon closes the application and sends the user to the JMS application.
   4. Selecting the Duress icon causes a confirmation screen to appear. If the closes the PDA application and disables the PDA until it is reset from the local TCS station.

H. Door Menu contains icons for the doors in the building.
   1. Doors appear Red if unsecure.
   2. Doors appear Grey if secure.

3. A Blue bar will appear across the icon if an intercom call is coming/waiting from the associated intercom.
4. A Green bar will appear if the PDA is connected to the associated intercom.
5. The Door Icon will appear yellow if opening the door would violate an interlock condition.

I. Control Menu contains icons that allow the user to control an icon from the Door menu once it is selected. The various controls are as follows:
1. "Open" for opening a selected door.
2. "Open/stop/close" for any gates that are controlled.
3. "Call" for connecting to the selected intercom.
4. "Push to Talk" for talking while connected with an intercom station. The push to talk button must be held down while talking.
5. "Clear" to disconnect an intercom or Dorr icon.
6. "Water" to turn off/on water.
7. ~~"Lights" to turn off/on lights.~~
8. ~~"Power" to turn on/off power.~~
9. "Group" to group a series of doors for a group release.
10. "Lock Down" will leave all of the doors locked so that an access card will not be able to open a door.

## 1.10 INTERCOM OPERATIONS

A. Intercom Control Queue: There shall be a group of control icons used to select, answer and reset audio communications between an intercom and the TCS. This group shall be as follows:
1. Description: Provide a call list or Queue that identifies as a minimum the last four calls with the call time for each. Provide controls to scroll up of down through the Queue. Provide a "CONNECT" icon, a "GO TO NEXT" icon and a "DISCONNECT" icon as a minimum.
2. Function: Queue shall be sized to display a minimum of four active calls. There shall be no limit to the number of calls allowed in the system on a TCS.
3. Distribution: Provide an intercom Queue on each TCS.

B. Intercom Station Call:
1. Description: Provide a speaker symbol on a button.
2. TCS operator Function: Selecting an intercom station icon shall open a talk path between the operator's TCS and the associated intercom station. The intercom icon shall illuminate yellow. There shall be no audible tone at the field intercom station allowing the TCS operator to covertly listen to the station. The TCS operator can activate the press-to-talk switch on the microphone to speak to the station. Selecting the intercom station icon a second time shall close the talk path and the status icon shall extinguish.
3. Station call-in Function: Pressing the field call station button shall annunciate at the controlling TCS by flashing the associated field intercom icon in alternating colors with an audible voice annunciation stating "Intercom call." Selecting an intercom station icon shall open a talk path between the operator and the associated intercom station. The associated status icon shall illuminate yellow. Selecting an intercom station icon a second time shall close the talk path and the status icon shall extinguish.
4. Distribution: Provide an icon for each intercom station.

~~C. Officer Station to Control Room Communications: Same as intercom station to TCS operation described above.~~

~~D. Rollover: Once an intercom call button has been pressed, the PLC will start a timer. If after 10 minutes an intercom has not been answered by the local station assigned the intercom task group, Central Control will be alerted that the intercom has been unanswered.~~

E. Call Button:
1. Description: Provide a round icon for each call button. Icon shall be gray under normal operation. When call button is pressed the icon shall turn YELLOW in color and remain yellow until the reset button has been activated as to clear the call.
2. All call buttons shall be logged on the ERC system.
3. Distribution: Provide round icon on TCS station.

1.11 AUXILIARY OPERATIONS

A. General Alarm Condition: There shall be a status icon, which will illuminate and flash red with an audible tone to indicate a device initiated alarm condition. Selecting the silence icon shall silence the audible tone and illuminate the status icon a steady red. The status icon shall disappear when the device returns to normal operation. The following conditions are able to initiate general alarm conditions.
1. Emergency Power Status
2. Staff Duress Status
3. Controller Fault

B. Synchronized Digital Clock System: Provide a digital clock on all TCS's. The digital clock shall be a minimum of 0.5 inches high by 1.25 inches long. The digital clock shall have the capability of displaying both twenty-four (24) hour (military time) and twelve hour formats. Mode and time settings will be through the system utilities function. Accuracy of the synchronized digital clock system shall be within +/- one (1) minute within a thirty (30) day period.

C. Staff Duress System: Activation of a duress station will cause:
1. Annunciation on the central control TCS.
2. A red icon to appear and an audible tone will sound.
3. If there is a local TCS, the TCS will be shut down.
4. Central control will have to reactivate the local TCS once the station has been reset.
5. Each activation will be logged on the central control event recording system (ERC).
6. Camera associated shall automatically call up.
7. Provide a duress icon on each local TCS. This should be located at the top right hand side of the screen. This will function the same as a duress station mounted on the wall.

~~D. Enable/Disable Function:~~
~~1. Provide an icon on the Central Control TCS to enable/disable any local TCS. This should be located in each control room or location of the TCS on the map. This will log on the ERC each time this function is activated.~~

E. Door Alarm Shunt Icon:
1. Description: Provide a gray button with "Door Alarm Shunt" in black text. The button shall appear to be raised.

2. Function: Clicking on the "Door Alarm Shunt" shall cause the button to momentarily depress and silence the audible "Door Open to Long" or "Door Keyed Open" alarm. The visual indicator shall remain.
3. Distribution: Provide one Door Alarm shunt for each door on an Administrator password protected screen.

F. Fixed Camera Call-Up:
1. Description: Provide a black outline of a camera on a gray button. When activated, the background shall change to blue. The camera should graphically match the orientation of fixed cameras.
2. Function: Clicking on the camera icon shall, change the background to blue, and display the camera video on the spot monitor associated with the TCS displaying the camera.
3. Distribution: Provide a Fixed Camera Icon for each camera controlled from the TCS.

G. Water Control:
1. Description: Provide a black outline of a faucet on a gray button that appears raised. When activated, the background shall change to blue.
2. Function: Clicking on the faucet icon shall depress the button and change the background to blue and turn on the holding cell water. Clicking it a second time will cause it to return to grey and turn off the water.
3. Distribution: Provide one water icon for the one water valve of each holding cell.
4. ESC to provide cable, and wiring to control electrical valve. Coordinate with all trades to control water as indicated on the drawings.

H. Duress Silence Icon:
1. Description: Provide a gray button with “SILENCE” in black text. The button shall appear to be raised.
2. Function: Clicking on the silence icon shall cause the button to momentarily depress and silence the audible tone. The visual indicator shall remain. Alarms from duress stations cannot be reset until they are reset at the device.
3. Distribution: Provide one silence icon on each screen.

I. Reset Switch:
1. Description: Provide a gray button with “RESET” in black text. The button shall appear to be raised. .
2. Function: Clicking on the reset icon shall cause the button to momentarily depress. Silenced alarms shall be cleared from the system. Duress station alarms cannot be reset until they are reset at the station alarming device.
3. Distribution: Provide one reset icon on each screen.

J. System Utilities
1. Selecting this icon shall cause the system to switch to the System Management Screen.
2. Provide controls to set the time and date.

K. UPS System Alarms:
1. UPS alarm shall be a pop-up window generated in central control TCS, display in the alarm queue and will have an audible tone to indicate a device initiated alarm condition (refer to Specification Section 280500.1). Provide the UPS initiated alarm conditions as listed below:
   a. UPS Active or 120 VAC Power Failure

b. Low Battery.
c. Low Voltage.
d. Inverter Power.
e. Trouble.

2. Selecting the silence icon shall silence the audible tone. The status shall disappear when the device returns to normal operation.
3. This will log on the ERC each time this function is activated.

L. PLC Network Communication Alarms:
1. PLC network alarm shall be a pop-up window generated in central control TCS, display in the alarm queue and will have an audible tone to indicate a device initiated alarm condition. Provide the PLC network initiated alarm conditions as listed below:
   a. Communication Failure.
   b. Communication Power Failure.
2. Selecting the silence icon shall silence the audible tone. The status shall disappear when the device returns to normal operation.
3. This will log on the ERC each time this function is activated.

M. TVSS Alarms:
1. TVSS alarm shall be a pop-up window generated in central control TCS, display in the alarm queue and will have an audible tone to initiate a device initiated alarm condition. Provide the TVSS initiated alarm conditions as listed below:
   a. 120 VAC TVSS (Failure).
   b. 208 VAC TVSS (Failure).
2. Selecting the silence icon shall silence the audible tone. The status shall disappear when the device return to normal operation.
3. This will log on the ERC each time this function is activated.

N. Priority levels:
1. The system shall provide 25 levels of alarm priorities. Alarms and events shall be displayed by priority.
2. All alarm points shall be logged to the Alarm Log with the following minimum information:
   a. Time and date of alarm activation
   b. Alarm point name (Owner configured)
   c. Time and date of acknowledgment
   d. Time and date of reset
   e. Operator handling alarm

O. Motion Detectors:
1. Description: Provide a round gray button with “MD” in black text. The button shall appear to be raised. When motion is detected, the icon shall change colors to red and an audio alarm shall sound. The camera associated with the alarm shall call up on the stations spot monitor.
2. Function: Clicking on the MD icon shall cause the button to momentarily depress and silence the audible tone. The visual indicator shall remain. Selecting the icon again shall reset the device.
3. Distribution: Provide one motion detection icon for each device.
4. Motion detectors shall have a scheduler feature that allows each device to be active only during certain hours. The schedule shall only be accessible by administrative level users. Users shall have the ability to schedule the devices individually or all at once.

Scheduler shall have a 24 hour clock with each day of the week represented. The schedule shall carry over the previous week to week unless changed by the user.

5. The motion detector shall not register alarms during a time when it is scheduled to be inactive.

1.12 TASK GROUP

A. Definition: A task group is a logical grouping of points that can be assigned to multiple TCS stations. Refer to Specification Section 284600.1 Control Matrix for Task Groups.

1.13 IP VIDEO OPERATION

A. All cameras shall be displayed on the Central Control TCS stations only. These shall be by room location and camera number.

B. Activating the associated icon will call up the appropriate camera on the spot monitor for viewing by the operator.

C. Camera monitoring intercom stations shall automatically display on the spot monitor when the intercom station is selected at the related TCS.

D. Owner to provide camera titling prior to final programming of the camera and monitor system.

1.14 VOICE ANNOUNCE

A. The TCS shall provide a voice announcement of the following events. The announcement is by event type not by point as follows:
   1. Intercom calls to the TCS shall be preceded by a voice announcement "Intercom Call."
   2. Duress Stations shall be preceded by a voice announcement "Duress."
   3. Call button shall be preceded by a voice announcement " Incoming Call."
   4. Emergency release caution windows shall be annunciated by "Warning! You are attempting to open all the doors in the area. Escape is possible. Please confirm."
   5. Interlock override caution windows shall be annunciated by "Warning! You are attempting to override a security sally port. Escape is possible. Please confirm."

1.15 SUBMITTALS

A. Provide basic submittals as required by Section 280500 Common Work Results for Electronic Safety and Security and by the General Contract requirements.

B. In addition, submit color prints of all graphic screens for approval.

C. Also submit a list of all reportable alarm points.

D. Submit a flow chart or site map showing the relationship of all proposed screens.

1.16 SYSTEMS INTEGRATION

A. Integrated Systems:
   1. IP Video System.

2. Door locking control system.
3. Intercom system.
4. The PLC system.
5. UPS system.
6. Card Access systems

B. Event Priority Level: The operator shall always have control and can manually activate any icon displayed at any time. The following priority applies only to the automatic call up of events for the system and the "Select" icon described above under Interactive Alarm/Audio Handling and Operation. Events shall be given the following priority:
1. Staff Duress Alarms
2. Perimeter system alarms
3. Intercom Calls
4. Door alarms,
5. Communication failure alarms
6. Transient Voltage Surge Suppression Troubles

1.17 TCS CONTROL AND MONITORING SYSTEM:

A. Provide and program all necessary TCS selection zones and required graphic lay-out displays on the different monitors to control specified devices as follows:
1. The system shall be capable of changing to a called screen within one second.
2. The system must generate a command from the TCS to the remote PLC within 500 milliseconds of receiving the selection on the screen.
3. The TCS shall be updated with point status from the PLC every 500 milliseconds.
4. Failure of a TCS shall not disturb PLC communications with other control consoles.
5. The TCS system shall have a means to prevent image burn-in on the CRT when the system control panel has been inactive for more than 2 minutes. Any movement of the trackball should return to the last active screen.
6. Access to the TCS system shall be password protected and all operators shall log into the system. The system shall allow for a minimum of 16 different access levels. Users can log in from a keyboard or directly on the screen.
7. Data Logging: All alarms and critical actions are recorded to the hard drive.
   a. Critical actions initiated at any station are reported to the data logging system. Such reports shall consist of a time and date tag, activity description, station tag and the operator logged on to the system. Special alarms and conditions shall be reported in a similar manner. Critical actions are defined as follows:
      1) Duress alarm activation.
      2) Transient Voltage Suppressor failure on protected 120 VAC security circuits.
      3) Emergency Release activation.
      4) Refer to specification section 284600.2 for other actions to be logged.
   b. The data logging system shall maintain and store files from which reports may be generated. The Data Logger shall purge old files after a preset time.
   c. The log files will be stored on the hard drive and kept for a predetermined amount of time. The owner shall have the option to archive data files to CDs.

1.18 SUBMITTAL

A. The submittal of this section is to be provided with other sections defined in 280500 Common Work Results for Electronic Security and Safety. All sections defined in 280500 are to be submitted at the same time and in accordance with the specification. Refer to that specification for additional information.

1.19 WARRANTY

A. The warranty of this section is to be provided with other sections defined in 280500 Common Work Results for Electronic Security and Safety. All sections defined in 280500 are to be submitted at the same time and in accordance with the specification. Refer to that specification for additional information.

1.20 OWNER TRAINING

A. The owner training of this section is to be provided with other sections defined in 280500 Common Work Results for Electronic Security and Safety. All sections defined in 280500 are to be submitted at the same time and in accordance with the specification. Refer to that specification for additional information.

**PART 2 - PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

A. Acceptable Manufacturers
1. Basis of Design: Status Automation, Abbotsford, BC; 604-859-1892
2. Accurate Controls, Ripon, WI; 920-748-6603.
3. CML Security, Erie, CO: 720-466-3650
4. Com-Tec, Inc., Greenville, WI; 920-749-2840.
5. Cornerstone Security Electronics, Decatur. AL; 256-560-4207
6. Metroplex Control Systems, San Antonio TX; 210-495-5245.
7. Sierra Detention Systems, Brighton, CO 303-278-6879

2.2 EQUIPMENT

A. Furnish and install a complete, locking and control system with annunciation and control of all security subsystems utilizing touchscreen graphic controls with integrated Programmable Logic Controls. Provide all labor, equipment, materials, software, and supervision to install, calibrate, adjust, document and test the total system.

B. The locking control system shall control all electrically controlled hardware, motorized gates and other security subsystem devices. The system shall monitor and annunciate the status condition of all electrically equipped hardware, doors, gates and security subsystem control conditions, security conditions, call-in signals and other functions as described herein. The system shall interface with other security subsystems for control and annunciation as indicated.

2.3 SYSTEM CONFIGURATION:

A. The Interactive TCS Station consists of a Touchscreen monitor and a computer, which shall be connected to the Programmable Logic Controller (PLC) via a local area network. The PLC shall communicate with the TCS Station on an independent, closed network.

1. Touchscreen Control Station Consoles (TCS): The TCS shall serve as the graphic based operator interface between the corrections officer and the facility's locking controls system and the security subsystems as specified herein.

2. Programmable Logic Control System (PLC): The PLC shall provide all necessary logic transactions required to implement the functions and features of the locking control system and the security subsystem as specified herein. The PLC shall be distributive in nature and a standard product of one manufacture.

2.4 SYSTEM PERFORMANCE GUIDELINES:

A. The interaction time lag between selecting the control icon, i.e., key icon, at any given TCS and the controlled point activation, (i.e., the lock), shall be no greater than one second (1 sec).

B. The interaction time lag between a controlled point activating and any given TCS's response either by activation of an audible alarm and/or the associated icon changing state (color) shall be no greater than one second (1 sec).

C. The interaction time lag between recalling any floor plan at any given TCS shall be no greater than one second (1 sec).

2.5 MINIMUM HARDWARE REQUIREMENTS:

A. Each TCS shall consist of the following:
1. An IBM™ compatible computer with an Intel™ Xeon class E5 microprocessor chip set or equivalent. The operating speed shall be a minimum of 3.5 GHz, 16GB DDR4 SDRAM and a minimum of 8MB of Cache shall be provided.
2. The latest Operating System version from Microsoft. The Operating System shall be compatible with all software and approved during the submittal process.
3. One primary 500GB SATA 3.0Gb/s Hard Drive.
4. All necessary boards for integration to local area network, PLC's, sound system, etc., shall be provided.
5. Minimum 16X DVD-ROM Read/Write CD/DVD drive.
6. Gigabyte Network Interface Card.
7. TCS stations shall have an ELO "32" model 3243L Touchmonitor or equal. Unit shall provide the following features:
   a. 100 Watts or less power consumption.
   b. Operating temperature range of 41 to 95 degrees Fahrenheit.
   c. Provide custom adjustable tilt mount. Refer to Architecturals.

RFI 0090 — Security Touchscreen Monitor Clarification — Elo 2200L Touchscreen is an acceptable equal.

B. Each TCS shall be provided with an optical mouse. Features shall be as follows:
1. Two customizable buttons.
2. IBM PC compatible.
3. USB or PS/2 port connection.
4. Scroll wheel.

C. Each TCS shall be provided with desk paging microphone equal to Astatic model 878HL with the following features as a minimum:
1. Frequency response of 40 to 20,000 Hz.
2. Omnidirectional microphone.
3. Push to talk momentary switch.
4. Drivers and interface boards required for control of intercom system.

D. Each TCS shall be provided with multimedia speakers equal to Sony model SRS-A212 with the following features as a minimum:

1. Response bandwidth of 90-20000 Hz.
2. 3.6 Watt RMS power output.
3. Power on/off and volume controls.
4. Active amplification.
5. Hardware as required for intercom audio and TCS voice audibles.

E. The combination of the microphone in 2.5 C and the speakers in 2.5 D above, shall provide the intercom M.I.S. as defined in section 275123.

F. Each TCS shall be provided with a Workrite Ergonomics Fixed mount CPU holder equivalent to their Fixed Mount 920 CPU Holder. Mount these to the underside of the ergonomic desk in Security Booth A120.

2.6 PDA REQUIREMENTS

A. Furnish and install a PDA device equivalent to the Samsung Galaxy Tablet A. The Tablet A will be the base of the PDA design. Each PDA shall consist of the following:

1. The operating system shall be the latest version of the Andriod Lollipop.

2. The tablet should have a wireless protocol of 802.11 a/b/g/n.

3. The tablet should have a battery life of at least 7 hours.

4. The tablet should be no bigger than 9”.

5. The internal memory should be at least 1.5GB of RAM and 16 GB of ROM.

2.7 FIBER OPTIC MODULES

A. Furnish and install all fiber optic modules required for proper system operation.

B. Modules to be located in a common module rack located next to the fiber optic distribution panel in each security electronics room.

2.8 MINIMUM SOFTWARE BASE REQUIREMENTS

A. The software will be an *Off-the-Shel*f package available through a distributor network. The *Off-the-Shelf* software will be programmed and tailored to the specified functions and features described herein and shown on the drawings. **Approved manufacturer of software is GE Cimplicity or InduSoft.** All I/O server software packages shall standard in nature and be from one of the two approved software manufacturers listed below. If an I/O package (i.e. KepWare, TopServer…..) is used other than from the approved list, it shall be sent to the engineer for approval prior to being used to develop any programming. **Custom or Proprietary software code will not be approved.** The software will convey an accurate floor plan of all areas, which require display on the monitor. The software will utilize the maximum resolution and colors of the monitor to enhance and simplify the displayed control and status information. Fast orientation and ergonomics will be the goal of all graphic displays.

B. The software will provide log-on security password protection for all TCS's. There shall be a minimum of sixteen (16) levels of access, expandable. The software will provide a database for users. This database shall support a minimum of two hundred fifty six (256) users, expandable.

C. The software shall provide on-line utilities, accessed through the System Utilities function icon. These utilities shall provide the operator with the ability to edit and update required databases, system operating variables, report configuration and generation, alarm tags and point descriptions, etc. These utilities shall be protected by security levels and password requirements.

D. The software will automatically align and adjust the monitor display during the boot-up sequence of the TCS without interaction of the correction officer.

E. All software licenses shall be transferred to the Owner at completion of the project. This shall include, but not be limited to all original installation disks, software manuals, equipment manuals, etc., all project specific application software shall be transferred at the end of warranty period. The use of removable software licenses is prohibited.

F. The software license utilized shall be loaded directly onto each station. The use of a removable or "hard key" style license is not acceptable.

G. All application programming interfaces (APIS), Middleware, device drivers, dynamic-link libraries (DLL, GNU, etc. files), firmware, executable files, and all other software used as a part of the software/firmware/hardware framework shall be open source and non-proprietary. The contractor is to provide in the submittal a software architectural model detailing the HMI-PLC-DEVICE software architecture.

H. Once installed the owner shall be able to modify the GUI software for any system application changes, modifications, updates, troubleshooting, and/or repairs.

2.9 SPARE PARTS

A. Furnish one spare computer and monitor to match what is provided for a typical TCS station.

## PART 3 - EXECUTION

1.1 INSTALLATION

A. Coordination With Other Trades: The contractor shall coordinate the work of this section with that of other Divisions as required to ensure that the entire work of this project will be carried out in an orderly, complete and coordinated fashion.

B. Millwork: Completely coordinate cable and raceway access with millwork provider at each TCS location.

C. Field Wiring: The wiring that extends from the electronic control relay screw terminal strips to the locks, lights, etc. shall be class 1, 2, or 3 as defined by Article 725 of the California Electric Code. All conductors shall be 14 gauge or larger THHN or THWN, 600 volt rated,

and shall be installed in raceways and equipment enclosures with other conductors, within limitations defined by Article 725 of the California Electric Code.

1. Installation: Dress wires and cables to provide a neat and orderly appearance within all enclosures, equipment racks, cabinets, and consoles by routing in snap-cover, plastic wiring duct. In locations where wiring duct is not feasible, organize by cable clamping, dressing and tie-wrapping.
2. Strain Relief: Relieve strain on all loose wire bundles using tie-wrap, supports fastened with machine screws or bolts. Do not use self-adhesive type supports.
3. Shrink Tubing: Neatly form cable ends and apply shrinkable tubing to shielded cables or where necessary to secure the insulation against fraying or raveling.
4. Edge Protection: Install edge protection materials on edges, holes, lips of ducts, or any other place where wires or cables cross sharp metallic edges.
5. Service Loops: Allow sufficient service loops where conductors leave cabinet or transition to door mounted electronics.
6. Splicing: Field wiring shall not be spliced. All wiring shall be continuous from the field device to the termination in the control panel.
7. Future Wiring: All wiring not utilized in the current configuration shall be terminated at both ends and labeled for “Future” use.

D. Ground System: Connection to grounds for Transient Voltage Surge Suppressors shall be 1 ohms or less. All grounds shall be installed as required by the CEC.

E. Ground Wire: Furnish and install a ground wire sized as required by the CEC in all conduits containing conductors carrying voltages above 30 volts rms.

F. Listing: All wiring and raceways shall be listed for the intended installation and installed in strict accordance with the California Electric Code as required by the conditions of where it is stalled. This includes but is not limited to ratings for risers, plenum, or wet installations.

## 1.2 PROGRAMMING

A. Library: The TCS programming shall utilize a library of reusable, programmed modules. Programming a function will consist of submitting a point list to the appropriate program module and acting on the results.

B. Testing: All programming will be completely tested and debugged in the factory before being sent to the site for installation. Each response for each point shall be tested by an actual device or by software manipulation.

C. Personnel: All programmers developing software for the TCS systems shall be experienced programmers completely trained in the operation of the computers involved. The software shall be tested by competent programmers other than the developers.

## 1.3 FABRICATION

A. All cables between PLC and TCS shall be provided with quick disconnect connectors for ease of trouble-shooting and service.

B. All field wiring shall be landed on appropriately labeled terminal strips.

C. All wiring shall be cabled or neatly bundled and secured to the housing with wire ties and internal wire ducts.

1.4 TRAINING

A. The ESC shall provide without additional cost to the owner representatives specially trained in the operation of the Touchscreen systems provided. The representatives shall train the Owner's personnel in operation, repair, and upkeep of the PLC and custom relay cabinets.

B. The ESC shall be responsible for notifying the architect five (5) weeks prior to substantial completion of the total security system that training is scheduled. The ESC will coordinate the number to be trained with the owner's representative. The Touchscreen training will be provided in conjunction with the PLC training as these systems are integrated with each other.

C. The length of training shall be at least four hours long and be presented to all shifts.

D. Course Structure
   1. The ESC shall prepare and present to the Architect a detailed course outline that specifies each major training module to be covered. The training program on the security equipment shall include the sequences and instructions for proper use and maintenance of all hardware, locking devices, control and monitoring systems and panels. The material content shall be in simple layman's terminology, describe and demonstrate all step-by-step physical operations necessary for proper operation and necessary equipment adjustments. At the time of training, each trainer shall present to the trainees detailed outlines of each training module to be covered and the specific skills and knowledge which the trainee is expected to master within each training module.
   2. At a minimum the training program shall be subdivided into the following training modules:
      a. Troubleshooting, General Maintenance, Equipment Adjustments, Repair and Replacement of Security System Components.
      b. Operator Controls.
      c. Descriptive modules organized by specification section.
      d. Review of panel as built plans and submittals.
      e. Review of Operation and Maintenance Manuals.
      f. Review of all contact telephone numbers.
      g. Review of all warranties.

E. The ESC shall record each training module. The recording does not have to include individual student practice. The ESC in preparing the recording shall structure it for easy reference by the facility's training officer for future use. Furnish to the owner DVD's or tape as required by the owner.

F. Training Certification
   1. Each facility employee shall receive at the conclusion of the security systems training program a certificate certifying his attendance of the total session or portion thereof.
   2. ESC shall maintain attendance records of each class.

G. In addition to the training requirements listed above the ESC shall include all associated cost to provide additional onsite owner training following substantial completion. The additional

training shall occur at the three (3) months periods and shall cover topics as referenced in paragraph "D" above. Coordinate this additional training with the owner.

1.5 FIELD QUALITY CONTROL

A. All functions specified shall be individually activated and the result documented.

B. All functions shall be demonstrated for the Owner and Consultant's representative.

**TCS VERIFICATION AND CHECK-OUT FORM**

✓ = OK

**Job #**
**Job Name:**
**Panel #**

| **FIELD TEST CODE:** | | **REPAIR CODE:** | |
|---|---|---|---|
| A - No status change | M - Poor audio | 1-SSI | Software Test By:_____ Date_____ |
| B - Won't show secure | N - No audio | 2-ELECTRICIAN | |
| C - No power to door | O - Out of focus | 3-IRONWORKER | Hardware Test By:_____ Date_____ |
| D - Door won't open | P - No picture | 4-CARPENTER | |
| E - Door won't close | Q - Call button sticks | 5-OWNER/REP | System Test By:_____ Date_____ |
| F - Door needs alignment | R - Reversed | 6 -ENG | |
| G - Wrong door opens | S - Software problem | 7 - | Design Engineering By:_____ Date_____ |
| H - Adjust DPS | T - Not installed | 8 - | |
| I - Adjust roller bolt | U - | 9 - | Wiring By:_____ Date_____ |
| J - File strike plate | V - | 10 - | |
| K - Adjust lock | W - | 11 - | Field Test By:_____ Date_____ |
| L - No latch back | X - | 12 - | |

| | | | | | | | **ON-SITE** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ICON ID#** | **ICON TYPE** | **C/U CAM. NO.** | **DOOR INTLK WITH** | **CELL GRP. REL.** | **SOFT-WARE TEST** | **HARD-WARE TEST** | **FIELD TEST CODE** | **REPAIR CODE** | **RE-CHECK "X"** | **FIELD CHECK OUT NOTES** | **PROBLEM RESOLVED (BY/DATE)** |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

1.6 SOFTWARE

A. For each TCS, furnish to the owner uniquely identified:
1. One (1) copy of the programming and source code of the application software on a CD or DVD. This copy shall have all programmer comments, variable names, and mnemonics included.
2. Complete and accurate set of programming work sheets filled out with the final configuration for each system.
3. One (1) back-up CD or DVD with programmer's notes and source code. Each disk will be labeled with the project name, programs, programmer, and revision date.

B. Furnish a single Adobe Acrobat PDF file detailing all passwords for each TCS. This file shall also identify the following by system and panel:
1. The file name of each program required for restoration of each failed TCS.
2. The passwords required for each TCS as well as required programs.
3. The name of the programmers for each custom program.
4. The date of the last program change.

C. Furnish documents listed in 3.4 A-B at project completion. Furnish a new set with all revisions after the completion of changes during the Warranty. This shall include any

changes that occur during the 3 month post occupancy walkthrough period as specified in 280500, 1.8-C.

**END OF SECTION 28 46 00**

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## SECTION 28 46 00.1 - SECURITY ELECTRONICS CONTROL MATRIX

The Control Matrix is a tool to aid in the programming of the Locking Control System. Each device that is a part of the locking control system is listed in the first column below.

The Interlock Groups in the second column define the sally ports in the facility. If doors are interlocked in a group, only one door can be open in the group at a time without the Touchscreen Control Station (TCS) operator completing extra steps.

The third column shows the Emergency Release groups. There are currently 2 emergency release groups. They are:

Building A or **bldgA**
Building B or **bldgB**

The activation of an emergency release group will open all of the doors associated with the group and hold the locks open. Emergency Release can only be activated from the TCS station.

The Camera Call-Up column defines which camera will appear on the TCS's video spot monitor when an intercom or duress is activated.

The next two columns are for the wireless Personal Digital Assistants (PDAs). Any device that can be controlled or monitored from a PDA is indicated in this column. The PDAs can be enabled and disabled from the TCS station. The PDAs can only operate the devices in the building they are in. PDAs located in building A cannot operate devices in building B and vice versa.

The next two columns are used to define the devices that are controlled from the TCS station. There is one control station at Solano County Training Center. It is located in Security Booth A120 in Building A. This station has primary control. The devices that are controlled by the TCS at Solano County Training Center are listed by building in columns:

Building A or **bldgA**
Building B or **bldgB**

The Card Access Column (**CARD**) distinguishes devices that are a part of the card access system. Some devices are integrated into both the card access and locking control system.

The remaining column is for additional notes that might distinguish a device from a similar device. The notes are as follows:

### CONTROL MATRIX KEYED NOTES

1 TCS has primary control and monitoring.
2 TCS has monitoring only.
3 TCS has takeover capabilities of the control functions of its assigned task group. Stations do not have simultaneous control.
4 When Central Control's Duress is activated, the Central Control station is disabled and must be re-activated from the Security Reset in SEC A106.
5 This device is controlled from the card access system and the locking control system.
6 Activation of this device shall be recorded on the Event Recording Computer.
7 HIGH SECURITY RISK pop up window to appear when this door is signaled to be open.
8 DOOR OPEN TOO LONG pop up window will appear when this door is opened to long.
9 DOOR KEYED OPEN alarm to register when this door is opened by means other than the TCS station.
10 PDA has control and monitoring.
11 PDA has monitoring only.
12 15 second delay egress door.
13 This intercom is part of Best Value Enhancement #9.
14 This card reader is part of Best Value Enhancement #11.
15 This motion detector is part of Best Value Enhancement #22.
16 Motion detector is to have an adjustable timer. Refer to specification Section 284600 for operations.

| Device | Interlk Group | Emerg Release | Camera Call-Up | PDA.A | PDA.B | BLDG A | BLDG B | Card | Keyed Notes | System Note Testing |
|---|---|---|---|---|---|---|---|---|---|---|
| **BUILDING A** | | | | | | | | | | |
| **Intercom Stations** | | | | | | | | | | |
| A101.2A | | | A22 | 10 | | 1 | | | 6 | |
| A101.2B | | | A04 | 10 | | 1 | | | 6, 13 | |
| A102A.1A | | | A22 | 10 | | 1 | | | 6 | |
| A102A.1B | | | A21 | 10 | | 1 | | | 6, 13 | |
| A102B.1A | | | A23 | 10 | | 1 | | | 6 | |
| A102B.1B | | | A18 | 10 | | 1 | | | 6, 13 | |
| A103.1A | | | A24 | 10 | | 1 | | | 6 | |
| A103.1B | | | A28 | 10 | | 1 | | | 6, 13 | |
| A103A.1A | | | A23 | 10 | | 1 | | | 6 | |
| A103A.1B | | | A29 | 10 | | 1 | | | 6, 13 | |
| A104A.1A | | | A24 | 10 | | 1 | | | 6 | |
| A104A.1B | | | A17 | 10 | | 1 | | | 6, 13 | |
| A104B.1A | | | A23 | 10 | | 1 | | | 6 | |
| A104B.1B | | | A14 | 10 | | 1 | | | 6, 13 | |
| A109.1A | | | A08 | | | 1 | | | 6 | |
| A109.2A | | | A10 | | | 1 | | | 6 | |
| A110.1A | | | A25 | | | 1 | | | 6 | |
| A113.1A | | | A32 | | | 1 | | | 6 | |
| A113.1B | | | | | | 1 | | | 6 | |
| A120.1A | | | A09 | | | 1 | | | 6 | |
| A121.1A | | | A32 | | | 1 | | | 6 | |
| A121.1B | | | A09 | | | 1 | | | 6 | |
| A121.2A | | | A32 | | | 1 | | | 6 | |
| A121.2B | | | A09 | | | 1 | | | 6 | |
| A121.3A | | | A02 | | | 1 | | | 6 | |
| A121.3B | | | A09 | | | 1 | | | 6, 13 | |
| A122.1A | | | A09 | 10 | | 1 | | | 6, 13 | |
| A128.1A | | | A03 | | | 1 | | | 6 | |
| A128.1B | | | A22 | | | 1 | | | 6 | |
| A129.1A | | | A32 | | | 1 | | | 6 | |
| A129.1B | | | | | | 1 | | | 6 | |
| G01.A | | | A02 | | | 1 | | | 6 | |
| G01.B | | | A33 | | | 1 | | | 6 | |
| G09.A1 | | | A34 | | | 1 | | | 6 | |
| G09.A2 | | | A34 | | | 1 | | | 6 | |
| G09.B1 | | | ST16 | | | 1 | | | 6 | |
| G09.B2 | | | ST16 | | | 1 | | | 6 | |

| Device | Interlk Group | Emerg Release | Camera Call-Up | PDA.A | PDA.B | BLDG A | BLDG B | Card | Keyed Notes | System Note Testing |
|---|---|---|---|---|---|---|---|---|---|---|
| G11.A1 | | | ST17 | | | 1 | | | 6 | |
| G11.A2 | | | ST17 | | | 1 | | | 6 | |
| G11.B1 | | | ST18 | | | 1 | | | 6 | |
| G11.B2 | | | ST18 | | | 1 | | | 6 | |
| | | | | | | | | | | |
| **Individually Controlled Doors** | | | | | | | | | | |
| A101.2 | | **bldgA** | | 10 | | 1 | | 5 | 6 | |
| A102A.1 | | **bldgA** | | 10 | | 1 | | 5 | 6 | |
| A102B.1 | | **bldgA** | | 10 | | 1 | | 5 | 6 | |
| A103.1 | | **bldgA** | | 10 | | 1 | | 5 | 6 | |
| A103A.1 | | **bldgA** | | 10 | | 1 | | 5 | 6 | |
| A104A.1 | | **bldgA** | | 10 | | 1 | | 5 | 6 | |
| A104B.1 | | **bldgA** | | 10 | | 1 | | 5 | 6 | |
| A106.1 | | | | 11 | | 1 | | 5 | 6, 8 | |
| A107.1 | | | | 11 | | 1 | | 5 | 6, 8 | |
| A109.1 | | **bldgA** | | 11 | | 1 | | 5 | 6,8, 12 | |
| A109.2 | | **bldgA** | | 11 | | 1 | | 5 | 6, 8 | |
| A110.1 | | **bldgA** | | 11 | | 1 | | 5 | 6 | |
| A113.1 | | **bldgA** | | 11 | | 1 | | | 6,8,9 | |
| A120.1 | | | | 11 | | 1 | | 5 | 6,8,9 | |
| A121.1 | | **bldgA** | | 11 | | 1 | | | 6,7,8, 9,12 | |
| A121.2 | A1 | **bldgA** | | 11 | | 1 | | | 6,8,9 | |
| A121.3 | | | | 11 | | 1 | | 5 | 6,8,9 | |
| A122.1 | | **bldgA** | | 10 | | 1 | | 5 | 6 | |
| A128.1 | | **bldgA** | | 11 | | 1 | | 5 | 6,7,8, 9,12 | |
| A129.1 | | **bldgA** | | 11 | | 1 | | | 6,8,9 | |
| | | | | | | | | | | |
| **Individually Controlled Gates** | | | | | | | | | | |
| G01 | A1 | | | | | 1 | | | 6,8,9 | |
| G02 | A1 | **bldgA** | | | | 2 | | | 6,8,9, 12 | |
| G09 | A2 | | | | | 1 | | 5 | 6,8,9 | |
| G11 | B3 | | | | | 1 | | 5 | 6,8,9 | |
| | | | | | | | | | | |
| **Duress Stations** | | | | | | | | | | |
| A01 (Security Booth A120) | | | | 11 | | 4 | | | 6 | |
| A02 (Interview A123) | | | A12 | 11 | | 2 | | | 6 | |

| Device | Interlk Group | Emerg Release | Camera Call-Up | PDA.A | PDA.B | BLDG A | BLDG B | Card | Keyed Notes | System Note Testing |
|---|---|---|---|---|---|---|---|---|---|---|
| A03 (Interview A124) | | | A13 | 11 | | 2 | | | 6 | |
| A04 (Classroom 2B A104B) | | | A14/ A15 | 11 | | 2 | | | 6 | |
| A05 (Classroom 2A A104A) | | | A16/ A17 | 11 | | 2 | | | 6 | |
| A06 (Classroom 1B A102B) | | | A18/ A19 | 11 | | 2 | | | 6 | |
| A07 (Classroom 1A A102A) | | | A20/ A21 | 11 | | 2 | | | 6 | |
| A08 (Life Science Classroom A101) | | | A29/ A31 | 11 | | 2 | | | 6 | |
| A09 (Computer Classroom A103) | | | A28/ A35 | 11 | | 2 | | | 6 | |
| A10 (Life Science Classroom A101) | | | A04/ A30 | 11 | | 2 | | | 6 | |
| | | | | | | | | | | |
| **Monitored Doors and Gates** | | | | | | | | | | |
| A108.1 | | | | | | 2 | | | 6, 8 | |
| A110B.1 | | | | | | 2 | | | 6, 8 | |
| G08 | A2 | | | | | 2 | | | 6,8,9 | |
| | | | | | | | | | | |
| **Paging Zones** | | | | | | | | | | |
| ZONE A | | | | | | 1 | | | 6 | |
| | | | | | | | | | | |
| **Building A Auxiliary Controls** | | | | | | | | | | |
| Holding A113 Water | | | | 10 | | 1 | | | 6 | |
| Holding A129 Water | | | | 10 | | 1 | | | 6 | |
| Holding A113 Lights | | | | 10 | | 1 | | | 6 | |
| Holding A129 Lights | | | | 10 | | 1 | | | 6 | |
| | | | | | | | | | | |
| **SEC Closet A106 System Alarms** | | | | | | | | | | |
| UPS Active/Power Failure | | | | | | 2 | | | 6 | |
| UPS Low Battery | | | | | | 2 | | | 6 | |
| UPS Low Voltage | | | | | | 2 | | | 6 | |
| UPS Inverter Power | | | | | | 2 | | | 6 | |
| UPS Trouble | | | | | | 2 | | | 6 | |
| 120 VAC TVSS Failure | | | | | | 2 | | | 6 | |
| 24 VDC TVSS Failure | | | | | | 2 | | | 6 | |
| PLC Communication Failure | | | | | | 2 | | | 6 | |
| PLC Low Battery | | | | | | 2 | | | 6 | |

| Device | Interlk Group | Emerg Release | Camera Call-Up | PDA.A | PDA.B | BLDG A | BLDG B | Card | Keyed Notes | System Note Testing |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| **BUILIDNG B** | | | | | | | | | | |
| **Intercom stations** | | | | | | | | | | |
| A133.3A | | | B36 | | | | 1 | | 6 | |
| A133.3B | | | B37 | | | | 1 | | 6 | |
| A138.3A | | | B27 | | | | 1 | | 6 | |
| A138.3B | | | B26 | | | | 1 | | 6 | |
| A138.4A | | | B49 | | | | 1 | | 6 | |
| A138.4B | | | B50 | | | | 1 | | 6 | |
| B129.2A | | | B46 | | | | 1 | | 6 | |
| B129.2B | | | B47 | | | | 1 | | 6 | |
| B129.3A | | | B43 | | | | 1 | | 6 | |
| B129.3B | | | B44 | | | | 1 | | 6 | |
| B133.1A | | | B35 | | 10 | | 1 | | 6 | |
| B133.1B | | | B37 | | 10 | | 1 | | 6 | |
| B133.2A | | | B47 | | 10 | | 1 | | 6 | |
| B135.2A | | | B61 | | | | 1 | | 6, 13 | |
| B135.2B | | | B35 | | | | 1 | | 6 | |
| B135.3A | | | B31 | | | | 1 | | 6, 13 | |
| B135.3B | | | B35 | | | | 1 | | 6 | |
| B136.3A | | | B61 | | | | 1 | | 6 | |
| B136.3B | | | B34 | | | | 1 | | 6 | |
| B136.4A | | | B31 | | | | 1 | | 6 | |
| B136.4B | | | B32 | | | | 1 | | 6 | |
| B138.1A | | | B17 | | 10 | | 1 | | 6 | |
| B138.1B | | | B26 | | 10 | | 1 | | 6 | |
| B138.2A | | | B34 | | 10 | | 1 | | 6 | |
| B140.1A | | | B15 | | | | 1 | | 6, 13 | |
| B140.1B | | | B17 | | | | 1 | | 6 | |
| B140.2A | | | B19 | | | | 1 | | 6, 13 | |
| B140.2B | | | B20 | | | | 1 | | 6 | |
| B141.3A | | | B15 | | | | 1 | | 6 | |
| B141.3B | | | B16 | | | | 1 | | 6 | |
| B141.4A | | | B19 | | | | 1 | | 6 | |
| B141.4B | | | B18 | | | | 1 | | 6 | |
| B145.3A | | | B14 | | | | 1 | | 6 | |
| B145.3B | | | B03 | | | | 1 | | 6 | |
| B145.6A | | | B21 | | | | 1 | | 6 | |
| B145.6B | | | B06 | | | | 1 | | 6 | |
| B148.1A | | | B03 | | 10 | | 1 | | 6 | |

| Device | Interlk Group | Emerg Release | Camera Call-Up | PDA.A | PDA.B | BLDG A | BLDG B | Card | Keyed Notes | System Note Testing |
|---|---|---|---|---|---|---|---|---|---|---|
| B148.1B | | | B13 | | 10 | | 1 | | 6 | |
| B148.2A | | | B16 | | 10 | | 1 | | 6 | |
| B148.3A | | | B14 | | | | 1 | | 6 | |
| B148.3B | | | B13 | | | | 1 | | 6 | |
| B152.2A | | | B49 | | | | 1 | | 6 | |
| B152.2B | | | B48 | | | | 1 | | 6 | |
| B152.3A | | | B53 | | | | 1 | | 6 | |
| B152.3B | | | B45 | | | | 1 | | 6 | |
| B154.1A | | | B48 | | 10 | | 1 | | 6 | |
| B154.1B | | | B50 | | 10 | | 1 | | 6 | |
| B154.2A | | | B60 | | 10 | | 1 | | 6 | |
| B155.1A | | | B62 | | | | 1 | | 6 | |
| B155.1B | | | B60 | | | | 1 | | 6 | |
| B155.3A | | | B56 | | | | 1 | | 6 | |
| B155.3B | | | B59 | | | | 1 | | 6 | |
| | | | | | | | | | | |
| **Individually Controlled Doors** | | | | | | | | | | |
| A133.3 | | **bldgB** | | | 11 | | 1 | 5 | 6,8,9 | |
| A138.3 | | **bldgB** | | | 11 | | 1 | 5 | 6,8,9 | |
| A138.4 | | **bldgB** | | | 11 | | 1 | 5 | 6,8,9 | |
| B129.2 | | **bldgB** | | | 11 | | 1 | 5 | 6,8,9 | |
| B129.3 | | **bldgB** | | | 11 | | 1 | 5, 14 | 6,8,9 | |
| B129B.1 | | **bldgB** | | | 10 | | 1 | 5 | 6,9 | |
| B133.1 | BE1 | **bldgB** | | | 10 | | 1 | 5 | 6,8,9 | |
| B133.2 | BE1 | **bldgB** | | | 10 | | 1 | 5 | 6,8,9 | |
| B135.2 | | **bldgB** | | | 11 | | 1 | 5 | 6,8,9 | |
| B135.3 | | **bldgB** | | | 11 | | 1 | 5, 14 | 6,8,9 | |
| B135B.1 | | **bldgB** | | | 10 | | 1 | 5 | 6,9 | |
| B136.3 | | **bldgB** | | | 11 | | 1 | 5 | 6,8,9 | |
| B136.4 | | **bldgB** | | | 11 | | 1 | 5, 14 | 6,8,9 | |
| B136B.1 | | **bldgB** | | | 10 | | 1 | 5 | 6,9 | |
| B138.1 | BW2 | **bldgB** | | | 10 | | 1 | 5 | 6,8,9 | |
| B138.2 | BW2 | **bldgB** | | | 10 | | 1 | 5 | 6,8,9 | |
| B140.1 | | **bldgB** | | | 11 | | 1 | 5 | 6,8,9 | |
| B140.2 | | **bldgB** | | | 11 | | 1 | 5, 14 | 6,8,9 | |
| B140B.1 | | **bldgB** | | | 10 | | 1 | 5 | 6,9 | |
| B141.3 | | **bldgB** | | | 11 | | 1 | 5 | 6,8,9 | |
| B141.4 | | **bldgB** | | | 11 | | 1 | 5, 14 | 6,8,9 | |
| B141B.1 | | **bldgB** | | | 10 | | 1 | 5 | 6,9 | |
| B144.1 | | | | | 11 | | 1 | 5 | 6,8,9 | |
| B145.3 | | **bldgB** | | | 11 | | 1 | 5 | 6,8,9 | |

| Device | Interlk Group | Emerg Release | Camera Call-Up | PDA.A | PDA.B | BLDG A | BLDG B | Card | Keyed Notes | System Note Testing |
|---|---|---|---|---|---|---|---|---|---|---|
| B145.6 | | **bldgB** | | | 11 | | 1 | 5, 14 | 6,8,9 | |
| B145B.1 | | **bldgB** | | | 10 | | 1 | 5 | 6,9 | |
| B147.1 | | **bldgB** | | | 11 | | 1 | 5 | 6,8,9 | |
| B148.1 | BW1 | **bldgB** | | | 10 | | 1 | 5 | 6,8,9 | |
| B148.2 | BW1 | **bldgB** | | | 10 | | 1 | 5 | 6,8,9 | |
| B148.3 | | **bldgB** | | | 11 | | 1 | 5 | 6,8,9 | |
| B150.1 | | | | | 11 | | 1 | 5 | 6,8,9 | |
| B152.2 | | **bldgB** | | | 11 | | 1 | 5 | 6,8,9 | |
| B152.3 | | **bldgB** | | | 11 | | 1 | 5, 14 | 6,8,9 | |
| B152B.1 | | **bldgB** | | | 10 | | 1 | 5 | 6,9 | |
| B153.1 | | **bldgB** | | | 11 | | 1 | 5 | 6,8,9 | |
| B154.1 | BE2 | **bldgB** | | | 10 | | 1 | 5 | 6,8,9 | |
| B154.2 | BE2 | **bldgB** | | | 10 | | 1 | 5 | 6,8,9 | |
| B155.1 | | **bldgB** | | | 11 | | 1 | 5 | 6,8,9 | |
| B155.3 | | **bldgB** | | | 11 | | 1 | 5, 14 | 6,8,9 | |
| B155B.1 | | **bldgB** | | | 10 | | 1 | 5 | 6,9 | |
| B156B.1 | | | | | 11 | | 1 | 5 | 6,8,9 | |
| | | | | | | | | | | |
| **Individually Monitored Gates** | | | | | | | | | | |
| G12 | BE3 | | | | | | 2 | | 6,7,8, 9 | |
| | | | | | | | | | | |
| **Duress Stations** | | | | | | | | | | |
| B01 (Classroom B148) | | | B13 | | 11 | | 2 | | 6 | |
| B02 (Classroom B138) | | | B26 | | 11 | | 2 | | 6 | |
| B03 (Classroom B133) | | | B37 | | 11 | | 2 | | 6 | |
| B04 (Classroom B154) | | | B50 | | 11 | | 2 | | 6 | |
| | | | | | | | | | | |
| **Monitored Doors** | | | | | | | | | | |
| B129.1 | | | | | 11 | | 2 | | 6,8 | |
| B134.1 | | | | | 11 | | 2 | | 6,8 | |
| B135.1 | | | | | 11 | | 2 | | 6,8 | |
| B136.1 | | | | | 11 | | 2 | | 6,8 | |
| B136.2 | | | | | 11 | | 2 | | 6,8 | |
| B139.1 | | | | | 11 | | 2 | | 6,8 | |
| B140.3 | | | | | 11 | | 2 | | 6,8 | |
| B140.4 | | | | | 11 | | 2 | | 6,8 | |
| B140.5 | | | | | 11 | | 2 | | 6,8 | |
| B141.1 | | | | | 11 | | 2 | | 6,8 | |
| B141.2 | | | | | 11 | | 2 | | 6,8 | |
| B141.5 | | | | | 11 | | 2 | | 6,8 | |

| Device | Interlk Group | Emerg Release | Camera Call-Up | PDA.A | PDA.B | BLDG A | BLDG B | Card | Keyed Notes | System Note Testing |
|---|---|---|---|---|---|---|---|---|---|---|
| B145.1 | | | | | 11 | | 2 | | 6,8 | |
| B145.2 | | | | | 11 | | 2 | | 6,8 | |
| B145.4 | | | | | 11 | | 2 | | 6,8 | |
| B145.5 | | | | | 11 | | 2 | | 6,8 | |
| B149.1 | | | | | 11 | | 2 | | 6,8 | |
| B152.1 | | | | | 11 | | 2 | | 6,8 | |
| | | | | | | | | | | |
| **Motion Detector** | | | | | | | | | | |
| B01 | | | B03, B06,B07 | | | | 2 | | 15,16 | |
| B02 | | | B03, B06,B07 | | | | 2 | | 15,16 | |
| B03 | | | B09, B16,B18 | | | | 2 | | 15,16 | |
| B04 | | | B09, B16,B18 | | | | 2 | | 15,16 | |
| B05 | | | B17, B20 | | | | 2 | | 15,16 | |
| B06 | | | B17, B20 | | | | 2 | | 15,16 | |
| B07 | | | B32, B34 | | | | 2 | | 15,16 | |
| B08 | | | B33, B35 | | | | 2 | | 15,16 | |
| B09 | | | B44, B47 | | | | 2 | | 15,16 | |
| B10 | | | B45, B48 | | | | 2 | | 15,16 | |
| B11 | | | B59, B60 | | | | 2 | | 15,16 | |
| | | | | | | | | | | |
| **Paging Zones** | | | | | | | | | | |
| ZONE B | | | | | | | 1 | | 6 | |
| ZONE PAD | | | | | | | 1 | | 6 | |
| | | | | | | | | | | |
| **SEC Closet B150 System Alarms** | | | | | | | | | | |
| UPS Active/Power Failure | | | | | | | 2 | | 6 | |
| UPS Low Battery | | | | | | | 2 | | 6 | |
| UPS Low Voltage | | | | | | | 2 | | 6 | |
| UPS Inverter Power | | | | | | | 2 | | 6 | |
| UPS Trouble | | | | | | | 2 | | 6 | |
| 120 VAC TVSS Failure | | | | | | | 2 | | 6 | |
| 24 VDC TVSS Failure | | | | | | | 2 | | 6 | |
| PLC Communication Failure | | | | | | | 2 | | 6 | |
| PLC Low Battery | | | | | | | 2 | | 6 | |
| | | | | | | | | | | |

**END OF SECTION 28 46 00.1**

November 9, 2016

## SECTION 28 46 00.1 - SECURITY ELECTRONICS CONTROL MATRIX

The Control Matrix is a tool to aid in the programming of the Locking Control System. Each device that is a part of the locking control system is listed in the first column below.

The Interlock Groups in the second column define the sally ports in the facility. If doors are interlocked in a group, only one door can be open in the group at a time without the Touchscreen Control Station (TCS) operator completing extra steps.

The third column shows the Emergency Release groups. There are currently 2 emergency release groups. They are:

Building A or **bldgA**
Building B or **bldgB**

The activation of an emergency release group will open all of the doors associated with the group and hold the locks open. Emergency Release can only be activated from the TCS station.

The Camera Call-Up column defines which camera will appear on the TCS's video spot monitor when an intercom or duress is activated.

The next two columns are for the wireless Personal Digital Assistants (PDAs). Any device that can be controlled or monitored from a PDA is indicated in this column. The PDAs can be enabled and disabled from the TCS station. The PDAs can only operate the devices in the building they are in. PDAs located in building A cannot operate devices in building B and vice versa.

The next two columns are used to define the devices that are controlled from the TCS station. There is one control station at Solano County Training Center. It is located in Security Booth A120 in Building A. This station has primary control. The devices that are controlled by the TCS at Solano County Training Center are listed by building in columns:

Building A or **bldgA**
Building B or **bldgB**

The Card Access Column (**CARD**) distinguishes devices that are a part of the card access system. Some devices are integrated into both the card access and locking control system.

The remaining column is for additional notes that might distinguish a device from a similar device. The notes are as follows:

### CONTROL MATRIX KEYED NOTES

1 TCS has primary control and monitoring.
2 TCS has monitoring only.
3 TCS has takeover capabilities of the control functions of its assigned task group. Stations do not have simultaneous control.
4 When Central Control's Duress is activated, the Central Control station is disabled and must be re-activated from the Security Reset in SEC A106.
5 This device is controlled from the card access system and the locking control system.
6 Activation of this device shall be recorded on the Event Recording Computer.
7 HIGH SECURITY RISK pop up window to appear when this door is signaled to be open.
8 DOOR OPEN TOO LONG pop up window will appear when this door is opened to long.
9 DOOR KEYED OPEN alarm to register when this door is opened by means other than the TCS station.
10 PDA has control and monitoring.
11 PDA has monitoring only.
12 15 second delay egress door.
13 This intercom is part of Best Value Enhancement #9.
14 This card reader is part of Best Value Enhancement #11.
15 This motion detector is part of Best Value Enhancement #22.
16 Motion detector is to have an adjustable timer. Refer to specification Section 284600 for operations.

RFI 0532

SITE - Vehicle Gate Loop Detector Clarification

Only 3 loop detectors per ES301

| Device | Interlk Group | Emerg Release | Camera Call-Up | PDA.A | PDA.B | BLDG A | BLDG B | Card | Keyed Notes | System Note Testing |
|---|---|---|---|---|---|---|---|---|---|---|
| **BUILDING A** | | | | | | | | | | |
| **Loop Detector** | | | | | | | | | | |
| L01 | | | | | | 2 | | | 6 | |
| L02 | | | | | | 2 | | | 6 | |
| L03 | | | | | | 2 | | | 6 | |
| L04 | | | | | | 2 | | | 6 | |
| | | | | | | | | | | |
| **Intercom Stations** | | | | | | | | | | |
| A101.2A | | | A22 | 10 | | 1 | | | 6 | |
| A101.2B | | | A04 | 10 | | 1 | | | 6, 13 | |
| A102A.1A | | | A22 | 10 | | 1 | | | 6 | |
| A102A.1B | | | A21 | 10 | | 1 | | | 6, 13 | |
| A102B.1A | | | A23 | 10 | | 1 | | | 6 | |
| A102B.1B | | | A18 | 10 | | 1 | | | 6, 13 | |
| A103.1A | | | A24 | 10 | | 1 | | | 6 | |
| A103.1B | | | A28 | 10 | | 1 | | | 6, 13 | |
| A103A.1A | | | A23 | 10 | | 1 | | | 6 | |
| A103A.1B | | | A29 | 10 | | 1 | | | 6, 13 | |
| A104A.1A | | | A24 | 10 | | 1 | | | 6 | |
| A104A.1B | | | A17 | 10 | | 1 | | | 6, 13 | |
| A104B.1A | | | A23 | 10 | | 1 | | | 6 | |
| A104B.1B | | | A14 | 10 | | 1 | | | 6, 13 | |
| A109.1A | | | A08 | | | 1 | | | 6 | |
| A109.2A | | | A10 | | | 1 | | | 6 | |
| A110.1A | | | A25 | | | 1 | | | 6 | |
| A113.1A | | | A32 | | | 1 | | | 6 | |
| A113.1B | | | | | | 1 | | | 6 | |
| A120.1A | | | A09 | | | 1 | | | 6 | |
| A121.1A | | | A32 | | | 1 | | | 6 | |
| A121.1B | | | A09 | | | 1 | | | 6 | |
| A121.2A | | | A32 | | | 1 | | | 6 | |
| A121.2B | | | A09 | | | 1 | | | 6 | |
| A121.3A | | | A02 | | | 1 | | | 6 | |
| A121.3B | | | A09 | | | 1 | | | 6, 13 | |
| A122.1A | | | A09 | 10 | | 1 | | | 6, 13 | |
| A128.1A | | | A03 | | | 1 | | | 6 | |
| A128.1B | | | A22 | | | 1 | | | 6 | |
| A129.1A | | | A32 | | | 1 | | | 6 | |
| A129.1B | | | | | | 1 | | | 6 | |
| G01.A | | | A02 | | | 1 | | | 6 | |

| Device | Interlk Group | Emerg Release | Camera Call-Up | PDA.A | PDA.B | BLDG A | BLDG B | Card | Keyed Notes | System Note Testing |
|---|---|---|---|---|---|---|---|---|---|---|
| G01.B | | | A33 | | | 1 | | | 6 | |
| G09.A1 | | | A34 | | | 1 | | | 6 | |
| G09.A2 | | | A34 | | | 1 | | | 6 | |
| G09.B1 | | | ST16 | | | 1 | | | 6 | |
| G09.B2 | | | ST16 | | | 1 | | | 6 | |
| G11.A1 | | | ST17 | | | 1 | | | 6 | |
| G11.A2 | | | ST17 | | | 1 | | | 6 | |
| G11.B1 | | | ST18 | | | 1 | | | 6 | |
| G11.B2 | | | ST18 | | | 1 | | | 6 | |
| | | | | | | | | | | |
| **Individually Controlled Doors** | | | | | | | | | | |
| A101.2 | | **bldgA** | | 10 | | 1 | | 5 | 6 | |
| A102A.1 | | **bldgA** | | 10 | | 1 | | 5 | 6 | |
| A102B.1 | | **bldgA** | | 10 | | 1 | | 5 | 6 | |
| A103.1 | | **bldgA** | | 10 | | 1 | | 5 | 6 | |
| A103A.1 | | **bldgA** | | 10 | | 1 | | 5 | 6 | |
| A104A.1 | | **bldgA** | | 10 | | 1 | | 5 | 6 | |
| A104B.1 | | **bldgA** | | 10 | | 1 | | 5 | 6 | |
| A106.1 | | | | 11 | | 1 | | 5 | 6, 8 | |
| A107.1 | | | | 11 | | 1 | | 5 | 6, 8 | |
| A109.1 | | **bldgA** | | 11 | | 1 | | 5 | 6,8, 12 | |
| A109.2 | | **bldgA** | | 11 | | 1 | | 5 | 6, 8 | |
| A110.1 | | **bldgA** | | 11 | | 1 | | 5 | 6 | |
| A113.1 | | **bldgA** | | 11 | | 1 | | | 6,8,9 | |
| A120.1 | | | | 11 | | 1 | | 5 | 6,8,9 | |
| A121.1 | | **bldgA** | | 11 | | 1 | | | 6,7,8, 9,12 | |
| A121.2 | A1 | **bldgA** | | 11 | | 1 | | | 6,8,9 | |
| A121.3 | | | | 11 | | 1 | | 5 | 6,8,9 | |
| A122.1 | | **bldgA** | | 10 | | 1 | | 5 | 6 | |
| A128.1 | | **bldgA** | | 11 | | 1 | | 5 | 6,7,8, 9,12 | |
| A129.1 | | **bldgA** | | 11 | | 1 | | | 6,8,9 | |
| | | | | | | | | | | |
| **Individually Controlled Gates** | | | | | | | | | | |
| G01 | A1 | | | | | 1 | | | 6,8,9 | |
| G02 | A1 | **bldgA** | | | | 1 | | | 6,8,9, 12 | |
| G09 | A2 | | | | | 1 | | 5 | 6,8,9 | |
| G11 | **BE3** | | | | | 1 | | 5 | 6,8,9 | |

| Device | Interlk Group | Emerg Release | Camera Call-Up | PDA.A | PDA.B | BLDG A | BLDG B | Card | Keyed Notes | System Note Testing |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| **Duress Stations** | | | | | | | | | | |
| A01 (Security Booth A120) | | | | 11 | | 4 | | | 6 | |
| A02 (Interview A123) | | | A12 | 11 | | 2 | | | 6 | |
| A03 (Interview A124) | | | A13 | 11 | | 2 | | | 6 | |
| A04 (Classroom 2B A104B) | | | A14/ A15 | 11 | | 2 | | | 6 | |
| A05 (Classroom 2A A104A) | | | A16/ A17 | 11 | | 2 | | | 6 | |
| A06 (Classroom 1B A102B) | | | A18/ A19 | 11 | | 2 | | | 6 | |
| A07 (Classroom 1A A102A) | | | A20/ A21 | 11 | | 2 | | | 6 | |
| A08 (Life Science Classroom A101) | | | A29/ A31 | 11 | | 2 | | | 6 | |
| A09 (Computer Classroom A103) | | | A28/ A35 | 11 | | 2 | | | 6 | |
| A10 (Life Science Classroom A101) | | | A04/ A30 | 11 | | 2 | | | 6 | |
| | | | | | | | | | | |
| **Monitored Doors and Gates** | | | | | | | | | | |
| A108.1 | | | | | | 2 | | | 6, 8 | |
| A110B.1 | | | | | | 2 | | | 6, 8 | |
| G08 | A2 | | | | | 2 | | | 6,8,9 | |
| | | | | | | | | | | |
| **Paging Zones** | | | | | | | | | | |
| ZONE A | | | | | | 1 | | | 6 | |
| ZONE CLASSROOMS | | | | | | 1 | | | 6 | |
| | | | | | | | | | | |
| **Building A Auxiliary Controls** | | | | | | | | | | |
| Holding A113 Water | | | | 10 | | 1 | | | 6 | |
| Holding A129 Water | | | | 10 | | 1 | | | 6 | |
| ~~**Holding A113 Lights**~~ | | | | ~~**10**~~ | | ~~**1**~~ | | | ~~**6**~~ | |
| ~~**Holding A129 Lights**~~ | | | | ~~**10**~~ | | ~~**1**~~ | | | ~~**6**~~ | |
| | | | | | | | | | | |
| **SEC Closet A106 System Alarms** | | | | | | | | | | |
| UPS Active/Power Failure | | | | | | 2 | | | 6 | |
| UPS Low Battery | | | | | | 2 | | | 6 | |
| UPS Low Voltage | | | | | | 2 | | | 6 | |
| UPS Inverter Power | | | | | | 2 | | | 6 | |

*RFI 0591*

*BLDG A - Solenoid Actuated Valves At Holding Rooms*

*Install the Solenoid Actuated Valves at Holding Rooms per the Sheriff's response to meet the system design intent per Enhancement 18.*





| Device | Interlk Group | Emerg Release | Camera Call-Up | PDA.A | PDA.B | BLDG A | BLDG B | Card | Keyed Notes | System Note Testing |
|---|---|---|---|---|---|---|---|---|---|---|
| UPS Trouble | | | | | | 2 | | | 6 | |
| 120 VAC TVSS Failure | | | | | | 2 | | | 6 | |
| 24 VDC TVSS Failure | | | | | | 2 | | | 6 | |
| PLC Communication Failure | | | | | | 2 | | | 6 | |
| PLC Low Battery | | | | | | 2 | | | 6 | |
| | | | | | | | | | | |
| **BUILIDNG B** | | | | | | | | | | |
| **Intercom stations** | | | | | | | | | | |
| A133.3A | | | B36 | | | | 1 | | 6 | |
| A133.3B | | | B37 | | | | 1 | | 6 | |
| A138.3A | | | B27 | | | | 1 | | 6 | |
| A138.3B | | | B26 | | | | 1 | | 6 | |
| **B154.4A** | | | B49 | | | | 1 | | 6 | |
| **B154.4B** | | | B50 | | | | 1 | | 6 | |
| B129.2A | | | B46 | | | | 1 | | 6 | |
| B129.2B | | | B47 | | | | 1 | | 6 | |
| B129.3A | | | B43 | | | | 1 | | 6 | |
| B129.3B | | | B44 | | | | 1 | | 6 | |
| B133.1A | | | B35 | | 10 | | 1 | | 6 | |
| B133.1B | | | B37 | | 10 | | 1 | | 6 | |
| B133.2A | | | B47 | | 10 | | 1 | | 6 | |
| B135.2A | | | B61 | | | | 1 | | 6, 13 | |
| B135.2B | | | B35 | | | | 1 | | 6 | |
| B135.3A | | | B31 | | | | 1 | | 6, 13 | |
| B135.3B | | | B35 | | | | 1 | | 6 | |
| B136.3A | | | B61 | | | | 1 | | 6 | |
| B136.3B | | | B34 | | | | 1 | | 6 | |
| B136.4A | | | B31 | | | | 1 | | 6 | |
| B136.4B | | | B32 | | | | 1 | | 6 | |
| B138.1A | | | B17 | | 10 | | 1 | | 6 | |
| B138.1B | | | B26 | | 10 | | 1 | | 6 | |
| B138.2A | | | B34 | | 10 | | 1 | | 6 | |
| B140.1A | | | B15 | | | | 1 | | 6, 13 | |
| B140.1B | | | B17 | | | | 1 | | 6 | |
| B140.2A | | | B19 | | | | 1 | | 6, 13 | |
| B140.2B | | | B20 | | | | 1 | | 6 | |
| B141.3A | | | B15 | | | | 1 | | 6 | |
| B141.3B | | | B16 | | | | 1 | | 6 | |
| B141.4A | | | B19 | | | | 1 | | 6 | |
| B141.4B | | | B18 | | | | 1 | | 6 | |

| Device | Interlk Group | Emerg Release | Camera Call-Up | PDA.A | PDA.B | BLDG A | BLDG B | Card | Keyed Notes | System Note Testing |
|---|---|---|---|---|---|---|---|---|---|---|
| B145.3A | | | B14 | | | | 1 | | 6 | |
| B145.3B | | | B03 | | | | 1 | | 6 | |
| B145.6A | | | B21 | | | | 1 | | 6 | |
| B145.6B | | | B06 | | | | 1 | | 6 | |
| B148.1A | | | B03 | | 10 | | 1 | | 6 | |
| B148.1B | | | B13 | | 10 | | 1 | | 6 | |
| B148.2A | | | B16 | | 10 | | 1 | | 6 | |
| B148.3A | | | B14 | | | | 1 | | 6 | |
| B148.3B | | | B13 | | | | 1 | | 6 | |
| B152.2A | | | B49 | | | | 1 | | 6 | |
| B152.2B | | | B48 | | | | 1 | | 6 | |
| B152.3A | | | B53 | | | | 1 | | 6 | |
| B152.3B | | | B45 | | | | 1 | | 6 | |
| B154.1A | | | B48 | | 10 | | 1 | | 6 | |
| B154.1B | | | B50 | | 10 | | 1 | | 6 | |
| B154.2A | | | B60 | | 10 | | 1 | | 6 | |
| B155.1A | | | B62 | | | | 1 | | 6 | |
| B155.1B | | | B60 | | | | 1 | | 6 | |
| B155.3A | | | B56 | | | | 1 | | 6 | |
| B155.3B | | | B59 | | | | 1 | | 6 | |
| | | | | | | | | | | |
| **Individually Controlled Doors** | | | | | | | | | | |
| A133.3 | | **bldgB** | | | 11 | | 1 | 5 | 6,8,9 | |
| A138.3 | | **bldgB** | | | 11 | | 1 | 5 | 6,8,9 | |
| **B154.4** | | **bldgB** | | | 11 | | 1 | 5 | 6,8,9 | |
| B129.2 | | **bldgB** | | | 11 | | 1 | 5 | 6,8,9 | |
| B129.3 | | **bldgB** | | | 11 | | 1 | 5, 14 | 6,8,9 | |
| B129B.1 | | **bldgB** | | | 10 | | 1 | 5 | 6,9 | |
| B133.1 | BE1 | **bldgB** | | | 10 | | 1 | 5 | 6,8,9 | |
| B133.2 | BE1 | **bldgB** | | | 10 | | 1 | 5 | 6,8,9 | |
| B135.2 | | **bldgB** | | | 11 | | 1 | 5 | 6,8,9 | |
| B135.3 | | **bldgB** | | | 11 | | 1 | 5, 14 | 6,8,9 | |
| B135B.1 | | **bldgB** | | | 10 | | 1 | 5 | 6,9 | |
| B136.3 | | **bldgB** | | | 11 | | 1 | 5 | 6,8,9 | |
| B136.4 | | **bldgB** | | | 11 | | 1 | 5, 14 | 6,8,9 | |
| B136B.1 | | **bldgB** | | | 10 | | 1 | 5 | 6,9 | |
| B138.1 | BW2 | **bldgB** | | | 10 | | 1 | 5 | 6,8,9 | |
| B138.2 | BW2 | **bldgB** | | | 10 | | 1 | 5 | 6,8,9 | |
| B140.1 | | **bldgB** | | | 11 | | 1 | 5 | 6,8,9 | |
| B140.2 | | **bldgB** | | | 11 | | 1 | 5, 14 | 6,8,9 | |
| B140B.1 | | **bldgB** | | | 10 | | 1 | 5 | 6,9 | |

| Device | Interlk Group | Emerg Release | Camera Call-Up | PDA.A | PDA.B | BLDG A | BLDG B | Card | Keyed Notes | System Note Testing |
|---|---|---|---|---|---|---|---|---|---|---|
| B141.3 | | **bldgB** | | | 11 | | 1 | 5 | 6,8,9 | |
| B141.4 | | **bldgB** | | | 11 | | 1 | 5, 14 | 6,8,9 | |
| B141B.1 | | **bldgB** | | | 10 | | 1 | 5 | 6,9 | |
| B144.1 | | | | | 11 | | 1 | 5 | 6,8,9 | |
| B145.3 | | **bldgB** | | | 11 | | 1 | 5 | 6,8,9 | |
| B145.6 | | **bldgB** | | | 11 | | 1 | 5, 14 | 6,8,9 | |
| B145B.1 | | **bldgB** | | | 10 | | 1 | 5 | 6,9 | |
| B147.1 | | **bldgB** | | | 11 | | 1 | 5 | 6,8,9 | |
| B148.1 | BW1 | **bldgB** | | | 10 | | 1 | 5 | 6,8,9 | |
| B148.2 | BW1 | **bldgB** | | | 10 | | 1 | 5 | 6,8,9 | |
| B148.3 | | **bldgB** | | | 11 | | 1 | 5 | 6,8,9 | |
| B150.1 | | | | | 11 | | 1 | 5 | 6,8,9 | |
| B152.2 | | **bldgB** | | | 11 | | 1 | 5 | 6,8,9 | |
| B152.3 | | **bldgB** | | | 11 | | 1 | 5, 14 | 6,8,9 | |
| B152B.1 | | **bldgB** | | | 10 | | 1 | 5 | 6,9 | |
| B153.1 | | **bldgB** | | | 11 | | 1 | 5 | 6,8,9 | |
| B154.1 | BE2 | **bldgB** | | | 10 | | 1 | 5 | 6,8,9 | |
| B154.2 | BE2 | **bldgB** | | | 10 | | 1 | 5 | 6,8,9 | |
| B155.1 | | **bldgB** | | | 11 | | 1 | 5 | 6,8,9 | |
| B155.3 | | **bldgB** | | | 11 | | 1 | 5, 14 | 6,8,9 | |
| B155B.1 | | **bldgB** | | | 10 | | 1 | 5 | 6,9 | |
| B156B.1 | | | | | 11 | | 1 | 5 | 6,8,9 | |
| | | | | | | | | | | |
| **Individually Monitored Gates** | | | | | | | | | | |
| G12 | BE3 | | | | | | 2 | | 6,7,8,9 | |
| | | | | | | | | | | |
| **Duress Stations** | | | | | | | | | | |
| B01 (Classroom B148) | | | B13 | | 11 | | 2 | | 6 | |
| B02 (Classroom B138) | | | B26 | | 11 | | 2 | | 6 | |
| B03 (Classroom B133) | | | B37 | | 11 | | 2 | | 6 | |
| B04 (Classroom B154) | | | B50 | | 11 | | 2 | | 6 | |
| | | | | | | | | | | |
| **Monitored Doors** | | | | | | | | | | |
| B129.1 | | | | | 11 | | 2 | | 6,8 | |
| B134.1 | | | | | 11 | | 2 | | 6,8 | |
| B135.1 | | | | | 11 | | 2 | | 6,8 | |
| B136.1 | | | | | 11 | | 2 | | 6,8 | |
| B136.2 | | | | | 11 | | 2 | | 6,8 | |
| B139.1 | | | | | 11 | | 2 | | 6,8 | |
| B140.3 | | | | | 11 | | 2 | | 6,8 | |

| Device | Interlk Group | Emerg Release | Camera Call-Up | PDA.A | PDA.B | BLDG A | BLDG B | Card | Keyed Notes | System Note Testing |
|---|---|---|---|---|---|---|---|---|---|---|
| B140.4 | | | | | 11 | | 2 | | 6,8 | |
| B140.5 | | | | | 11 | | 2 | | 6,8 | |
| B141.1 | | | | | 11 | | 2 | | 6,8 | |
| B141.2 | | | | | 11 | | 2 | | 6,8 | |
| B141.5 | | | | | 11 | | 2 | | 6,8 | |
| B145.1 | | | | | 11 | | 2 | | 6,8 | |
| B145.2 | | | | | 11 | | 2 | | 6,8 | |
| B145.4 | | | | | 11 | | 2 | | 6,8 | |
| B145.5 | | | | | 11 | | 2 | | 6,8 | |
| B149.1 | | | | | 11 | | 2 | | 6,8 | |
| B152.1 | | | | | 11 | | 2 | | 6,8 | |
| **B155.2** | | | | | **11** | | **2** | | **6,8** | |
| | | | | | | | | | | |
| **Motion Detector** | | | | | | | | | | |
| B01 | | | B03, B06,B07 | | | | 2 | | 15,16 | |
| B02 | | | B03, B06,B07 | | | | 2 | | 15,16 | |
| B03 | | | B09, B16,B18 | | | | 2 | | 15,16 | |
| B04 | | | B09, B16,B18 | | | | 2 | | 15,16 | |
| B05 | | | B17, B20 | | | | 2 | | 15,16 | |
| B06 | | | B17, B20 | | | | 2 | | 15,16 | |
| B07 | | | B32, B34 | | | | 2 | | 15,16 | |
| B08 | | | B33, B35 | | | | 2 | | 15,16 | |
| B09 | | | B44, B47 | | | | 2 | | 15,16 | |
| B10 | | | B45, B48 | | | | 2 | | 15,16 | |
| B11 | | | B59, B60 | | | | 2 | | 15,16 | |
| | | | | | | | | | | |
| **Paging Zones** | | | | | | | | | | |
| ZONE B | | | | | | | 1 | | 6 | |
| ZONE PAD | | | | | | | 1 | | 6 | |
| | | | | | | | | | | |
| **SEC Closet B150 System Alarms** | | | | | | | | | | |
| UPS Active/Power Failure | | | | | | | 2 | | 6 | |
| UPS Low Battery | | | | | | | 2 | | 6 | |
| UPS Low Voltage | | | | | | | 2 | | 6 | |
| UPS Inverter Power | | | | | | | 2 | | 6 | |
| UPS Trouble | | | | | | | 2 | | 6 | |
| 120 VAC TVSS Failure | | | | | | | 2 | | 6 | |

| Device | Interlk Group | Emerg Release | Camera Call-Up | PDA.A | PDA.B | BLDG A | BLDG B | Card | Keyed Notes | System Note Testing |
|---|---|---|---|---|---|---|---|---|---|---|
| 24 VDC TVSS Failure | | | | | | | 2 | | 6 | |
| PLC Communication Failure | | | | | | | 2 | | 6 | |
| PLC Low Battery | | | | | | | 2 | | 6 | |
| | | | | | | | | | | |

**END OF SECTION 28 46 00.1**

# SECTION 28 4600.2 - EVENT RECORDING SYSTEM

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Scope of work: Furnish and install all components for an Event Recording System integrated with the security systems as indicated on the plans and described herein.

B. The ESC as defined in Section 280500 Common Work Results for Electronic Safety and Security shall be responsible for providing and coordinating this system.

### 1.2 SYSTEM DESCRIPTION

A. Event Recording Computer: The Event Recording Computer (ERC) shall be a computer terminal with the appropriate cards and programming incorporated into it to form an integrated unit to serve as an operator interface for the PLC system.

B. Basic Operation: All critical events monitored and controlled by the PLC will be recorded with Operator Identification, event, time and date on the ERC‘s hard drive.

C. Graphic Plans: The ERC shall provide graphic representations of each area to aid in defining points recorded. Each graphic is to be a 1/8” scaled depiction of each area. Graphics are to be sized for proper operation of control icons and useful building representations.
   1. Key Plan: A facility key plan will be available on all graphic screens. Touching an area of the key plan will call up a graphic of the area providing control icons and more detailed building information. Icons as described below will be located on the plan to graphically locate where in the facility the controlled item is installed. The area plans are the second level of graphic zoom.
   2. Detail Window: Detail plan windows shall be provided for any section of the graphic plan where there is a high concentration of controls making it impossible to properly indicate all icons. This shall be the second and last level of graphical zoom.

### 1.3 REPORT FUNCTIONS

A. System Historical Journal:
   1. The system shall maintain a history file on the hard disk. The history data shall be organized into a logically circular file such that the most recent 500,000 (minimum) transactions are accessible directly from the hard disk without having to resort to archival media. Points to be recorded are as follows:
      a. Staff duress activation.
      b. Staff duress reset.
      c. Unlock commands from Touchscreen Control Station (TCS) or Personal Digital Assistant (PDA) units.
      d. Emergency Release Activation
      e. Intercom call placed.
      f. Intercom call answered by TCS or PDA.
      g. Intercom call reset.

h. TCS controlled doors opened by means other than the TCS.
i. Monitored door activation.
j. Vehicle loop activation.
k. 120 VAC TVSS failure.
l. Loss of power.
m. Interlock override activation.
n. Alarm reset.
o. Signal Silence.
p. TCS/PDA operator log in and log out.

2. All information shall be stored in an SQL database.
3. Each history entry in the journal shall be marked with the date and time of its occurrence, the name of the operator logged on (if applicable), and the terminal from which the event was initiated (if applicable).
4. The system shall provide a method by which incremental sections of the historical journal may be backed up to compact disk, or flash memory for storage and later recall. The system journal archive method shall be sufficient to assure that no events are lost in the transfer from hard disk to the archive media.
5. In addition, the journal archive method shall preserve the contents of all data in the on-line portion of the historical journal until the disk space occupied by data must be reclaimed for use in an oldest-first order.
6. Data shall be stored on the ERC hard drive and be available for a minimum of 365 days. At the end of the 366th day, the day 1 data shall automatically be deleted from the data base. Each day following this point, the oldest days data shall be automatically deleted from the hard drive as the new day's data is preserved.

B. Operator Comments:
1. The system shall allow operator comments to be entered from the TCS for any duress alarm condition.
a. When the alarm is active, allow the operator to select an icon and enter up to 1000 characters of information for the event.
b. Store the operator comment tagged to the event for as long as the event is stored.
c. When the tagged event is deleted or overwritten, delete the comment.
2. Provide memory for 10,000 operator comments.
3. Provide the operator the ability to search operator comments for a particular word or character string.

C. Historical Reports:
1. The system shall be capable of producing the following reports of historical events over a specified time range, both individually and in any combination from the historical journals.
2. Report of alarms or group of alarms. As a minimum, provide reporting of the following alarms:
a. Staff Duress Activation
b. Staff Duress Clear
c. TVSS Fault
d. Power Fault
3. Report of event activation for a selected event or group of events. As a minimum, provide reporting of the following events:
a. Emergency Release Activation

b. Interlock Override
c. Controlled Door / Gate Lock Activation
d. Controlled Door Gate Slider Operation

4. Report of operator comments.
5. Each TCS/PDA activation shall be recorded with time, date, event, and operator identification number. Non TCS/PDA events shall be recorded with time, date, and event.
6. Report of manual operator overrides actions (acknowledge, reset, manual door unlocks, etc.).
7. Report of automatic system actions (automatic door unlocks).
8. The system shall be capable of generating these reports in a format that is user defined. Search and sort capacity shall include sorts by the field parameters defined by the user, sorts alphabetically and sorts numerically.
9. The ESC shall create a list of pre-defined reports. The pre-defined report shall only require that the date and time be determined before generating the report. At a minimum provide the following pre-defined report options:
   a. Emergency Release Activation
   b. Interlock Override Activations
   c. Door alarms
   d. Duress Alarms
   e. Trouble Alarms

D. Preventive Maintenance Reports
   1. The system shall be capable of keeping running totals and summations.
   2. The system shall be capable of producing reports identifying the number of lock activations by device to identify locks requiring maintenance.

1.4 NETWORKING

A. The Event Recording System shall be part of the Security Systems local area network to include the UPS, TCS, and PLC systems. All events from these systems will be recorded to the ERC computer. The ERC computer will not be accessible to the owner's LAN.

B. The Security and PLC systems will not be accessible from the owner's LAN over the ERC computer network connection.

1.5 SUBMITTALS

A. Provide basic submittals as required by Section 280500 Common Work Results for Electronic Safety and Security and by the General Contract requirements.

B. In addition, submit color prints of all graphic screens for approval.

C. Submit a list of all reportable alarm points.

D. Submit a flow chart of all proposed screens.

1.6 SYSTEMS INTEGRATION

A. Integrated Systems: The Event Recording System shall be integrated with the other systems including, but not limited to:

1. The TCS/PDA.
2. The Door Locking Control system.
3. PLC system.
4. Intercom System.
5. IP video system
6. UPS system.

1.7 SOFTWARE BACKUP

A. This unit shall provide backup and storage for all custom programs in a program folder entitled BACKUP.

B. Backup program folder shall contain a copy of the backup software for each TCS/PDA so that the programming can be recreated if the backup is lost or damaged.

**PART 2 -** PRODUCTS

2.01 MINIMUM HARDWARE REQUIREMENTS:

A. The ERC machine shall be equal to the Dell PowerEdge T430 Tower Server which consists of the following:
1. An IBM™ compatible computer with an Intel™ Xeon class E5 microprocessor chip set or equivalent. The operating speed shall be a minimum of 2.4 GHz, 16GB DDR4 SDRAM and a minimum of 20MB of Cache shall be provided.
2. Windows Server 2012R2 Standard Edition.
3. Two primary 2GB SATA 6.0 Gb/s Hard Drive.
4. All necessary boards for integration to local area network, PLC's, sound system, etc., shall be provided.
5. Minimum 16X DVD-ROM Read/Write CD/DVD drive.
6. Dell 18.5 KVM console including keyboard, monitor, and mouse
7. Gigabyte Network Interface Card.
8. All necessary boards for integration to local area network, PLC's shall be provided.

B. The ESC shall rackmount the ERC in A106.

2.02 MINIMUM SOFTWARE BASE REQUIREMENTS

A. The software will be a*n Off-the-She*lf package available through a distributor network. The Off-the-Self software will be programmed and tailored to the specified functions and features described herein and shown on the drawings. The database shall be programmed in SQL.

B. The software will provide common database functions, templates, and forms.

C. All software licenses shall be transferred to the Owner at completion of the project. This shall include, but not be limited to all original installation disks, software manuals, equipment

manuals, etc., all project specific application software shall be transferred at the end of warranty period.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

A. Coordination with Other Trades: The contractor shall coordinate the work of this section with that of other divisions as required to ensure that the entire work of this project will be carried out in an orderly, complete and coordinated fashion.

B. Software: All source code, programming keys, and printouts of the operating program shall be furnished to the Owner at the end of the project.

C. UPS: Furnish and install a UPS to power all ERC components. This shall be in addition to providing emergency power.

D. Listing: All wiring and raceways shall be listed for the intended installation and installed in strict accordance with the National Electric Code as required by the conditions of where it is installed. This includes but is not limited to ratings for riser, plenum, or wet installations.

### 3.02 FIELD QUALITY CONTROL

A. All functions specified above shall be individually activated and the result documented. Test reports shall be printed lists. Note each function as “pass” or “fail”. The completed test reports shall be copied and submitted to the engineer prior to final inspection.

B. All functions shall be demonstrated for the Owner’s, Architect’s, and Consultant’s representative.

**EVENT RECORDING VERIFICATION AND CHECK-OUT FORM**

✓ = OK

**Job #**
**Job Name:**
**Panel #**

| **FIELD TEST CODE:** | | **REPAIR CODE:** | |
|---|---|---|---|
| A - No status change | M - | 1-SSI | Software Test By:_____ Date_____ |
| B- No power to ERC | N - | 2-ELECTRICIAN | |
| C -Software problem | O - | 3-IRONWORKER | Hardware Test By:_____ Date_____ |
| D -Not installed | P - | 4-CARPENTER | |
| E - | Q - | 5-OWNER/REP | System Test By:_____ Date_____ |
| F - | R - | 6 -ENG | |
| G - | S - | 7 - | Design Engineering By:_____ Date_____ |
| H - | T - | 8 - | |
| I - | U - | 9 - | Wiring By:_____ Date_____ |
| J - | V - | 10 - | |
| K - | W - | 11 - | Field Test By:_____ Date_____ |
| L - | X - | 12 - | |

| | | | | | | | **ON-SITE** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ICON ID#** | **ICON TYPE** | | | | **SOFT-WARE TEST** | **ERC TEST** | **FIELD TEST CODE** | **REPAIR CODE** | **RE-CHECK "X"** | **FIELD CHECK OUT NOTES** | **PROBLEM RESOLVED (BY/DATE)** |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

3.03 SOFTWARE:

A. For the ERC, furnish to the owner uniquely identified:
   1. One (1) separate back-up CD or Disc for the ERC program. Label the disk with the project name, programs, programmer, and revision date.

B. Furnish a single Microsoft Word file detailing all passwords for each system. This file shall also identify the following by system and panel:
   1. The file name of each program required for restoration of each failed system.
   2. The passwords required for each system and software.
   3. The name of the programmers for each custom software program.
   4. The date of the last program change.

C. Furnish a digital copy of the facility's Operation and Maintenance Manual in PDF format on the ERC. Refer to Specification section 280500.

D. Furnish a digital copy of the As-Built documents in PDF format on the ERC. Refer to Specification section 280500.

E. Furnish digital copies of the facility training videos in a Windows Media file format (.wmv or equal) on the ERC. Files shall be easily viewable on the ERC's media player for training staff. Refer to Specification section 280500.

3.04 SPARE PARTS:

A. Spare parts shall be packaged in protective packing material. Box spare parts for easy storage and clearly identify the contents of each box on all four sides of each container.

B. Furnish the following:

   1. 25 Blank Read Write CD’s

**END OF SECTION 284600.2**

# SECTION 28 46 19 - PROGRAMMABLE LOGIC CONTROLLER (PLC)

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Scope of work: Furnish and install all components for a complete and integrated Programmable Logic Controller (PLC) integrated with the security systems as indicated on the plans and described herein. The PLC system shall be a standalone system similar in form and function to the existing system in the Stanton facility. Although such work may not be specifically shown or specified, all supplementary or miscellaneous items appurtenances, and devices incidental to, or necessary for a sound, secure, complete, and compatible installation shall be furnished and installed as part of the work. Any case of error, omission, discrepancy, or lack of clarity shall be promptly identified for clarification prior to the bid due date.

B. The ESC as defined in Section 280500 Common Work Results for Electronic Safety and Security shall be responsible for providing and coordinating this system.

C. Provide a new Touchscreen Control Station (TCS) as indicated on the plans. This station shall function as the human-machine interface for the PLC system. Refer to Specification sections 284600 and 284600.2 for additional information.

D. Integrate all new PLC's, TCS, PDAs, and IP Video system into a single control system enabling the staff to control and monitor all locations.

E. Provide a separate and dedicated fiber optic network for PLC communication.

F. **Provide a wireless security network consisting of wireless access points, CAT6A cabling, network switches, and Personal Digital Assistants (PDA) for a mobile human-machine interface for the facility.**

G. **PDAs: Provide ten (10) PDA tablets as the for operating the locking control system. Refer to specification 284600 for more details on the PDA.**

### 1.2 SYSTEM DESCRIPTION

A. PLC: The PLC network shall control all of the logic functions of the operator interface stations for control and annunciation of locking control and security systems.

B. PLC CPU: The PLC CPU shall provide the necessary logic and timing functions, memory, software variables, and communication capabilities required to meet the functions described in the specifications. Each PLC location shall be provided with a CPU to allow independent degraded operations in the event of loss of network communications.

C. Master Clock: Furnish and install programming to automatically update the PLC clock for daylight savings time across all PLC's, TCS, and IP Video computers. The current time shall be transmitted to all PLC CPU's in the system. All system clocks shall be updated within 2 seconds of a change being entered at the main PLC master clock.

D. The PLC system shall be industrial general purpose in nature, not custom designed and built for this isolated application. The PLC shall be generally non-location specific in its construction. The controller shall be operationally customized and made location specific by installing the applicable software, and making the I/O interface board's system specific. All components shall be manufacturer's standard modules.

E. The PLC shall accomplish emergency release by staggering all unlock commands to minimize surges. Up to three motorized locks may be grouped together and released simultaneously. Solenoid locks shall be released individually.

F. In a single emergency release grouping, all doors shall unlock within sixty (60) seconds of the command being initiated.

G. Furnish and install a complete PLC in each PLC rack noted on the plans.

H. Removable Media: Each PLC CPU shall have a slot for a removable memory card, which allows the PLC program to be offloaded for storage.

1.3 SYSTEMS INTEGRATION

A. The PLC units shall be integrated with the other systems including, but not limited to:
1. Intercom system.
2. Touchscreen Control Station
3. Access Control system.
4. IP Video system.
5. UPS system.

1.4 SUBMITTAL

A. The submittal of this section is to be provided with other sections defined in 280500 Common Work Results for Electronic Security and Safety. All sections defined in 280500 are to be submitted at the same time and in accordance with the specification. Refer to that specification for additional information.

1.5 WARRANTY

A. The warranty of this section is to be provided with other sections defined in 280500 Common Work Results for Electronic Security and Safety. All sections defined in 280500 are to be submitted at the same time and in accordance with the specification. Refer to that specification for additional information.

1.6 OWNER TRAINING

A. The owner training of this section is to be provided with other sections defined in 280500 Common Work Results for Electronic Security and Safety. All sections defined in 280500 are to be submitted at the same time and in accordance with the specification. Refer to that specification for additional information.

## PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Acceptable system manufacturers:
   1. **Basis of Design: Status Automation, Abbotsford, BC; 604-859-1892**
   2. Accurate Controls, Ripon, WI; 920-748-6603.
   3. CML Security, Erie, CO: 720-466-3650
   4. Com-Tec, Inc., Greenville, WI; 920-749-2840.
   5. Cornerstone Security Electronics, Decatur. AL; 256-560-4207
   6. Metroplex Control Systems, San Antonio TX; 210-495-5245.
   7. Sierra Detention Systems, Brighton, CO 303-278-6879

***Note: Approval as an acceptable system manufacturer does not relieve the manufacturer from furnishing all materials as herein specified.***

B. Except as otherwise specified herein, the equipment and materials of this Section shall be products of a single manufacturer engaged in the production of logic control systems for industrial applications for a minimum of ten (10) years. Controllers manufactured by the following are acceptable:
   1. GE Fanuc
   2. Omron CS Series
   3. Modicon by Schneider Electric

2.2 WIRELESS SECURITY NETWORK

A. Furnish and install an aggregating switch equal to Cisco Catalyst 3850 series switch in SEC closet A106 and SEC closet B150. Furnish and install all power supplies, hardware, software, and access point licenses required for a fully functional system. Switches should be connected with link aggregation (NIC Teaming) as detailed on ES503.

B. Furnish and install a Cisco Aironet 1850 Series Wireless Access Points (WAPs) for all internal locations indicated on the ES plans. WAPs shall be rated for the environment in which it is installed. WAPS shall have CAT6A cable back to the nearest SEC closet.

C. Furnish and Install a Cisco Aironet AIR-AP1572IC-x-K9 Wireless Access Point for all external locations indicated on the ES plans.

D. Furnish and install all mounting brackets and licensures that are required.

E. Provide 10 Samsung Galaxy Tab A tablets for operating the locking control system. Galaxy tablets shall be fully integrated with the existing Jail Management System (JMS) system provided by ATIMS. ATIMS will assist the ESC in integrating the JMS.

2.3 GENERAL

A. Programmable logic control system shall control all input/output functions of the TCS station.

B. The programmable logic control system shall be designed so that each PLC operates totally independent of one another. Failure or loss of any controller shall not hamper the operation of any other controller.

C. The programmable controller and I/O modules shall be of modular construction and be capable of being rack mounted. Controller and I/O racks shall be capable of being front or rear mounted.

D. All modules must be key coded to ensure proper slot placement and polarity. All identical function modules shall be coded alike.

E. The controller shall be constructed to withstand as a minimum, the following climatic conditions without the need for special enclosures or additional environmental control equipment such as fans or air conditioning.
1. Temperature: 0 to 60 C (operating), -20 to 70 C (storage)
2. Humidity: 10 to 90% r. h. (non-condensing)

F. Controller shall be capable of operating over a voltage range of 88-132V with a frequency of 45-63 Hz.

G. Where more than one controller is used, all controllers shall be of one single manufacturer and if different size controllers are used, these must be fully compatible.

H. All controllers shall share the same control language and I/O structure.

I. All controller and I/O structures of a single manufacturer shall be capable of being mounted on the same size fixing centers to allow for larger capacity controllers to be installed in the future should the facility require an expansion beyond the limits specified in the original contract documents.

J. Programmable controller manufacturers must guarantee the availability of replacement/spare parts for a minimum of ten (10) years.

K. All input/output modules and housings must be of a standard type and be fully interchangeable with all size controllers.

L. All controllers shall have built-in comprehensive self-test and self-diagnostic capabilities to ensure reliable operation.

M. All controllers shall have built-in status indication of power supply voltages and controller healthy signal to show proper operation.

N. All I/O cards shall be 24V DC and each card shall have as minimum, sixteen (16) discrete circuits. These circuits shall be rated such that they have a minimum of 50% more current capacity than required by the respective I/O devices connected to them.

O. All I/O cards and modules for the unlocking of doors shall be of **the "sourcing" type only.**

P. Controllers must be capable of driving local I/O racks, where local is defined as up to one hundred (100) feet from the control unit, without the need for further intelligent interface modules or additional power supplies.

Q. When required, the system must be capable of controlling remote I/O up to a distance of ten kilometers (10km) from the controller, using high-speed links with a minimum data rate of 1.5 millimeters baud. Communications over this link shall be accomplished using twisted pair wires with an overall shield.

R. Fiber Optic Modules:
1. Furnish and install all fiber optic modules required for proper system operation.
2. Modules to be located in PLC CPU rack with continuous fiber through to the next node.
3. The PLC fiber optic communication link shall be installed in a two fiber self healing "loop" configuration thus eliminating any "single" point of failure from taking down the entire PLC system.

S. In each security electronics room, furnish and install an Ethernet switching hub. Provide sufficient Category 6A ports to connect to each security UPS, each PLC, each Wireless Access Point, and each TCS.

2.4 FUNCTIONAL REQUIREMENTS

A. The system application program and operating software and fixed database shall be stored in EEPROM.

B. Memory battery backup for general purpose ram shall be for a minimum period of twenty-four (24) months in the event of a power failure.

C. The controllers shall provide all necessary logic functions, timing functions, input points, output points, memory, communication capabilities, and software for the operating features shown in the contract documents.

D. Functions shall include but not be limited to the following which can be implemented in bit logic, word logic, or a mixture of both. The combination of said logic in sufficient levels, variations, and quantities must provide the operating features shown in the contrast documents.
1. Logical AND, OR, XOR and INVERT
2. On/Off Delay
3. Counters
4. Timers
5. Sequencers
6. Four Function Math (Add, Subtract, Multiply, Divide)
7. VCD Input and Output
8. Contacts
9. Coils
10. Block Instructions (conditional jumps)
11. Group Logic Functions
12. Array Math Functions

E. Communications capability shall be provided in logic controllers to allow serial communication between distributed controllers, and ASCII serial devices. Serial communications shall be RS232, RS422, or 20 mA and shall operate at selectable speeds from 300 to 19,200 baud.

F. The logic controllers shall be capable of communication (if required) to other controller via industry standard Ethernet LAN network utilizing non-proprietary protocols.

G. The following modes of operation of the CPU must be selectable via a key operated switch or programming software commands:

1. PROGRAM – Processor is not scanning program in memory and all outputs are held OFF.
2. MONITOR – Processor is executing program and changes in user memory and data memory are allowed.
3. RUN – Processor is executing program in memory and outputs are controlling to the program. No editing of data registers are allowed.

H. The above settings shall require either a key, or programming console with a key, or programming software loaded on a computer to change the operating mode of the CPU.

I. The processor shall incorporate extensive self-diagnostic features that will not half the processor. In addition, separate visual indicators will annunciate at the following conditions.
1. POWER – Logic Power is applied to the CPU and I/O rack from the power supply.
2. RUN – Processor is executing the program in memory and outputs are being controlled according to the program.
3. OUTPUT INHIBIT – Processor is executing program in memory according to input status, but outputs are being held in the OFF state.
4. ALARM – A non-fatal error (such as a low memory battery condition) has occurred in the PLC hardware or program software. The PLC is still running and the outputs are being controlled according to the program.
5. ERROR – A fatal error (such as a memory parity error) has occurred, the CPU is not scanning the program and the outputs are held in the OFF state.

J. In addition to visual self-diagnostic indicators (LED's), the processor shall have a specifically designated block of at least 100 internal diagnostic words and bits. These shall provide more detailed system status and fault diagnostic information accessible by programming equipment or intelligent peripherals.

K. The processor must contain an error log area. This area must be able to log what error occurred and when the error happened, giving exact time and date. This area must be able to store a minimum of 1000 records.

L. At a minimum, the internal diagnostic registers shall provide the type of digital (input or output) or intelligent (analog, ASCII, etc.) I/O unit inserted in console or programming software.

M. The program storage medium shall be Battery Backed Random Access Memory (RAM). The memory shall be housed in the same enclosure as the processor.

N. Each Network Interface unit for each PLC shall not consume more than one I/O slot in the main PLC rack.

O. The Network Interface units on each of the PLC's shall be powered directly by the terminals located on the rack across the backplane like the other I/O units on that rack. In addition, the Network Interface units shall have auxiliary power supply terminals located on the rack, so

that it can be powered separately from some uninterruptable source in the event of a CPU power supply failure.

P. The data rate of the network shall not be less than 2 millions B.P.S. This data rate will remain the same regardless of the number of nodes on the network loop.

Q. The network shall accommodate at least 62 nodes on any network loop.

R. The transmitted data packets from any node must be capable of carrying not less than 512 bytes of data.

S. The PLC and network system shall be designed so that each PLC system will accept at least four Network Interface Units operating simultaneously on their racks.

T. Any node on the network must be able to send data to every other node on the network simultaneously.

U. Using a single command, a network node can communicate with other nodes on three network levels: Nodes on the local network, nodes on the network connected directly via a gateway/bridge, and nodes on networks separated by one other network (i.e., connected via two network gateways/bridges).

V. The logic control system installed I/O shall be no greater than 80% of the controller's capacity.

W. The logic control system shall be supplied with 20% spare memory capacity available after completion of system software required by the contract documents for future system expansion.

X. Standard PLC communication protocols confirmed by a third party are acceptable for lower level controls. Protocols shall provide a means of supervision to annunciate loss of communication.

2.5 ELECTRONIC CONTROL RELAY SYSTEM

A. The electronic control relay system will perform actual switching of power to locks, intercom, paging, etc. as required and shall be capable of interfacing with other systems. All relays shall be mounted in suitable enclosures with the capability of key lockable doors and removable steel mounting plates if required. The cabinets shall be sized as required to adequately accommodate the equipment housed therein and shall conform to the space requirements indicated on the plans. The cabinets shall be installed as shown on contract drawings.

B. Class 1 Circuit control Relays: The control relays shall be electro-mechanical type that are rated for at least 50% more current capacity than required for any given steady state control function, but in no case less than 10 amps for power control functions. The relays shall be capable of operating on an input signal of 24 VDC and the output shall be capable of switching the required voltage and current for the intended applications. The unit shall have a minimum of 2500 VAC isolation between the input and output.

C. Class 2 Circuit Control Relays: The control relays shall be electro-mechanical type that are rated for at least 50% more current capacity than required for any given steady state control function, but in no case less than 2 amps for power control functions. The relays shall be capable of operating on an input signal of 24 VDC and the output shall be capable of switching the required voltage and current for the intended applications. The unit shall have a minimum of 2500 VAC isolation between the input and output.

D. Each relay for locking control shall be individually fused to meet California Electric Code distribution requirements and to protect the relay and other circuitry from a short circuit failure at the lock.

E. Each relay rated at 4 amps or higher shall be socket mounted to facilitate field replacement.

F. Provide individual relays for each 120VAC man gate. Locate these relays separately from all other door lock control relays within the equipment rack. Individually fuse each 120VAC current carrying door lock wire with a minimum 4 amp fuse.

G. Indicators on relay base sockets must be rated for the appropriate load. LED indicators on 120VAC relay base sockets are required to function without external resistors, diodes, or other means of draining excess voltage.

H. All relays and terminations are to be clearly labeled to show all field connections.

2.6 TRANSIENT SURGE SUPPRESSION

A. Acceptable manufacturers are as follows:
1. Northern Technologies Incorporated
2. DITEK
3. PolyPhaser Corporation
4. Transtector

B. Miscellaneous Controls: Provide surge protection as indicated on the plans for miscellaneous control circuits that leave the building. Provide surge protectors equal to Northern Technologies series PLP-s units matched to the voltage of the circuit suppressed. The suppressors shall have a peak pulse power dissipation rating of 10 joules each mode, minimum.

C. Security System Power: Provide surge protection for all 120 volt emergency power connections powering logic and control equipment. Device shall be equal to Northern Technologies TCS-HWR series rated for the power of the circuit suppressed. The suppressors shall have a peak pulse power dissipation rating of 300 joules L-N, minimum. Units shall provide a dry contact monitored by the security system and identified by electrical panel circuit number.

D. Clearly identify at each rack location all 120VAC power sources.

2.7 EQUIPMENT ENCLOSURES

A. Acceptable Manufacturers:
1. Hammond Co.
2. Lowell

B. Cabinets: Mount equipment in minimum 83" high by 27" deep by 23" wide free standing cabinets as indicated on the plans equal to the Lowell LSER-4427.

1. All racks shall be rated for the seismic requirements of the project, refer to Specification section 280548. Racks shall be constructed of cold rolled steel and provide standard mounting rails for 19" rack mounted equipment.
2. Conduit shall enter from the top.
3. Low voltage wiring shall be separated from 120 volt wiring.
4. PLC equipment may be mounted with intercom or IP video control equipment.
5. Furnish and install solid metal doors for access to both the front and back. Doors shall be minimum 16 gauge flush mounted with air louvers and flush pulls.
6. Side panels shall be a minimum of 16 gauge flush mount.
7. Both front and rear doors shall be provide with key locks.
8. Furnish and install ventilation fans as required to enable proper ventilation for the equipment.
9. Coordinate cabinet power with and Division 26.
10. Furnish and install blank plates by manufacturer to provide closure on all unused rack sections.
11. Furnish and install all seismic supports for computers, monitors, etc.

## 2.8 DURESS STATION

A. Button: Furnish and install a red mushroom button mounted on a single gang wall plate. Mushroom button shall latch when depressed and require a key reset. Mount at 4 feet above finished floor unless indicated otherwise on plans. If millwork is provided, locate the switch where it is easily accessible by the intended user, but hidden from public view.

B. Switch shall be as follows:
1. Mushroom head key released latching push button equal to IDEC model HW1B-X4F10-R with plastic bezel and one normally CLOSED contact.
2. Mushroom guard shall be equal to IDEC model HW9Z-KG2-TK2120. Furnish and install where indicated on the plans.
3. Faceplate shall be 11 gauge stainless steel attached to box with security screws.

C. Keys: Furnish four duress reset keys for project.

## 2.9 DOOR MONITOR

A. Where a door is to be monitored, but no door position switch is provided, furnish and install a door contact equal to Sentrol 2707A-L hermetically sealed reed switch. Mount to side opposite of the corridor where possible.

B. Unit shall provide a three-foot flexible stainless steel cable. Surface mount sealed switch on the secure side of the door and monitor position.

C. Reed switch shall provide a form C contact and handle up to .25 amps at 30 volts.

D. Reed switch shall function properly with an installed gap of up to three inches.

## 2.10 VEHICLE LOOP DETECTOR

A. Acceptable Manufactures:
   1. EMX Industries

B. Equipment.
   1. Preformed Vehicle Detection Loop: Provide vehicle detection loops model PR-XX-YY where XX is the loop size and YY is the lead length as indicated on the plans. Provide features as follows:
      a. One continuous length of wire through loop turns and lead-in.
      b. Machine twisted lead-in with a minimum of 12 turns per foot.
      c. Ease of 45° or even 90° turns in frigid weather.
      d. Loop wires are securely held together with a polypropylene back tape.
      e. Minimum number of turns: 3.0.
   2. Single Loop Controller: Provide vehicle loop controllers as indicated on the plans equal to LP D-TEK controller.
   3. Detector Loop Sealant: Provide vehicle detection loop sealant as needed equal to National Loop Company Q-Seal 290. Provide features as follows:
      a. For use in both asphalt and concrete pavements.
      b. Cures in approximately 3 hours at 77°F and 50% R.H.
      c. Chemical resistance to de-icing salts, gasoline, hydraulic brake fluid, motor oil and Calcium Chloride (5%).
   4. Installation: Coordinate installation with all other trades. Coordinate with pavement installation. Furnish and install wire as required by manufacturer.

## 2.11 CABLING AND WIRE

A. Acceptable manufacturers:
   1. Liberty Wire and Cable
   2. Eastman Wire & Cable
   3. West Penn Wire
   4. Belden
   5. Carol
   6. General Cable
   7. Clifford of Vermont, Inc.

B. Wire Size: Furnish and install sufficient wire gauge to limit voltage drop to 5% or less.

C. Listings: Wiring shall be listed for the installation. Wire indicated below is intended to provide electrical characteristic requirements.

D. Duress Station Wiring: Furnish and install a two conductor #22 cable to each duress station. Cable shall be equal to West Penn 220 or AQC290.

E. Door Monitor Device Wiring: Furnish and install a two conductor #20 AWG cable to each device. Cable shall be equal to West Penn 222 or AQC292. Cable must be ‘wet location rated’ if routed under the floor slab.

F. Control Wiring: All control wiring within the relay cabinets shall be installed using good workmanship and standard shop wiring and control practices. Conductors shall be grouped and laced with nylon tie straps. Straps will be placed on each side of all bundle breakouts. Wiring will be supported at intervals not exceeding four inches and labeled at both ends. Each relay shall be labeled with its circuit number.

G. Line Voltage Wiring: Line Voltage Wiring that extends from electronic control relay screw terminal strips to the 120 VAC locks; receptacles, etc. shall meet Article 300 of the California Electric Code. All power conductors shall be a minimum 14 AWG THWN, 600 volt rated and shall be installed in raceways and equipment enclosures with other conductors within limitations defined by Article 300 of the California Electric Code.

H. Class 2 Circuit Wiring that extends from the electronic control relay screw terminal strips to the low voltage devices shall be Class 2 as defined by article 725 of the California Electric Code. All control conductors shall be a minimum of 20 AWG, jacketed, control cable. All control cable insulation shall be 600 volt rated.

I. All control wiring shall use stranded copper conductors. All terminations shall be made on screw terminal strips correctly sized and applied to conductor provided.

J. All terminations at devices shall be made with crimp type lugs correctly sized and applied to conductor with crimping tool intended for use with the lug or connector used.

K. All wiring systems shall be labeled and color-coded with labeling and coding shown on shop drawings. White conductors shall be used only for neutral conductors, green only for grounding conductors with exceptions of low voltage control wiring that meet the requirements of Article 725 of the California Electric Code.

L. All conductors within junction boxes pull boxes, and equipment enclosures shall be grouped and laced with nylon tie straps. Attach identification tabs in individual sets serving individual locks or groups. Conductor groups shall be identified on the tab with respect to room or area served.

M. Control system conductors shall not be spliced. All conductors shall be continuous between the control termination point and the controlled device.

2.12 Microwave/PIR Dual Technology Detector**:** Furnish and install dual technology motion sensors equal to Protect model Piramid SDI-76XL-MIL. The unit shall combine Stereo Doppler Microwave technology with dual element infrared detection technology. Both technologies must be activated before an alarm is indicated. Unit shall contain a ten-position digital switch to adjust the detection range. Provide one audible tester to assist in walk-test and initial sensor set-up for each unit.

## PART 3 – EXECUTION

3.1 INSTALLATION

A. Coordination with Other Trades: The ESC shall coordinate the work of this section with that of other Divisions as required to ensure that the entire work of this Project will be carried out in an orderly, complete and coordinated fashion.

B. Field Wiring: The wiring that extends from the electronic control relay screw terminal strips to the locks, lights, etc. shall be class 1, 2, or 3 as defined by Article 725 of the California Electric Code. All conductors shall be 14 gauge or larger THHN or THWN; 600 volt rated,

and shall be installed in raceways and equipment enclosures with other conductors, within limitations defined by Article 725 of the California Electric Code.

1. Installation: Dress wires and cables to provide a neat and orderly appearance within all enclosures, equipment racks, cabinets, and consoles by routing in a plastic snap-cover wiring duct. In locations where wiring duct is not feasible, organize by cable clamping, dressing and tie-wrapping.
2. Strain Relief: Relieve strain on all loose wire bundles using tie-wrap supports fastened with machine screws or bolts. Do not use self-adhesive type supports.
3. Shrink Tubing: Neatly form cable ends and apply shrinkable tubing to shielded cables or where necessary to secure the insulation against fraying or raveling.
4. Edge Protection: Install edge protection materials on edges, holes, lips of ducts, or any other place where wires or cables cross sharp metallic edges.
5. Service Loops: Allow sufficient service loops where conductors leave cabinet or transition to door mounted electronics.
6. Splicing: Field wiring shall not be spliced. All wiring shall be continuous from the field device to the termination in the control panel.
7. Wire Termination: All wiring shall be terminated at both ends and labeled in accordance with the equipment wiring plans. Wire not energized or connected to active devices shall be labeled for future use.

C. Ground System: Connection to grounds for Transient Voltage Surge Suppressors shall be 1 ohms or less. All grounds shall be installed as required by the CEC.

D. Ground Wire: Furnish and install a ground wire sized as required by the CEC in all conduits containing conductors carrying voltages above 30 volts rms.

E. Listing: All wiring and raceways shall be listed for the intended installation and installed in strict accordance with the California Electric Code as required by the conditions of where it is stalled. This includes but is not limited to ratings for riser, plenum, or wet installations.

F. Labeling: All wiring/cabling shall be labeled with the system type and the device ID at each end. The label shall be generated by a Brady I.D. Plus Pro Printer or equal and utilize a Brady part# WML-511-292 label or equal. The label used should allow for the clear part of the label to overlap and protect the printed portion of the label from being exposed to damage and/or being rubbed off over time. Hand written labels are not acceptable. Provide one sample of the labeling to be used on the intercom system, and lock wiring for approval. The numbering system used should match the equipment wiring plans and the existing number system in Stanton.

G. Vehicle sensor: Completely coordinate the installation of the vehicle sensors with all trades and the owner's representative.

3.2 FABRICATION

A. All cables between racks for PLC inputs and outputs shall be provided with quick release connectors for ease of trouble-shooting and service.

B. Install rack mounted components so they are accessed from the front and/or rear of the cabinet. Do not mount items on the sides of the equipment rack.

C. All field wiring shall be landed on appropriately labeled screw terminal strips.

D. All wiring shall be cabled or neatly bundled and secured to the housing with wire ties and internal wire ducts.

E. Wire nuts, crimp caps and other similar style wire connectors are not acceptable within the equipment racks. All connections within these racks must be done with screw style terminal connections.

3.3 SEPARATION

A. Cabling and conduit shall be installed in strict compliance with the California Electric Code and TIA 569.

B. Communication, Class 2, and Class 3 wires and cables shall be separated by at least 2 inches from conductors of any electric light, electric power, Class 1, non-power-limited fire alarm, or medium power network-powered broadband communications circuits.
1. Separation can be less if communication, Class 2, and Class 3 circuits are completely enclosed in metallic pathways that are properly grounded and bonded per ANSI/TIA-607-B. Walls of the pathway must have a minimum thickness of .04 inches if made of steel or .06 inches if made of aluminum.
2. Separation can be less if any electric light, electric power, Class 1, non-power-limited fire alarm, or medium power network-powered broadband communications circuits are completely enclosed in metallic pathways that are properly grounded and bonded per ANSI/TIA-607-B. Walls of the pathway must have a minimum thickness of .04 inches if made of steel or .06 inches if made of aluminum.

3.4 FIELD QUALITY CONTROL

A. All functions specified shall be individually activated and the result documented. Utilize preprinted test sheets with space for comments and indicate “pass” or “fail” for each. These test reports shall be copied and submitted to the engineer prior to requesting the Engineer to witness the final functional test.

B. All functions shall be demonstrated for the owner and Architects representative.

**PLC VERIFICATION AND CHECK-OUT FORM**

✓ = OK

**Job #**
**Job Name:**
**Panel #**

| **FIELD TEST CODE:** | | **REPAIR CODE:** | |
|---|---|---|---|
| A - No status change | M - Poor audio | 1-SSI | Software Test By:_____ Date_____ |
| B - Won't show secure | N - No audio | 2-ELECTRICIAN | |
| C - No power to door | O - Out of focus | 3-IRONWORKER | Hardware Test By:_____ Date_____ |
| D - Door won't open | P - No picture | 4-CARPENTER | |
| E - Door won't close | Q - Call button sticks | 5-OWNER/REP | System Test By:_____ Date_____ |
| F - Door needs alignment | R - Reversed | 6 -ENG | |
| G - Wrong door opens | S - Software problem | 7 - | Design Engineering By:_____ Date_____ |
| H - Adjust DPS | T - Not installed | 8 - | |
| I - Adjust roller bolt | U - | 9 - | Wiring By:_____ Date_____ |
| J - File strike plate | V - | 10 - | |
| K - Adjust lock | W - | 11 - | Field Test By:_____ Date_____ |
| L - No latch back | X - | 12 - | |

| | | | | | | | | | ON-SITE | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ICON ID#** | **ICON TYPE** | **C/U CAM. NO.** | **DOOR INTLK. WITH** | **CELL GRP. REL.** | **SOFT-WARE TEST** | **HARD-WARE TEST** | **FIELD TEST CODE** | **REPAIR CODE** | **RE-CHECK "X"** | **FIELD CHECK OUT NOTES** | **PROBLEM RESOLVED (BY/DATE)** |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

3.5 SOFTWARE

C. For each PLC, furnish to the owner uniquely identified:
   1. One (1) separate back-up CD or flash memory device for each PLC with the ladder logic file (programmer's notated file) and the source code. Each disk will be labeled with the project name, programs, PLC, programmer, and revision date.
   2. One (1) copy of the source code of the application software on CD and/or other digital media.

D. Furnish a single Microsoft Word file detailing all passwords for each PLC. This file shall also identify the following by system and panel:
   1. The file name of each program required for restoration of each failed PLC.
   2. The passwords required for each PLC as well as required programs.
   3. The name of the programmers for each custom program.
   4. The date of the last program change.

E. Furnish documents listed in 3.5 A-B at project completion. Furnish a new set with all revisions after the completion of the three month walkthrough outlined in Specification section 280500.

3.6 SPARES

A. The contractor shall turn over to the Owner, the following program documentation and materials:

   1. One electronic copy of the source code of the applications software including full instruction documentation and comments on a CD or portable hard drive.
   2. All keys, passwords, and access codes for access to the programming software.
   3. Furnish one (1) PLC central processor of each type installed.
   4. Furnish one (1) Network Ethernet switch for each type installed.

5. Furnish one (1) power supply of each type installed.
6. Furnish one (1) group of programmed memory media for each program installed.
7. Furnish one (1) spare input card of each type installed in the facility.
8. Furnish one (1) spare output card of each type installed in the facility.
9. Furnish one (1) completely assembled duress station.
10. Furnish no less than five (5) of each style of relay used, including relay base.
11. Furnish no less than ten (10) of every size replaceable fuse used.
12. Furnish one (1) Sentrol monitor switch of each type installed on project.
13. Furnish one CPU memory card for each PLC CPU plus 10%.
14. Spare parts shall be packaged in appropriate protective packing material.
15. Box spare parts for easy storage and clearly identify the contents of each box on four sides of each container.

**END OF SECTION 28 46 19**

# SECTION 31 10 00 - SITE CLEARING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 DEFINITIONS

A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.

D. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings.

E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

### 1.3 MATERIAL OWNERSHIP

A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

### 1.4 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed trafficways if required by Owner or authorities having jurisdiction.

### 1.5 SUBMITTALS

A. Submit under provisions of Division 01.

B. Submit plan for debris removal and traffic access.

## PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."
   1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

## PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and enclosed according to requirements in Section 015639 "Temporary Tree and Plant Protection."

C. Protect existing site improvements to remain from damage during construction.
   1. Restore damaged improvements to their original condition, as acceptable to Owner.

**END OF SECTION 31 10 00**

# SECTION 31 11 00 - CLEARING AND GRUBBING

## PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Site clearing and grubbing.

1.2 ENVIRONMENTAL REQUIREMENTS

A. Burning is not permitted.

B. Clearing or grubbing:
1. Do not perform during weather conditions which may produce runoff from the site.
2. Resumption of clearing and grubbing will be determined by the COUNTY Representative.

1.3 SUBMITTALS

A. Submit under provisions of Division 01.

B. Submit plan for debris removal, recycling, and/or disposal.

## PART 2 PRODUCTS – (NOT USED)

## PART 3 EXECUTION

3.1 PREPARATION

A. Perform site preparation Work in accordance with the Contract Documents.

B. Verify field measurements are as shown on the Contract Documents.

C. Determine with COUNTY Representative existing utilities and other elements that are to remain.

D. Protect elements surrounding the site from damage.

E. Verify that existing plant life to remain is tagged or identified.

3.2 SITE CLEARING

A. Clear site of trees, shrubs, and other vegetation, except for those indicated to remain. Depressions made by grubbing are to be filled with structural backfill to the original surface in accordance with Section 312323, Backfill unless further excavation is required. Clearing and grubbing must consist of:
1. Clearing the area within the limit of work of all objectionable plant material, to include roots, snags, brush, grass, weeds, and similar undesirable vegetation and any other debris

found at the site not specified as improvements to be included as part of this project. Remove all organics and soils with greater than 3 percent organics by dry weight. Clearing and stripping shall extend a minimum of 5 feet outside of the limits of proposed improvements, with the exception of the existing concrete equipment pad and portions of gravel roadway to remain. Materials cleared and stripped shall not be used as engineered fill.

2. In addition to the clearing of vegetation growth, the area must be grubbed to a depth of 12 inches below finish grade, of debris and rocks over 4 inches in size.

B. Remove existing above-grade and below-grade improvements as shown on the Contract Documents or found on site and require removal in order to facilitate new construction. For items found on-site that are not identified in the Contract Documents, Contractor must coordinate with the COUNTY Representative for removal. Contractor will be compensated by change order for removal and disposal of below grade improvements not shown or specified in the Contract Documents.

3.3 DEBRIS DISPOSAL

A. Remove all cleared and grubbed material from the prepared site areas.

B. Excess fill material to be disposed of offsite will first be placed at the designated onsite excess fill disposal area. The fill disposal area must be where indicated in the Contract Documents.

C. Dispose of trash, demolished material, and debris at approved landfill sites.

D. Burning is not permitted.

**END OF SECTION 31 11 00**

# SECTION 31 20 00 - EARTH MOVING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Related Requirements:
   1. Caltrans Standard Specifications, latest edition.

### 1.3 DEFINITIONS

A. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

B. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

C. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

D. Fill: Soil materials used to raise existing grades.

E. Structural Fill: Area within vertical planes located five feet outside the perimeter of each building; or one foot outside the outermost edge of the surface of roadways, parking areas, sidewalks, concrete traffic slabs, or their shoulders unless specifically indicated otherwise on the drawings.

F. Nonstructural Areas: Graded areas for landscaping, including concrete walkways less than four feet wide, berms, and all other areas not defined as a structural fill or as storm water detention basin.

G. Influence Area: Area within planes sloped downward and outward at an angle of 45 degrees from the horizontal from:
   1. The outermost edge of the structural full areas; or
   2. The bottom, outer edge of building perimeter foundations; or
   3. The outermost edge at the surface of roadways or shoulder; or
   4. The exterior edge at the spring line of pipes and culverts.

H. Rock: Rock material in beds, ledges, unidentified masses, conglomerate deposits, and boulders of rock material 3/4 cu. yd. or more in volume that exceed a standard penetration resistance of 100 blows/2 inches when tested by a geotechnical testing agency, according to ASTM D 1586.

I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

1.4 INFORMATIONAL SUBMITTALS

A. Submit, under provisions of Division 1, product data and certificates of compliance for all products and materials proposed to be used under this section.

B. Imported Materials: Samples of all proposed imported materials, minimum 50 pounds, tagged with source location and supplier shall be submitted to the OWNER's Representative at least 10 working days prior to import. Materials shall not be imported to job site without written approval by the OWNER's Representative.

C. Samples, product data, and certification for imported materials.

1.5 QUALITY ASSURANCE

A. Soil Testing:
1. Owner will employ and pay for the services of an independent testing laboratory to perform specified testing per CCR Title 24, and any other testing specifically indicated in the Contract Documents to verify compliance with the Contract Documents.
2. Relative compaction, moisture, and permeability tests will be made at locations determined by the Owner Representative. When tests indicate that the specified requirements have not been achieved, that portion of the Work shall be reworked until the required density, moisture, and permeability had been attained. Re-testing to show compliance shall be at the Contractor's expense/
3. Daily testing of materials and the work of the Contractor will be made during construction.
4. Where solid material is required to be compacted to a percentage of maximum density, the maximum density at optimum moisture content will be determined in accordance with ASTM D 1557. Where cohesion less, free draining soil material is required to be densified to a percentage of relative density the calculation of relative density will be determined in accordance with ASTM D 4253 and D 4254. Field density in-place tests will be performed in accordance with ASTM D 2922, or by such other means acceptable to the Engineer.

1.6 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.
1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
1. Do not proceed with work on adjoining property until directed by Architect.

C. Utility Locator Service: Notify USA North, by calling 811 or visiting their website at www.usanorth.org, for area where Project is located before beginning earth-moving operations.

D. Contractor to maintain utility markings throughout the project.

E. Contractor to pothole as necessary, to avoid existing utilities.

F. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures specified in Section 015723 Temporary Stormwater Pollution Prevention and the erosion and sedimentation drawings are in place.

G. Do not commence earth-moving operations until plant-protection measures specified in Section 015639 "Temporary Tree and Plant Protection" are in place.

H. The following practices are prohibited within protection zones:
1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

I. Do not direct vehicle or equipment exhaust towards protection zones.

J. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

K. Environmental Conditions:
1. Weather: Protect bearing surfaces under foundations. Should bearing surfaces become softened, excavate to solid bearing and fill with concrete, mix and strength as approved by the Owner Representative, to elevations indicated.
2. No fill material shall be placed, spread, or rolled if weather conditions increase the moisture content above permissible limits. When work is interrupeted by rain, the earthwork operations shall stop and not be resumed until directed by Owner's Representative.

## PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Unsuitable Soils: Material encountered below the natural ground surface in embankment areas or below the grading plane in excavation areas that the Engineer determines to be in any of the following conditions:

1. Of such unstable nature that it cannot be compacted to the specified density using ordinary methods at optimum moisture content.

2. Too wet to be properly compacted and cannot be dried before incorporating it into the work. Excessive moisture alone is not sufficient cause for determining that the material is unsuitable.

3. Inappropriate for the planned use.

C. Structural Fill:
   1. Fill material for structural pad areas or structural fill material may be native material obtained from onsite excavations, free from organic and inorganic debris. Particle size shall nor exceed 3 inches of any dimension.
   2. Imported soil shall consist of silts and sands that have Plasticity Index not greater than 20, 1 Liquid Limit less than 35, and Expansion Index not exceeding 20, a particle size not greater than 3 inches, and, when used in pavement areas, an R-value of 25 or greater.
   3. Representative samples of material to be used for structural fill and earth fill shall be tested to determine the maximum density, optimum moisture content, and classification of the soil.

D. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
   1. For influence areas: Shall be non-expansive material, with a plasticity index of loess than 15, a liquid limit of less than 35, between 5 and 45 percent passing the No. 200 sieve, and shall not contain aggregates larger than 3 inches. Material may be obtained and used from on-site excavation with the approval of the Geotechnical Engineer.

E. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

F. Drainage Course: Shall conform to Section 68 of the Caltrans Standard Specifications, Class 2 permeable. Material may be obtained and used from on-site excavation eith the approval of the Geotechnical Engineer.

G. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and zero to 5 percent passing a No. 4 sieve.

H. Sand: ASTM C 33/C 33M; fine aggregate.

I. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

## 2.2 ROCK (RIPRAP) SLOPE PROTECTION (RSP)

A. Rock riprap shall be angular and well graded rocks in accordance with Section 72 of the Caltrans Standard Specifications, Facing Class. Rock encountered during site grading operations may be utilized for Rock Slope Protection as approved by the Owner's representative. Rounded rock shall not be allowed.

B. Grouted riprap shall be in accordance with section 72-5 of the Caltrans Standard Specifications.

C. Rock slope protection fabric, if used, shall be in accordance with Section 88 of the Caltrans Standard Specifications.

2.3 ACCESSORIES

A. Steel Plate
1. When steel plate bridging is provided in-lieu of backfill and temporary asphalt, it shall conform to Section 602.1 of the Caltrans Encroachment Permit Manual, with the following minimum thickness:

| Trench Width | Minimum Plate Thickness |
|---|---|
| 10" | 1/2" |
| 1'-11" | 3/4" |
| 2'-7" | 7/8" |
| 3'-5" | 1-1/4" |

2. For spans greater than 5 feet 3 inches, a structural design shall be prepared by a civil engineer registered with the State of California.

**PART 3 - EXECUTION**

3.1 PREPARATION

A. Should indicated conditions conflict with actual conditions and contours, notify the Owner's Representative and await directions before proceeding. Commencement of work indicates acceptance of existing conditions.

B. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.

C. Protect and maintain erosion and sedimentation controls during earth-moving operations.

D. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

E. Perform clearing and grubbing in accordance with Section 311100.

F. Material with concentrations of organics greater than 5 percent, as determined by ASTM D2974, shall be removed or placed in non-structural areas. Strippings shall not be used within embankment, structural, or pavement fills and shall be spread in the designated excess fill disposal area shown on the Drawings.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
   1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

## 3.3 EXCAVATION, GENERAL

A. General:
   1. Excavate for structured to the lines and grades shown or as required to accomplish construction. Perform all excavation regardless of the type, nature, or condition of the material encountered. The method of excavation used is optional; however, no heavy equipment shall be operated within 5 feet of existing structures or newly completed construction, except as approved. Excavation that cannot be accomplished without endangering the present or new structures shall be performed with hand tools. The bottom of all excavations shall be proof rolled to observe the presence of any potentially soft, yielding subgrade conditions. Notify the Owner Representative prior to commencement of proof rolling.
   2. Excavations and trenches shall be properly sheeted, shored, braced and/or sloped to support adjacent earth banks, structures, construction materials, and equipment and to provide safe working conditions. No trench, pit, or other excavation shall remain open longer than is necessary to expeditiously carry out the work.
   3. Increased excavation as a result of the final foundation design and as required for permit by the agency having jurisdiction (beyond those shown on S201, S202, and S203) shall be at no additional cost to the County.

## 3.4 SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.

B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade with a pneumatic-tired to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
   1. Completely proof-roll subgrade in one direction. Limit vehicle speed to 3 mph.
   2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

## 3.5 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.6 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
   1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.7 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.8 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
   1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
   2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.9 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:
   1. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.

3.10 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
   1. Provide a smooth transition between adjacent existing grades and new grades.
   2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

3.11 ROCK (RIP RAP) SLOPE PROTECTION

A. Rock riprap shall be so placed as to provide a minimum of voids. The larger rocks shall be placed in the toe course and on the outside surface of the slope protection surfacde. Local surface irregularities shall not vary from the design grades by more than 1 foot measured at right angles to the slope.

B. All rock slope protection shall be installed per Method "A" in accordance with section 72-2.03 of the Caltrans Standard Specifications.

C. Grouted riprap shall be installed in accordance with section 72-5.04 of the Caltrans Standard Specifications for placement of concrete.

D. Rock slope protection fabric shall be installed in accordance with section 72-2.025 of the Caltrans Standard Specifications.

3.12 SUBSURFACE DRAINAGE

A. Subdrainage Pipe: Specified in Section 334600 "Subdrainage."

3.13 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place subbase course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase course under pavements and walks as follows:
1. Shape subbase course to required crown elevations and cross-slope grades.
2. Place subbase course 6 inches or less in compacted thickness in a single layer.
3. Place subbase course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
4. Compact subbase course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.14 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

**END OF SECTION 31 20 00**

# SECTION 31 23 33 - TRENCHING AND BACKFILL

## PART 1 GENERAL

### 1.1 SUMMARY

A. Section Includes:
   1. Trenching and Backfill.

B. Related Documents and Sections:
   1. Section 32 11 23 – Aggregate Base Course.

### 1.2 REFERENCES

A. ASTM References:
   1. ASTM C33 - Concrete Aggregate.
   2. ASTM C94 - Ready-Mixed Concrete.
   3. ASTM C136 - Test Method for Sieve Analysis of Fine and Coarse Aggregates.
   4. ASTM D422 - Test Method for Particle-Size Analysis of Soils
   5. ASTM D1557 - Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft$^3$ (2,700 kN-m/m$^3$)).
   6. ASTM D2487 - Classification of Soils for Engineering Purposes (Unified Soil Classification System)
   7. ASTM D4318 - Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
   8. ASTM D6938 - Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

B. Caltrans Testing Methods:
   1. #205 - Determining Percentages of Crushed Particles
   2. #217 - Sand Equivalent
   3. #229 - Durability Index

C. Caltrans Standard Specifications, current edition.

### 1.3 DEFINITIONS

A. Pipe Base: The trench area between the bottom of the trench and the bottom of the pipe. Extend full width and length of trench.

B. Pipe Zone: Area of trench between the top of the pipe base and six inches above the pipe, unless otherwise indicated. Extend full width and length of trench.

C. Backfill Zone: Area above Pipe Zone to finish grade.

D. Relative Compaction: Field-measured dry weight expressed as a percent of maximum dry density of same soil determined in accordance with ASTM D1557.

E. Unclassified Excavation: Nature of materials to be encountered is not identified or described.

1.4 DESCRIPTION

A. Provide materials, services, and equipment required for trenching, backfilling, and compacting.

B. An authorized Owner Representative will approve all trenching, backfilling, and compacting operations prior to commencement. Conduct work under the general observation and, where required, the detailed inspection of the Owner Representative. Do not backfill until each specific location is approved.

1.5 SUBMITTALS

A. Submit, under provisions of Division 01, product data and certificates of compliance for all materials proposed to be used under this Section

B. Submit methods and procedures for trenching, including but not limited to excavation, backfilling, compaction, and moisture addition or drying of all materials.

C. Submit “Shoring and Bracing Drawings” prior to beginning any trench or structure excavation 5 feet deep or over, in accordance with Section 6705, California Labor Code. If such plan varies from the shoring system standards established in the construction Safety Orders of the State of California, such alternative system plans must be prepared, stamped and signed by a civil or structural engineer licensed in the State of California at the Contractor’s expense.

D. Submit a construction drainage plan showing the collection and disposal of surface and subsurface water that may be encountered in the course of construction.

1.6 QUALITY ASSURANCE

A. OWNER will employ and pay for services of an independent testing laboratory to perform specified testing per CCR Title 24, and any other testing specifically indicated in the Contract Documents to verify compliance with the Contract Documents.

1.7 FIELD CONDITIONS

A. Utility Locator Service: Notify USA North, by calling 811 or visiting their website at www.usanorth.org, for area where Project is located before beginning earth-moving operations.

B. Contractor to pothole as necessary, to avoid existing utilities.

**PART 2 PRODUCTS**

2.1 PIPE BASE AND PIPE ZONE

A. Use sand conforming to ASTM C33 for conduit of any material less than 3-inch diameter and PVC pipe of any size.

2.2 BACKFILL MATERIAL

A. Native material: Free from organic and inorganic debris (including roots greater than ¼-inch in diameter) and containing materials no larger than 3-inches maximum size.
   1. On-site soils shall not be used for bedding or initial backfill of utilities. On-site soils may be used for other trench backfill, except in areas where non-expansive, engineered fill is required.

B. Open graded gravel and rock material (e.g. ½-inch or ¾-inch crushed rock) shall not be used as backfill.

C. Sand Slurry Mixture: One sack cement mix with sand aggregate; maximum slump of four inches.

2.3 STRUCTURAL FILL UNDER AND AROUND VAULTS, MANHOLES, AND STRUCTURES

A. 3/4 inch Class 2 Aggregate Base or equivalent of crushed rock aggregate base material meeting the requirements of Section 32 11 23, “Aggregate Base Course”.

2.4 CONCRETE FOR TRENCH BACKFILL

A. Conform to ASTM C94, Alternate 3. Proportion to obtain a 28-day compressive strength of 2,500 pounds per square inch. Use a minimum of five sacks of cement per cubic yard of concrete.

RFI 0099 — Drain Rock/ Bedding Rock Clarification — 3/4" AB accepted without meeting Class 2

## PART 3 EXECUTION

3.1 GENERAL

A. Verify that native excavated material to be reused as backfill meets specified requirements and is acceptable to OWNER Representative.

B. Verify lines and grades of proposed trench/utilities.

3.2 REMOVAL OF WATER

A. At all times, provide and maintain means and devices to remove and dispose of water entering trench during preparations for and during pipe laying, and until backfill of the pipe is complete.

B. Attention is directed to the Geotechnical Investigation Report referenced in Appendix section. Groundwater conditions and the limitations of the geotechnical information are described in that report.

C. Verify groundwater elevations in areas where its presence is likely to impact construction activities.

D. Determine means and methods and perform dewatering as needed to establish a stable trench and structure base.

E. Dewatering facilities must be installed and functioning prior to excavation below groundwater levels in order to avoid heave of the trench bottom and/or trench wall instability. Plan sufficient time between dewatering and excavation to allow for drawdown of groundwater surfaces to below the lowest adjacent trench depths.

F. Water disposal must comply with Federal, State, and local requirements including the approved erosion control plan for the project.

3.3 TRENCH EXCAVATION

A. Trench excavation is unclassified. Excavate depth and width as shown or as directed. Allow for cover and pipe base under pipe. Remove loose matter.

B. Comply with CAL-OSHA requirements regarding trench bracing and shoring.

C. If Contractor elects to slope top of trench in lieu of trench bracing, maintain the trench width at least 2 feet above top of pipe before sloping begins. Unless otherwise approved by the Owner Representative, slope no greater than1:1.

D. Furnish and install all shoring, sheeting and bracing required to support adjacent earth banks and structures for the protection and safety of all personnel working in the trench. All shoring, sheeting and bracing must conform to the requirements of the State or local agencies having jurisdiction over such matters. Remove shoring, sheeting and bracing in a manner that will protect the workman and prevent caving of banks and damage to the pipe, excavation, backfill or adjacent property.

E. Construct trenches to the line and grades as shown on the Contract Documents. Allow for pipe thickness, bedding material and stabilization material.

F. Backfill any part of the trench excavated below grade with fill material approved by Owner Representative.

G. Install all pipe with grades less than 1 percent to grade and alignment established by an electronic, self-leveling, collimated laser which must have good visibility and meet all Federal, State, and Engineer requirements as to safety, operation and field use. The laser must have an off-grade warning system which must operate until the instrument is corrected to grade. The laser equipment must have a minimum accuracy of + 0.001 percent of grade, + 0.01 percent of alignment, and a minimum visible range of 600 feet. Periodically check the accuracy of the laser setting. Make corrections in grade as directed by the Owner representative at no additional expense to Owner.

H. The Contractor may use batter boards with a string line with horizontal level and vertical grade rod for grades over one percent, or may use other methods approved by the Owner representative.

I. Dead flat or reverse grades are not acceptable.

J. Where pipelines are to be installed in embankments, place and compact embankments a minimum of 2 feet above the top of the pipe before trench excavation.

K. Where it is necessary to cross or parallel drainage ditches and swales or channels, carefully place and compact the backfill on the bottom and banks to 95 percent relative compaction

with impervious material so as to avoid settlement or erosion. Restore the shape of the banks and leave bottom in good condition.

3.4 PIPE BASE

A. Provide pipe base for supporting pipe for full width of trench. Unless shown otherwise, provide a minimum pipe base thickness of four inches below the pipe and three inches below the pipe bell.

B. Hand-grade ahead of pipe laying. Provide a firm, unyielding base.

C. If trench is excavated below required depth for pipe base, fill the excess depth with stabilization or pipe base/zone material to proper subgrade. Place pipe material for full width of trench in layers not exceeding six inches deep and compact until material does not yield or move.

D. Authorized overexcavation and backfill for subgrade stabilization will be paid for by contract change order when the exposed subgrade is unstable and subgrade stabilization is required, as determined by the OWNER Representative. Stabilization required as a result of the Contractor's operations or inadequate dewatering must be performed by the Contractor at no additional cost to the OWNER.

3.5 PIPE ZONE

A. Do not proceed with placing pipe zone material until pipe base stability has been approved by the OWNER Representative. Perform pipe base stabilization including dewatering and drying of the subgrade, removal of yielding soils as directed by the Owner Representative and replacement with additional pipe base material, gravel or crushed rock (3-inch minus).

B. Use pipe zone material within the pipe zone except where concrete encased. Place material simultaneously on both sides of pipe in a manner approved by the Owner Representative. Lifts in excess of six inches are not allowed.

C. "Walk-in" each lift of backfill. Slice with a shovel or tamp with J-bars or similar devices so that all voids around pipe are filled.

D. Give particular attention to zone from bottom of pipe to pipe springline. Ensure firm support to prevent lateral movement or pipe deflection during final backfilling.

3.6 BACKFILL ZONE

A. Place moisture-conditioned backfill material in lifts not exceeding six inches for hand operated mechanical compactors and not exceeding eight inches for heavy equipment compactors.

B. Compact backfill to at least 95 percent relative compaction.

C. Jetting will not be permitted.

3.7 SETTLEMENT OF PAVED AND UNPAVED AREAS

A. Repair all damage caused by settlement deemed to have occurred if the following conditions exist:
   1. In paved areas, settlement is defined as a depression of 3/8-inch or more below the average of the sides of the uncut portion.
   2. Along shoulder areas and unpaved portions of the roadways, settlement is defined as a depression of 3/4-inch or more below the average of the sides of the uncut portion.
   3. Across all unpaved areas, or areas untraveled by automotive equipment, settlement is defined as a depression of 1-1/2-inches or more below the average of the sides of the uncut portion. In this regard, any settlement that causes drainage problems or concentration causing water to run along the depression will be subject to correction immediately during the entire guaranty period.

3.8 PAVING REMOVAL

A. Saw cut asphalt concrete or concrete on roads before excavation. Cutting with a spade or jackhammer or grader-mounted wheel will not be allowed. Cut armor coats on roads with a suitable tool before excavation. Breaking of asphalt, concrete or armor coats with excavation equipment will not be permitted.

B. Cut all edges of asphalt concrete or armor coats vertically, with a neat, square edge.

C. In all cases, saw cut existing asphalt paving, concrete, or armor coating after construction and just prior to final paving to a point 6 inches or wider than each side of the trench line. Make saw cuts parallel or perpendicular to center line of the trench.

D. Dispose of excess paving per the Owner Representative’s direction. Such excess paving may not be used as backfill material.

3.9 FIELD QUALITY CONTROL

A. Field testing will be performed under provisions of Division 01.

B. Owner Representative will conduct nuclear gauge moisture and density testing in accordance with ASTM D6938 procedures on each 100 feet of compacted lift of trench materials placed (minimum of 1 test per 100 feet) or as directed by the Owner Representative.

**END OF SECTION 31 23 33**

# SECTION 31 25 00 - EROSION AND SEDIMENTATION CONTROLS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:
   1. Erosion and sediment control measures.

### 1.2 REFERENCES

A. ASTM A116 - Metallic-Coated Steel Woven Wire Fence Fabric.

B. ASTM A615 - Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

C. ASTM A702 - Steel Fence Posts and Assemblies, Hot Wrought.

D. ASTM D4632 - Test Method for Grab Breaking Load and Elongation of Geotextiles.

E. ASTM D1682 - Test Methods for Breaking Loading and Elongation of Textile Fabrics.

F. CTM 206 - Test for Specific Gravity and Absorption of Course Aggregate.

G. CTM 229 - Durability Index.

### 1.3 DESCRIPTION

A. Provide materials, services, and equipment required for controlling pollutants in storm water runoff associated with construction activity.

B. Water Quality - Measures must be provided to prevent siltation of streams, rivers, lakes and bays etc.; avert instream degradation due to turbidity and pollutant load; and prevent toxic materials from leaving the construction site.

C. Existing System - Methods must be provided to prevent construction sediment from entering existing drainage facilities.

D. Adjacent Properties - Methods must be employed to prevent any damage to adjacent public and private properties.

E. Areas requiring protection must include all areas disturbed by demolition, site preparation, or earthwork. Other areas including access roads, staging areas, and other areas potentially disturbed by the Contractor’s activities must be protected.

F. Maintain fences, fiber rolls, straw mulch, and other erosion control features provided as a part of the Work.

1.4 SUBMITTALS

A. Submit, under provisions of Division 01, product data and certificates of compliance for all materials proposed to be used under this section.

B. Provide spill control and response plan.

1.5 SCHEDULE

A. Construct erosion control measures early in the project, but no later than the start of excavation or hard demolition.

B. Stake grading areas after receiving the Notice to Proceed and before any grading operations have taken place.

**PART 2 - PRODUCTS**

2.1 MATERIALS

A. Silt Fence Filter Fabric:
1. A pervious sheet of synthetic polymer composed of at least 85 percent by weight ethylene, propylene, amide, ester or vinylidene yarn, woven or non-woven, and containing stabilizers and/or inhibitors to resist deterioration by heat, water, and ultraviolet light.
2. Fabric must conform to the following criteria:
   a. Equivalent Opening Size (U.S. Standard Sieve): 70 to 100 range.
   b. Tensile Strength: ASTM D1682, Method G; Minimum 200 pounds.

B. Silt Fence Posts:
1. Redwood, cedar, or Douglas fir, cut from sound timber, free from unsound knots, or other defects which render them unfit structurally.
2. Metal posts; ASTM A702, Class B steel with anchor plate. Metal posts must be minimum length of 5 feet.

C. Fiber Rolls:
1. Prefabricated rolls of straw, flax or similar material.
2. Rolled tubes of erosion control blanket/mat:
   a. Roll length of erosion control blanket/mat into a tube of minimum 8 inch diameter.
   b. Bind roll at each end and every 4 feet along length of roll with jute-type twine.

D. Straw Mulch:
1. Chopped hay or straw with tackifier.

E. Hydroseed:
   1. Native or adaptive seed mix for permanent stabilization.

F. Aggregate for Stabilized Construction Entrance:
   1. Asphalt concrete grindings must not be used.
   2. Filter fabric: Woven polypropylene, minimum 4.0 oz per square yard and 20 mil thickness. Manufacturer: TenCate or approved equal.
   3. Aggregate must be 3 to 6 inches in size, washed, well-graded gravel or crushed rock conforming to the following quality requirements:

| Test | California Test Method | Requirement |
|---|---|---|
| Apparent Specific Gravity | 206 | 2.5 min |
| Absorption | 206 | 4.2% max. |
| Durability Index | 229 | 52 min. |

**PART 3 - EXECUTION**

3.1 LIMITS OF WORK

A. Confine soil disturbance, grading and machinery access to the construction areas shown on the Contract Documents.

B. No payments will be made for additional Work or damages caused by the Contractor's performance of the Work, either inside or outside the State property.

3.2 FIBER ROLLS

A. Locate fiber rolls on level contours spaced as follows:
   1. Slope inclination of 4:1 (H:V) or flatter: Fiber Rolls are to be placed at a maximum interval of 20 feet. Slope inclination between 4:1 and 2:1 (H:V): Fiber Rolls are to be placed at a maximum interval of 15 feet.
   2. Slope inclination 2:1 (H:V) or greater: Fiber Rolls are to be placed at a maximum interval of 10 feet.
   3. Fiber Rolls at the toe of slopes greater than 5:1 (H:V) are to be a minimum of 20-inch diameter or installations achieving the same protection (i.e. stacked smaller diameter fiber rolls, etc.).

B. Locate fiber rolls to be used as checkdams as follows:
   1. Fiber rolls shall be placed perpendicular to the flowline of the ditch.
   2. Fiber rolls shall be extended across the entire length of the ditch, including a minimum of 2 feet past the top of bank.

C. Turn the ends of the fiber roll up-slope to prevent runoff from going around the roll.

D. Stake fiber rolls into a 2 to 4 inch deep trench with a width equal to the diameter of the fiber roll.

E. Drive stakes at the end of each fiber roll and spaced 4 feet maximum on center.

F. Use wood stakes with a nominal classification of 0.75 inches by 0.75 inches and minimum length of 24 inches.

G. If more than one fiber roll is placed in a row, the rolls should be overlapped, not abutted. When fiber rolls are placed within ditches, do not allow overlaps within the flow path.

H. Remove the fiber rolls at the completion of construction, or as directed by the Owner Representative.

3.3 SILT FENCES

A. Silt fencing may be substituted for fiber rolls around the project site perimeter, as approved by the Owner Representative. Silt fencing shall not be used in direct drainage flow paths or in existing ditches.

B. Construct the fence to follow site contours as closely as possible.

C. Cut filter fabric from a continuous roll to avoid the use of joints. When joints are necessary, splice fabric only at a support post, with minimum 6-inch overlap, both ends securely fastened to the post.

D. Space posts a maximum of ten feet apart; place securely into the ground, with a minimum buried depth of 12 inches for steel, three feet for wood.

E. Excavate a trench approximately six inches wide and six inches deep along the line of posts and upslope from the barrier.

F. Staple or wire filter fabric to the fence, and extend into the trench as shown on the Contract Documents. Extend fabric approximately 36 inches above the original ground surface.

G. Backfill the trench and compact soil over the toe of the filter fabric.

H. Remove the silt fence at the completion of construction, or as directed by the Owner Representative.

3.4 STABILIZED CONSTRUCTION ENTRANCE

A. Construction entrances shall be installed prior to commencement of demolition and construction activities. All construction traffic entering the site must cross the stabilized construction entrance.

B. Provide one stabilized construction entrance pad located on the primary construction road servicing the site. Maintain the entrance pad in a condition that will prevent tracking mud or flowing of sediment onto public right-of-ways.

C. Stabilized construction entrance must be minimum 50 feet long and 30 feet wide, unless otherwise noted on the Erosion Control Plan or approved by the Owner Representative. Provide adequate turning radii at the entrance for construction vehicles. Aggregate depth must be a minimum of 12 inches, or as directed by the Owner representative, designed for the heaviest vehicles and equipment used.

D. Provide periodic top dressing with additional rock as conditions demand; repair and clean out trapped sediment. Remove any sediment spilled, dropped, washed or tracked onto public rights-of-way, through street sweeping or vacuuming.

E. Clean vehicle and equipment wheels to remove any retained sediment prior to entrance onto public rights-of-way. When washing is used to prevent tracking, wash on an area stabilized with crushed stone that drains into an approved sediment trap or sediment basin. Prevent sediment from entering any storm drain, ditch, or watercourse through use of sand bags, gravel, boards, or other methods as approved by the Owner Representative.

3.5 WIND EROSION / AIR POLLUTION CONTROL

A. Prevent wind erosion and air pollution by wetting down or applying other approved dust control measures to the work site. Control the generation of dust which could violate State and Local air pollution control standards, damage on-site/off-site facilities, and/or impact crops growing on adjacent properties.

B. Apply water or other dust control measures to common areas that will be used by all Bid Package Contractors. Coordinate dust control Work performed under this contract with the dust control work of other Bid Package Contractors.

C. The Contractor is responsible for providing adequate pollution measures for spill prevention and control, management of solid wastes, concrete wastes, sanitary / septic waste, and liquid wastes.

3.6 WATER POLLUTION CONTROL

A. Comply with laws, rules, and regulations of the State of California, U.S. Army Corps of Engineers, and the Environmental Protection Agency prohibiting the pollution of lakes, oceans, bays, wetlands, streams, or river waters from the placing or dumping of refuse, construction materials, soils, or debris. In the event of a conflict, the most stringent requirement must govern.

3.7 EQUIPMENT MAINTENANCE

A. Perform equipment repairs and maintenance including lubrication and fueling at sites approved by the Owner Representative.

3.8 EMERGENCY TREATMENT

A. In the event of precipitation during construction which produces contaminated runoff from the project site, immediately provide additional erosion control measures such as check dams, temporary sediment basins, or other controls as necessary to prevent site runoff. Coordinate additional erosion control activities and measures with the Owner Representative.

3.9 SITE STABILIZATION

A. At the completion of construction and site disturbing activities, all disturbed site areas not stabilized by pavement, lime treatment or aggregate base shall be stabilized using hydroseed. Hydroseed mix must consist of native and/or adaptive seeds suitable to the regional climate. The Contractor is responsible for providing adequate water for seed germination.

B. If required by the Owner Representative, the Contractor shall provide temporary site stabilization using straw mulch. Temporary stabilization shall be removed at the completion of construction.

3.10 MAINTENANCE

A. Inspect all erosion control features immediately after each precipitation event that produces runoff at the erosion control installation and at least daily during prolonged events. Make required repairs to restore the erosion control function immediately.

B. Inspect local roads to the site and roads adjacent to the construction entrance(s), daily. Sweep or vacuum entrances from paved roadways daily to remove visible sediment and prior to forecasted rain events.

C. Maintain erosion control features throughout project construction. Unless shown or specified to be removed, leave all erosion control features in good condition.

D. Remove sediment deposits that exceed one-third the height of the barriers.

E. Dispose of sediment deposits on-site at a location shown on the Contract Documents and acceptable to the Owner Representative. Leave the disposal area in a neat free draining condition.

**END OF SECTION 31 25 00**

# SECTION 31 50 00 - EXCAVATION SUPPORT AND PROTECTION

## PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes temporary excavation support and protection systems.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, performance properties, and dimensions of individual components and profiles, and calculations for excavation support and protection system.

1.4 FIELD CONDITIONS

A. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

## PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that are either new or in serviceable condition.

## PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.
   1. Shore, support, and protect utilities encountered.

B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Locate excavation support and protection systems clear of permanent construction so that construction and finishing of other work is not impeded.

3.2 FIELD QUALITY CONTROL

A. Survey-Work Benchmarks: Resurvey benchmarks regularly during installation of excavation support and protection systems, excavation progress, and for as long as excavation remains open. Maintain an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Architect if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

B. Promptly correct detected bulges, breakage, or other evidence of movement to ensure that excavation support and protection system remains stable.

C. Promptly repair damages to adjacent facilities caused by installation or faulty performance of excavation support and protection systems.

**END OF SECTION 31 50 00**

# SECTION 32 11 13.13 - LIME TREATED SUBGRADES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:
1. Lime treatment requirements for subgrade.

### 1.2 REFERENCES

A. ASTM:
1. C51 – Standard Terminology Relating to Lime and Limestone
2. C977 – Quicklime and Hydrated Lime for Soil Stabilization
3. D2216 – Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
4. D4718 - Standard Practice for Correction of Unit Weight and Water Content for Soils Containing Oversize Particles
5. D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3))
6. D1556 – Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
7. D6938 – Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

B. AASHTO:
1. M216 – Standard Specification for Lime for Soil Stabilization
2. T26 – Standard Method of Test for Quality of Water to Be Used in Concrete
3. T219 – Standard Method of Test for Testing Lime for Chemical Constituents and Particle Sizes

### 1.3 SUBMITTALS

A. Submit in accordance with Division 01.

B. Submit proposed mix design, prepared by a testing laboratory under the direction and control of a registered professional engineer.

C. Submit proposed safety plan and measures for working with lime materials.

## PART 2 PRODUCTS

### 2.1 MATERIALS

A. Lime
1. Lime shall be either quicklime or hydrated lime, in conformance with ASTM C977.

B. Water
   1. Water used for mixing or curing shall be reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable, or other harmful substances. Water shall be tested in accordance with, and shall meet the suggested requirements of, AASHTO T-26. Potable water may be used without testing.

## PART 3 - EXECUTION

3.1 GENERAL

A. Verify that subgrade is to the correct line, grade, and required compaction immediately prior to placing lime treatment. Subgrade must conform to specified compaction requirements and elevation tolerances and must be free of loose or extraneous materials.

B. Subgrade to be treated shall contain no rocks larger than 2 inches in diameter.

C. Obtain approval from the Owner Representative prior to lime treating any soils.

D. Schedule work during favorable weather conditions. Lime treated subgrade shall not be constructed if the ambient temperature is below 40° F or when conditions indicate that temperatures may fall below 40° F within 24 hours.

3.2 EQUIPMENT

A. Contractor shall provide all equipment necessary to complete the work including grading and scarifying equipment, a spreader of the lime, mixing and pulverizing equipment, sheepsfoot and pneumatic rollers, sprinkling equipment and trucks. Gravity feed or tailgate spreading, defined as not having automatic controls, will not be permitted. The spreader shall demonstrate the ability to maintain a consistent spread rate over variable travel speeds. All equipment used for this work is subject to approval by the Engineer.

3.3 SPREADING

A. Quicklime shall only be applied by approved spreader trucks equipped with operating dust collectors to minimize dust issues while loading. Additionally, dust control measures must be utilized during the spreading and soil mixing of quicklime. Contractor shall exercise safety measures when mixing quicklime with water.

B. Lime shall be spread by a system which will uniformly distribute the required amount of lime for the full width of the pass or on the windrow. Lime spread rate shall not vary more than 10 percent from the designated spread rate. All lime shall be mixed on the same day as spread.

C. If the material to be treated is windrowed, the top of the windrow shall be flattened or trenched to receive the lime. No traffic other than water trucks and the mixing equipment will be allowed to pass over the spread lime until after the completion of mixing.

3.4 MIXING

A. Mixing shall be accomplished with a traveling mixed, approved by the Engineer, which shall be equipped with a system capable of introducing water at a controlled rate during mixing in order to produce a completed mixture with uniform moisture content. Mixing operations shall be performed in such a manner as to produce a uniform moisture of the lime, water and the materials being treated, free of streaks and pockets of lime. Nonuniformity of color reaction, when the treated material is tested with the standard phenolphthalein-alcohol indicator, shall be considered as evidence of adequate mixing.

B. Water shall be added during the mixing process until the water content of the mixture is approximately 2 percent above the optimum moisture content of the lime-treated soil. Sufficient water shall be added during initial mixing to slake all the quicklime.

3.5 COMPACTION

A. After mixing is complete, curing period of not less than 16 nor more than 72 hours is required before the lime-treated material is spread and compacted. Thickness of a compacted layer shall not exceed 8 inches. Where the thickness is more than 8 inches, the mixture shall be spread and compacted in two or more approximately equal layers. Moisture content shall be maintained to achieve compaction. Relative density shall be 90 percent minimum.

B. Areas inaccessible to conventional rolling equipment shall be compacted to the required density by methods approved by the Engineer. Mellowing time and mellowing moisture content shall be specified by the mix design and performed prior to final compaction

C. Materials shall be aerated or watered as necessary to provide and maintain required moisture content.

D. A composite of treated soil or subgrade materials from a minimum of five (5) random locations, per soil type, within the area to be stabilized shall be used to determine the maximum dry density and optimum moisture content in accordance with ASTM D698. The field density of the compacted mixture shall be at least 95 percent of the maximum dry density of the field sampled proctor. The in-place compacted field density shall be determined in accordance with ASTM D1556, sand cone, or ASTM D6938, nuclear gauge. In the event of disputed results, the nuclear gauge density shall be correlated to the referee sand cone density while the nuclear water content shall be correlated to the referee ASTM D2216 water content. The adjustment for rock larger than the no. 4 sieve shall be performed in accordance with ASTM D4718.

E. At the end of each day’s work, a vertical-faced construction joint shall be made in thoroughly compacted material normal to the centerline of the roadbed. Additional mixture shall not be placed until the construction joint has been approved by the Engineer.

3.6 FINISHING AND CURING

A. Following compaction of the final layer, subgrade shall be brought to the required lines and grades in accordance with the Contract Documents. Completed section shall be finished by rolling with a pneumatic or other suitable roller.

B. Each layer of lime treated subgrade shall be maintained in a moist condition until the next layer of structure is placed.

C. If required, a curing seal shall be furnished and applied to the surface of the final layer of the lime stabilized material as soon as possible after the completion of final rolling and before the temperature falls below 40° F. Curing seal shall be applied at a rate between 0.10 and 0.20 gallons per square yard of surface.

D. After curing begins, all traffic, except necessary construction equipment shall be kept off the lime stabilized subgrade for a minimum of 7 days (72 hours if a curing seal is applied). As an alternative, the Contractor may place a loose lift of aggregate base course over the curing subgrade. The aggregate base course should be kept moist during the curing process.

3.7 FIELD QUALITY CONTROL

A. The thickness of the lime treated subgrade shall be determined by visual inspection and/or by depth tests taken at intervals so that each test shall represent no more than 1000 square yards per layer. If more than one layer, the method used to remove material to determine the depth of lime treatment may be by shovel and/or pick, coring or other method approved by the Engineer. Phenolphthalein solution shall be used to detect the presence of lime. When the grade deficiency is more than 1 inch, the Contractor shall correct such areas in a manner satisfactory to the Engineer. Contractor shall replace, at no cost to the Contracting Agency, the material where depth tests are taken.

B. All irregularities, depressions, or weak spots which develop shall be corrected immediately by scarifying the areas affected, adding or removing material as required, and reshaping and recompacting. The surface of the course shall be maintained in a smooth condition, free from undulations and ruts, until other work is placed thereupon or the work is accepted. Compaction and finishing shall be done in such a manner as to produce a smooth dense surface free of compaction planes, cracks, ridges or loose materials.

**END OF SECTION 32 11 13.13**

# SECTION 32 11 23 - AGGREGATE BASE COURSE

## PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aggregate Base.

1.2 REFERENCES

A. ASTM D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort.

B. CTM 217 - Sand Equivalent.

C. CTM 229 - Durability Index.

D. CTM 301 - Resistance “R” Value of Treated and Untreated Bases, Subbases and Basement Soils (Stabilometer).

E. Caltrans Standard Specifications, current edition.

1.3 SUBMITTALS

A. Submit in accordance with Division 01.

B. Submit Certificate of Product Compliance indicating conformance of Aggregate Base material with Caltrans Standard Specifications requirements for Class 2, Aggregate Base (including both standard Aggregate Base, and Aggregate Base which does not contain recycled materials).

## PART 2 - PRODUCTS

RFI 0092 — Under Structural Slab AB

3/4" Crushed Rock in lieu of AB is acceptable under SOG.

2.1 MATERIALS

A. Aggregate Base must be ¾ inch maximum, Class 2 and must conform to the provisions of Section 26, “Aggregate Bases,” of the Caltrans Standard Specifications. Aggregate Base must be free from organic matter and other deleterious substances, and must be capable of being compacted to form a firm and stable base.

B. Aggregate base placed beneath the Portland cement concrete flatwork shall not contain recycled materials.

RFI 0246 — SITE - Recycled AB Under PCC Flatwork

No recycled materials are acceptable. HP to submit separate AB containing no recycled material for areas beneath PCC flatwork.

## PART 3 - EXECUTION

3.1 GENERAL

A. Verify that subgrade is to the correct line, grade, and required compaction immediately prior to placing base material. Subgrade must conform to specified compaction requirements and elevation tolerances and must be free of loose or extraneous materials.

B. Obtain approval from the Owner Representative prior to placing aggregate base.

C. Schedule work during favorable weather conditions.

3.2 PLACING AGGREGATE BASE

A. Aggregate Base must be delivered as uniform mixture and spread free from pockets of coarse or fine material.

B. When Aggregate Base is placed, moisture content must be sufficient to obtain the required compaction. Supplement with sprayed water as required to achieve compaction. Moisture must be uniformly distributed throughout the material.

C. Maximum compacted thickness of any one layer must not exceed 6 inches. Begin compaction of each layer as soon after spreading as practicable. Continue compaction until a minimum of 95 percent relative compaction, ASTM D1557, has been achieved.

D. Each layer must be placed and compacted to the specified density before a succeeding layer is placed.

E. The finished surface must be trimmed and shaped to produce a smooth, uniform surface. The entire work area must be left in a neat condition and ready for placement of paving, in required locations, as shown on the Contract Documents.

3.3 FIELD QUALITY CONTROL

A. Owner will conduct compaction testing on each lift placed at the project site, or as directed by the Owner Representative. Compaction testing will be performed in accordance with ASTM D1557.

**END OF SECTION 32 11 23**

# SECTION 32 12 16 - ASPHALT PAVING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 INFORMATIONAL SUBMITTALS

A. Mix Design: Include the following:
1. Testing shall be in accordance with CCR Title 24, and any other testing specifically indicated in the Contract Documents to verify compliance.
2. Gradation of each aggregate constituent to be used in mixture.
3. Proportion of each constituent to be used to produce combined gradation of aggregate within limits specified.
4. ASTM bulk specific gravity of each aggregate constituent.
5. Measured maximum specific gravity of mix at optimum asphalt content determined in accordance with ASTM D2041.
6. Properties of mix for at least four different asphalt contents other than optimum, two of which will be below optimum and two of which will be above optimum.
7. Percent of asphalt lost due to absorption by aggregate.
8. Temperature of water when dscharged from mixer.
9. Bitumen percentage based on the total weight of mix.
10. Other information pertinent to design of mix.

### 1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by authorities having jurisdiction or the DOT of state in which Project is located.

B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated, and certified by the State of California, Office of the State Architect

C. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of “Standard Specifications State of California 2015” of Caltrans for asphalt paving work.
1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

### 1.4 FIELD CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
1. Prime Coat: Minimum surface temperature of 60 deg F.
2. Tack Coat: Minimum surface temperature of 60 deg F.
3. Slurry Coat: Comply with weather limitations in ASTM D 3910.

4. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
5. Asphalt Surface Course: Minimum surface temperature of 60 deg Fat time of placement.

1.5 STORAGE AND HANDLING

A. Store materials in a bermed area away from drainage courses.
   1. Cover materials and equipment when not in use.
   2. Place drip pans or absorbent materials under paving equipment when not in use.

**PART 2 - PRODUCTS**

2.1 AUXILIARY MATERIALS

A. Sand: ASTM D 1073 or AASHTO M 29, Grade No. 2 or No. 3.

2.2 MIXES

A. Hot-Mix Asphalt: Shall conform with Section 39 of the State Specifications and shall be Type A Asphalt Concrete meeting PG70-10.

B. Production Mix Tolerances:
   1. Average of all mix tests shall fall within requirements specified for job mix formula.
   2. Individual field quality assurance tests may fall outside job-mix formula per the following, provided job mix average does not fall outside master grading band:
      a. Aggregate passing No. 4 sieve or larger: plus or minus 7 percent.
      b. Aggregate passing No. 8, 16, 30, and 40 sieves: plus or minus 4 percent.
      c. Aggregate passing No. 100 and 200 sieves: plus or minus 2 percent.
      d. Bitumen: plus or minus 0.40 percent.
      e. Temperature of mix: plus or minus 20 degrees F.

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to begin paving.

B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
   1. Completely proof-roll subgrade in one direction. Limit vehicle speed to 3 mph.
   2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
   3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

C. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 PLACING HOT-MIX ASPHALT

A. Schedule so that spreading and rolling of all mixture prepared for one day's run can be completed during daylight, unless otherwise approved by the Owner's Representative and adequate artificial lighting is provided. Hauling over freshly placed material is not permitted until material has been compacted and cooled to atmospheric temperature.

B. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
   1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
   2. Place hot-mix asphalt surface course in single lift.
   3. Spread mix at a minimum temperature of 250 deg F.
   4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
   5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

C. In areas where irregularities or unavoidable obstacles make use of mechanical spreading and finishing equipment impractical, mixture ma be spread, raked, and luted by hand tools.

D. Place paving in consecutive strips not less than 10 feetwide unless infill edge strips of a lesser width are required.
   1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Overlap mix placement about 1 to 1-1/2 inchesfrom strip to strip to ensure proper compaction of mix along longitudinal joints.
   2. Complete a section of asphalt base course before placing asphalt surface course.

E. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.3 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
   1. Clean contact surfaces and apply tack coat to joints.
   2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
   3. Offset transverse joints, in successive courses, a minimum of 24 inches.
   4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."
   5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
   6. Compact asphalt at joints to a density within 2 percent of specified course density.

B. Roller shall not pass over the unprotected end of freshly lain mixture except when necessary to form transverse joint. When necessary to form transverse joint, it shall be made by means of placing a bulkhead or by tapering the course, in which case the edge shall be cut back on a straight line to its full depth.

3.4 COMPACTION

A. General:
1. Sufficient rollers shall be furnished to handle output of mixing plant. Speed of rollers shall be sufficiently slow to avoid displacement of hot mixture. Any displacement occurring as a result of reversing roller direction, or from any other cause, shall be corrected at once by rakes and fresh mixture.
2. Roller wheels shall be kept properly moistened to prevent adhesion of the mixture, but excessing water will not be permitted. In areas not accessible to the roller, asphalt mixture shall be compacted with hot hand tampers.
3. Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
4. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
1. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent or greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness. Any mixture with becomes loose and broken or in any way defective, shall be removed and replaced with fresh hot mixture and immediately compacted to conform to surrounding area. Skin patching shall not be allowed.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.5 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
   1. Base Course: Plus or minus 1/2 inch.
   2. Surface Course: Plus 1/4 inch, no minus.

B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
   1. Base Course: 1/4 inch.
   2. Surface Course: 1/8 inch.
   3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.6 WASTE HANDLING

A. General: Handle asphalt-paving waste according to approved waste management plan required in Section 017419 "Construction Waste Management and Disposal."

3.7 MAINTENANCE

A. Except where damaged by trenching by other Contractors, this Work includes maintenance of all asphalt concrete surfaces installed by the Contractor throughout the project. Maintain surfaces in drivable condition throughout project duration and repair areas of settlement and cracked surfaces prior to placement of the final lift of asphalt concrete.

3.8 FINAL LIFT

A. In general, final lift of pavement shall not be constructed until heavy construction traffic has ceased. Perform final lift paving operations following approval by the Owner's Representative to proceed. Apply tack coat to existing asphalt concrete surface prior to placing final lift.

**END OF SECTION 32 12 16**

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# SECTION 32 13 13 - CONCRETE PAVING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes Concrete Paving.

### 1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash, slag cement, and other pozzolans.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

### 1.4 FIELD CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

B. Cold-Weather Concrete Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:
   1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
   2. Do not use frozen materials or materials containing ice or snow.
   3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

C. Hot-Weather Concrete Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
   1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
   2. Cover steel reinforcement with water-soaked burlap, so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
   3. Fog-spray forms and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

### 1.5 SUBMITTALS

A. Product data: Submit product technical data verifying that products meet the requirements stipulated in “Part 2 Products” of this specification.

**PART 2 - PRODUCTS**

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 unless otherwise indicated.

2.2 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.
   1. Use flexible or uniformly curved forms for curves with a radius of 100 feet or less. Do not use notched and bent forms.

2.3 CONCRETE MATERIALS

A. Water: Potable and complying with ASTM C 94/C 94M.

2.4 CURING MATERIALS

A. Water: Potable.

2.5 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.
   1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
   2. When automatic machine placement is used, determine design mixtures and obtain laboratory test results that comply with or exceed requirements.

B. Cementitious Materials: Use the following cementitious materials, of same type, brand, and source throughout Project:
   1. Portland Cement: ASTM C 150, white, Portland cement Type II. Supplement with the following:
      a. Fly Ash: ASTM C 618, Class C or Class F.
      b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.1 percent by weight of cement.

D. Concrete Mixtures: Normal-weight concrete.
   1. Compressive Strength (28 Days): 3000 psi
   2. Maximum W/C Ratio at Point of Placement: 0.50.
   3. Slump Limit: 8 inches after admixture.
   4. Solar Reflectance Index: Not less than 29.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.
   1. Correct subbase with soft spots and areas of pumping or rutting according to requirements in Section 312000 "Earth Moving."

C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

### 3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

### 3.4 CONCRETE PLACEMENT

A. Before placing concrete, inspect and complete formwork installation and items to be embedded or cast-in.

B. Remove snow, ice, or frost from subbase surface before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating joint devices.

H. Screed paving surface with a straightedge and strike off.

I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleedwater appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

J. Slip-Form Paving: Use design mixture for automatic machine placement. Produce paving to required thickness, lines, grades, finish, and jointing.
1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of slip-form paving machine during operations.

## 3.5 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

## 3.6 PAVING TOLERANCES

A. Comply with tolerances in ACI 117 and as follows:
1. Elevation: 3/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-feet- long; unleveled straightedge not to exceed 1/2 inch.
4. Joint Spacing: 3 inches.
5. Joint Width: Plus 1/8 inch, no minus.

## 3.7 REPAIR AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

**END OF SECTION 32 13 13**

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# SECTION 32 172 6
# TACTILE WARNING SURFACE

## PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Precast concrete tactile warning tiles.

1.2 SUBMITTALS

A. Submittal list of materials proposed for use in work, in form of shop drawing, identified by manufacturer's name and product label prior to start of installation.

B. Product Data – Submit material specifications, manufacturer's installation, and maintenance instructions.

C. Certification: Manufacturer's certifications that all products furnished meet or exceed specified requirements.

1.3 REQUIREMENTS

A. Material must comply with local, state, and federal air pollution control requirements and federal lead content requirements.

B. Material must comply with California State Accessibility Standards, CCR Title 24.

C. Material must comply with Americans With Disabilities Act (ADA) Accessibilities Guidelines for Buildings.

1.4 QUALITY ASSURANCE

A. Manufacturer: Colors selected are from a single manufacturer.

B. Tile shall comply with requirements of Detectable Warnings on Walking Surfaces of the Americans with Disabilities Act and California State Accessibilities Standards, Title 24.

1.5 PRODUCT HANDLING

A. Protection: Products to be stored at the job site in a safe dry place with all labels intact and legible at time of installation.

B. Replacements: In the event of damage, make repairs and replacements.

C. Delivery and Handling: Deliver units to site at scheduled time of installation, and handled at the job site in the protective, shrink-wrapped pallets. Pallets shall be stored complete and unopened until time of use so that the units will not be discolored or soiled before installation and should be re-covered at the end of each workday.

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A. Protection: Products to be stored at the job site in a safe dry place with all labels intact and legible at time of installation.

B. Replacements: In the event of damage, make repairs and replacements.

C. Delivery and Handling: Deliver units to site at scheduled time of installation, and handled at the job site in the protective, shrink-wrapped pallets. Pallets shall be stored complete and unopened until time of use so that the units will not be discolored or soiled before installation and should be re-covered at the end of each workday.

D. Transport: Transport units in manner so as to prevent excessive stresses, cracking, or spalling.

1.6 PRODUCT HANDLING

A. Detectable warnings surfaces shall comply with CBC Section II B-705.

B. Detectable warning surfaces shall be yellow conforming to FS 33538 of Federal Standard 595B, except for locations at curb ramps, islands, or cut-through medians where color used shall contract visually with that of adjacent walking surfaces, either light-on-dark, or dark-on-light. CBC Sections 11B-705.1.1.3 and llB-705.1.1.5.

C. Detectable warning surfaces shall differ from adjoining surfaces in resiliency or sound-on-cane contact. CBC Section llB-705.1.1.4.

D. Warranty: Manufacturer agrees to repair or replace components of tactile warning surfaces that fail in materials within specified warranty period.
1. Warranty Includes: manufacturing defects, breakage, and deformation.
2. Warranty Period: 5 years from date of Substantial Completion.

**PART 2 – PRODUCTS**

2.1 MATERIALS

A. Concrete Cement
1. Using specific concrete mix of sand, gravel and color that will guarantee a minimum 5000 PSI, 28-day strength and precise color.
2. Obtain aggregates from single source throughout work.

B. Mortar and Grout
1. Admixture Manufacturers:
   a. Laticrete International
   b. Or Equivalent.
2. Setting: Bed Mortar: 1:3 Portland cement/sand gauged with Laticrete No. 3701 Admix or Equivalent.
3. Grout: Laticrete Dry Bond Grout and Joint Filler gauged with Laticrete No. 3701 Grout and Mortar Admix or Equivalent.
4. Mixing Proportions and Procedures: In accordance with recommendations of manufacturer of mortar additives.

C. Dimension and Color
1. Tile shall contain truncated domes with a diameter of nominal 0.9 inch at base tapering to 0.45 inch at the top, a height of nominal 0.2 inch and a center to-center spacing of nominal 2.35 inches.
2. Size:
   a. 24 inches x 24 inches x 2 inches thick
   b. 24 inches x 36 inches x 2 inches thick
   c. 36 inches x 48 inches x 2 inches thick

D. Transport: Transport units in manner so as to prevent excessive stresses, cracking, or spalling.

1.6 PRODUCT HANDLING

A. Detectable warnings surfaces shall comply with CBC Section II B-705.

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**PART 2 – PRODUCTS**

2.1 MATERIALS

A. Concrete Cement
1. Using specific concrete mix of sand, gravel and color that will guarantee a minimum ~~5000~~ PSI, 28-day strength and precise color.
2. Obtain aggregates from single source throughout work.

RFI 0330 Truncated Dome PSI ~~3000~~ PSI See RFI for details

B. Mortar and Grout
1. Admixture Manufacturers:
   a. Laticrete International
   b. Or Equivalent.
2. Setting: Bed Mortar: 1:3 Portland cement/sand gauged with Laticrete No. 3701 Admix or Equivalent.
3. Grout: Laticrete Dry Bond Grout and Joint Filler gauged with Laticrete No. 3701 Grout and Mortar Admix or Equivalent.
4. Mixing Proportions and Procedures: In accordance with recommendations of manufacturer of mortar additives.

C. Dimension and Color
1. Tile shall contain truncated domes with a diameter of nominal 0.9 inch at base tapering to 0.45 inch at the top, a height of nominal 0.2 inch and a center to-center spacing of nominal 2.35 inches.
2. Size:
   a. 24 inches x 24 inches x 2 inches thick
   b. 24 inches x 36 inches x 2 inches thick
   c. 36 inches x 48 inches x 2 inches thick

3. Coefficient of friction shall be 0.6 minimum when tested in accordance with ASTMC 1028.
4. Consistent color throughout tile. Cure units to develop concrete quality and to minimize appearance blemishes such as non-uniformity, staining, or surface cracking.
5. Minor patching is acceptable, provided that structural adequacy and appearance of units is not impaired. Units exhibiting evidence of extensive repairs will not be accepted.

D. Materials as manufactured by the following companies:
1. Tiletech Pavers (213) 380-5560
2. AccessTile (916) 844-4132
3. Or Equivalent.

2.2 SOURCE QUALITY CONTROL AND TESTING

A. Testing: Sampling and testing in accordance with manufactures standard procedures, subject to the engineer's acceptance.

## PART 3 – EXECUTION

3.1 GENERAL

A. Install truncated domes in conformance with manufacturer's specifications and substrate requirements.
1. Verify layout of work before beginning work.
2. Verify substrate is acceptable for placing units in place.
3. Beginning of work means acceptance of existing conditions.

3.2 INSTALLATION

A. Spread and screed mortar setting bed mixture true to plane. Limit setting bed to one tile prior to initial set.

B. Set and level each tile immediately. Tamp tiles to complete contact with setting bed. Do not set large areas of tiles for later leveling.

C. Remove excess mortar from face of tiles as work progresses while mortar is fresh.

D. On Continuous Runs: The Installer shall leave a 3/16 inch nominal gap between successive Tactile Warning Surface Tile.

E. Replacement: Replace tile work showing damage or disfiguration during progress of work in its entirety. Patching or hiding of defects is not permitted.

3.3 SEALANT

A. Seal with two coats of manufacturers sealing product or product designated by manufacturer designed for precast concrete penetration.

B. Sealant shall protect units against all weather conditions.

3. Coefficient of friction shall be 0.6 minimum when tested in accordance with ASTMC 1028.
4. Consistent color throughout tile. Cure units to develop concrete quality and to minimize appearance blemishes such as non-uniformity, staining, or surface cracking.
5. Minor patching is acceptable, provided that structural adequacy and appearance of units is not impaired. Units exhibiting evidence of extensive repairs will not be accepted.

D. Materials as manufactured by the following companies:
1. Tiletech Pavers (213) 380-5560
2. AccessTile (916) 844-4132
3. Or Equivalent.

2.2 SOURCE QUALITY CONTROL AND TESTING

A. Testing: Sampling and testing in accordance with manufactures standard procedures, subject to the engineer's acceptance.

## PART 3 – EXECUTION

3.1 GENERAL

A. Install truncated domes in conformance with manufacturer's specifications and substrate requirements.
1. Verify layout of work before beginning work.
2. Verify substrate is acceptable for placing units in place.
3. Beginning of work means acceptance of existing conditions.

3.2 INSTALLATION

A. Spread and screed mortar setting bed mixture true to plane. Limit setting bed to one tile prior to initial set.

B. Set and level each tile immediately. Tamp tiles to complete contact with setting bed. Do not set large areas of tiles for later leveling.

C. Remove excess mortar from face of tiles as work progresses while mortar is fresh.

D. On Continuous Runs: The Installer shall leave a 3/16 inch nominal gap between successive Tactile Warning Surface Tile.

E. Replacement: Replace tile work showing damage or disfiguration during progress of work in its entirety. Patching or hiding of defects is not permitted.

3.3 SEALANT

A. Seal with two coats of manufacturers sealing product or product designated by manufacturer designed for precast concrete penetration.

B. Sealant shall protect units against all weather conditions.

C. Sealant shall protect units against graffiti.

D. Coefficient of friction of 0.6 shall be maintained.

3.4 PROTECTION

A. Protect detectable warning tiles against damage during construction period to comply with tile manufacturer's specifications.

B. During and after the detectable warning tiles installation and the concrete curing stage, it is imperative that there is no walking, leaning, or external forces placed on the tile to rock the tile, causing a void between the underside of the tile and the concrete substrate.

C. Clean tiles not more than four days prior to date scheduled for inspection intended to establish date of substantial completion in each area of the project.

**END OF SECTION 32 17 26**

C. Sealant shall protect units against graffiti.

D. Coefficient of friction of 0.6 shall be maintained.

3.4 PROTECTION

A. Protect detectable warning tiles against damage during construction period to comply with tile manufacturer's specifications.

B. During and after the detectable warning tiles installation and the concrete curing stage, it is imperative that there is no walking, leaning, or external forces placed on the tile to rock the tile, causing a void between the underside of the tile and the concrete substrate.

C. Clean tiles not more than four days prior to date scheduled for inspection intended to establish date of substantial completion in each area of the project.

**END OF SECTION 32 17 26**

# SECTION 32 31 13 - CHAIN LINK FENCES AND GATES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 FIELD CONDITIONS

A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
      a. Fence and gate posts, rails, and fittings.
      b. Accessories.
      c. Gates and hardware.
      d. Operators.

B. Shop Drawings: For each type of fence and gate assembly.
   1. Include plans, elevations, sections, details, and attachments to other work.
   2. Include accessories, hardware, gate operation, and operational clearances.
   3. Gate Operator: Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.
   4. Wiring Diagrams: For power, signal, and control wiring.

### 1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency and factory-authorized service representative.

B. Product Certificates: For each type of chain-link fence, operator, and gate.

C. Product Test Reports: For framework strength according to ASTM F 1043, for tests performed by manufacturer and witnessed by a qualified testing agency.

D. Field quality-control reports.

E. Sample Warranty: For special warranty.

### 1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For gate operators to include in emergency, operation, and maintenance manuals.

B. Provide on-site commissioning and owner training for gate operator.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Testing Agency Qualifications: For testing fence grounding; member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

D. Mockups: Build mockups to set quality standards for fabrication and installation.

1. Build mockup for typical pedestrian gate, including accessories.

a. Size: 10-foot length of fence with gate assembly.

RFI 0204 — SITE - Chain Link Fence and Gate Mock-Up — 1.7B - 1-day review of the gate and accessories mock-up

1.7 WARRANTY

A. A. Special Warranty: Installer agrees to repair or replace components of chain-link fences and gates that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure to comply with performance requirements.
b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
c. Faulty operation of gate operators and controls.

2. Warranty Period: five (5) years from date of Substantial Completion.

**PART 2 - PRODUCTS**

2.1 MATERIALS

A. Framework:
1. Unless specified otherwise, framework must be Type I pipe or Type II pipe at Contractor’s option.
2. Type I Pipe:
a. ASTM F1083 standard weight (Schedule 40), plain ends.
3. Type II Pipe:
a. ASTM A1011, or ASTM A653, Grade D; cold formed, electric welded; minimum yield strength 50,000 psi.
b. Coating must conform to ASTM A123 or Section 80-4.01 A paragraphs 3 and 4 of the Caltrans Specifications, except the reference to 300 hours in paragraph 3 must

be 650 hours, and reference to the Engineer in paragraph 4 must be the Owner Representative.

4. Dimensions and Weights:

| Outside Diameter (OD) in inches | Type I Steel Weight/Foot | Type II Steel Weight/Foot |
|---|---|---|
| 2.375 | 3.65 | 3.12 |
| 2.875 | 5.79 | 4.64 |
| 4.000 | 9.11 | 6.56 |
| 6.625 | 17.97 | Not Permitted |
| 8.625 | 28.55 | Not Permitted |

5. Terminal Posts (End, Corner, and Angle Posts):
   a. Minimum 4.000-inch OD at fences with fabric extending 12 feet or less above finish grade.
   b. Minimum 6.625-inch OD elsewhere.
6. Line Posts:
   a. Minimum 2.875-inch OD at fences with fabric extending 12 feet or less above finish grade.
   b. Minimum 4.000-inch OD elsewhere.
7. Gate Posts: Type I Pipe; minimum 4.000-inch OD where gate leaf width is 6 feet or less and fabric height of fence and gate leaf extends 12 feet or less above finish grade; minimum 6.625-inch OD elsewhere.
8. Enclosure Posts: 3.5” OD.
9. Rails (Intermediate and Bottom) and Braces: 2.375-inch OD.
10. Tension Wire: ASTM A824; Type II, Class 3.

B. Fabric:
1. Standard:
   a. ASTM A392; Class 2 zinc coating.
   b. Two inch diamond-mesh, No. 9-gauge wire.
   c. Knuckled bottom selvage; twisted and barbed top selvage except knuckled top selvage where indicated.

C. Barbed Wire: ASTM A121; 12.5-gauge; 14-gauge four point round barbs, 5-inch spacing; class 3 coating.

D. Bottom Rail Anchors: No. 3 reinforcing bars, U-shape with hooks on each end.

E. Concrete:
1. Type specified in Section 03 30 00.
2. Unless otherwise indicated, provide concrete of the following strength:
   a. Post Footings: Minimum 3,000 psi compressive strength at 28 days.

F. Reinforcing Bars: Type specified in Section 03 30 00; Grade 60.

2.2 ACCESSORIES

A. Fittings:
1. Malleable steel, cast iron, or pressed steel.

2. Fittings include extension arms for barbed wire, tension bars and bands, clips, truss rod assemblies, boulevard clamps, brace bands, rail ends, hardware, fabric and barbed tape fastenings and accessories.

B. Tension (Stretcher) Bars: One-piece lengths equal to full height of fabric with a minimum cross-section of 1/4-inch by 3/4-inch.
1. Provide one tension bar for each gate post and end post.
2. Provide two tension bars for each corner post.

C. Tension (Stretcher) Bar Bands: Steel, 3/4-inch x 1/10-inch nominal to secure tension bars to posts.

D. Extension Arms:
1. 18 inches long, 45 degree bracket type; slits at even spacing for three strands of barbed wire.
2. Extension arms must permit permanent attachment to post without welding. Provide mechanical attachment to prevent unauthorized removal.
3. Locations Other Than Terminal Posts: Breakaway (swing-down) type designed to give way when a torque load of 40 to 50 foot pounds is applied to the arm.
4. Terminal Posts: Match other extension arms, except breakaway feature may be deleted to accommodate erection procedures if required. Extension arms other than break away must require approval.

E. Post Tops:
1. Weather tight closure cap for tubular posts.
2. One for each exposed tubular post end where equal protection is not afforded by combination post cap/extension arm.
3. Post tops must permit permanent attachment to post without welding. Provide mechanical attachment to prevent unauthorized removal.

F. Truss Assembly: Capable of withstanding 2,000 pounds tension consisting of minimum ½ inch truss rod with truss tightener or turnbuckle.

G. Boulevard Clamps: Two piece clamp, minimum 12 gauge with 5/16 inch carriage bolts and nuts.

H. Brace Bands: One inch size minimum 12 gauge with 5/16 x 1-1/2 inch carriage bolts and nuts.

I. Rail Ends: Weather tight closure for tubular rails and braces.

J. Hog Rings: 18-gauge stainless steel for attachment of barbed tape; 9-gauge galvanized steel at all other locations.

K. Tie Wire: 6-gauge galvanized steel wire, unless otherwise indicated.

2.3 GATES

A. Gate Frames: Type I pipe members, 2.375-inches OD unless otherwise indicated.

B. Provide truss rods of 3/8-inch minimum nominal diameter to prevent sag or twist.

C. Provide vertical intermediate bracing of gate leaves, spaced so that members are no more than 8 feet apart.

D. Provide horizontal gate leave braces as required to provide rigid construction, free from sag or twist.

E. Gate Fabric: Match fence fabric.

F. Attach fabric to frame at intervals not exceeding 12 inches. Secure with tension bars, tension bands, and 6-gauge steel wire.

2.4 GATE HARDWARE (REFERENCED AS HW 1.0 IN SECTION 08 06 71)

A. Hinges:
1. Rated heavy duty and sized for the supported gate, with large bearing surfaces for clamping in position.
2. Hinges must not twist or turn under the action of the gate.
3. Hinges must not allow the gate to be lifted without first removing the hinges.
4. The gates must be capable of being opened and closed easily by one person.
5. Hinges must be suitable for exterior use.
6. Weldable Gate Hinges: Butts 205 as specified in Section 08 71 63.

B. Latches:
1. Padlockable vertical slide bolt assembly.
2. Installed assembly must be capable of retaining gate in a closed position.
3. Installed assembly must be capable of withstanding a force of 500 pounds in any direction at any point in such a manner as to create the greatest stress on the locked assembly, without releasing the mechanism or allowing the gate to open. After the force is removed, the mechanism and gate must be without damage and continue to function as designed.
4. Latches must be arranged for locking with specified locking hardware.
5. Gates and posts must be modified as required to receive hardware, including locking and operating mechanisms as herein specified.

C. Hold-Open-Stop
1. Mechanical device which automatically engages the free end of the gate leaf when in the full open position and holds it in the open position until manually released.
2. Provide hold open stops for manually operated swinging vehicle gates.

D. Padlocks
1. Padlocks must be Master Padlock #6230.

2.5 GATE OPERATORS

A. UL Standard: Manufacture and label gate operators according to UL 325.

B. Controls: Electric controls separated from gate and motor and drive mechanism, with NEMA 250, Type 3R enclosure for pedestal mounting and with space for additional optional equipment.
1. Basis of Design : Doorking Inc 6100 ½ HP pad mounted series vehicular swing gate.

RFI 0561 GEN - Telephone Entry System Clarification

Control Station, Telephone Entry System and Multiunit System not required.

C. Control Devices:

1. Control Station: Momentary contact, single -button operated; located remotely from gate. Key switch to lock out open and close buttons.
2. Telephone Entry System: Hands-free voice-communication system for connection to building telephone system, with digital-entry code activation of gate operator and auxiliary keypad entry.
3. Multiunit System: Designed to be wired to a dedicated telephone line, with capacity to access 20 telephones and with electronic directory.
4. Vehicle Loop Detector: System that includes automatic closing timer with adjustable time delay before closing, timer cut-off switch, and loop detector designed to open and close gate. Provide electronic detector with adjustable detection patterns, adjustable sensitivity and frequency settings, and panel indicator light designed to detect presence or transit of a vehicle over an embedded loop of wire and to emit a signal activating the gate operator. Provide number of loops consisting of multiple strands of wire, number of turns, loop size, and method of placement at location shown on Drawings, and as recommended in writing by detection system manufacturer for function

## 2.6 GATE HARDWARE GROUPS

A. Pedestrian Manual Swing Gates (4-feet wide) with manual operation and manual lock - Referenced as HW 26.0 in section 08 06 71.
   1. Lock: See hardware schedule.
   2. Padlock shall lock a gravity drop bar that engages a tongue attached to the gate frame. Drop bar shall have positive stops to prevent opening the gate without first removing the lock and raising the drop bar.
   3. Shackle shall allow swinging the lock between gate frame and adjacent post so lock can be opened from either side of fence.

B. Double Leaf Vehicle Swing Gates (12-feet to 18-feet wide) with manual operation and locks - Referenced as HW 27.0 in section 08 06 71.
   1. Lock: See hardware schedule.
   2. Center drop rod or plunger bar must extend into a metal section set in concrete.
   3. Provide lock and padlock eyes as integral part of the latch, requiring one padlock for locking both gate leaves.
   4. Locking device must be constructed so center drop rod or plunger cannot be raised when locked.

## 2.7 FINISHES

A. Components Not Otherwise Indicated: Zinc-coated ASTM A123.

B. Hardware Not Otherwise Indicated: Zinc-coated ASTM A153.

C. Galvanizing Repair Compound: Per manufacturer’s recommendations.

## PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for a certified survey of property lines and legal boundaries, site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.
   1. Do not begin installation before final grading is completed unless otherwise permitted by Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 CHAIN-LINK FENCE INSTALLATION

A. Install chain-link fencing according to ASTM F 567 and more stringent requirements specified.
   1. Install fencing on established boundary lines inside property line.

B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.

C. Post Setting: Set posts at indicated spacing into firm, undisturbed soil.
   1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.

D. Terminal Posts: Install terminal end, corner, and gate posts according to ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more. For runs exceeding 500 feet, space pull posts an equal distance between corner or end posts.

E. Line Posts: Space line posts uniformly at 10 feet o.c.

F. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Diagonally brace terminal posts to adjacent line posts with truss rods and turnbuckles. Install braces at end and gate posts and at both sides of corner and pull posts.
   1. Locate horizontal braces at mid height of fabric 72 inches or higher, on fences with top rail, and at two-third fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.

G. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 1-inchbottom clearance between finish grade or surface and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.

H. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric according to ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.
   1. Maximum Spacing: Tie fabric to line posts at 12 inches o.c. and to braces at 24 inches o.c.

I. Fasteners: Install nuts for tension bands and carriage bolts on the side of fence opposite the fabric side.

3.4 ADJUSTING

A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

**END OF SECTION 32 31 13**

# SECTION 32 31 13.53 - HIGH-SECURITY CHAIN LINK FENCES AND GATES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 FIELD CONDITIONS

A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
      a. Fence and gate posts, rails, and fittings.
      b. Accessories.
      c. Gates and hardware.
      d. Operators.

B. Shop Drawings: For each type of fence and gate assembly.
   1. Include plans, elevations, sections, details, and attachments to other work.
   2. Include accessories, hardware, gate operation, and operational clearances.
   3. Gate Operator: Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.
   4. Wiring Diagrams: For power, signal, and control wiring.

### 1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency and factory-authorized service representative.

B. Product Certificates: For each type of chain-link fence, operator, and gate.

C. Product Test Reports: For framework strength according to ASTM F 1043, for tests performed by manufacturer and witnessed by a qualified testing agency.

D. Field quality-control reports.

E. Sample Warranty: For special warranty.

### 1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For gate operators to include in emergency, operation, and maintenance manuals.

B. Provide on-site commissioning and owner training for gate operator.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Testing Agency Qualifications: For testing fence grounding; member company of NETA or an NRTL.
1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

D. Mockups: Build mockups to set quality standards for fabrication and installation.
1. Build mockup for typical pedestrian gate, including accessories.
a. Size: 10-foot length of fence with gate assembly.

1.7 WARRANTY

A. A. Special Warranty: Installer agrees to repair or replace components of chain-link fences and gates that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
a. Failure to comply with performance requirements.
b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
c. Faulty operation of gate operators and controls.

B. Warranty Period: five (5) years from date of Substantial Completion.

**PART 2 - PRODUCTS**

2.1 SECURITY FENCE FRAMEWORK

A. Posts and Rails: ASTM F 1043 for framework, including rails, braces, and line; terminal; and corner posts.
1. Fence Height: As indicated on Drawings.
2. Rail Members: rails according to ASTM F 1043 for Heavy Industrial.

2.2 FITTINGS

A. Provide fittings according to ASTM F 626.

B. Tie Wires, Clips, and Fasteners: According to ASTM F 626.
1. High-Security Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, according to the following:
a. Metallic-Coated Steel: 0.148-inch diameter wire; zinc coating.
b. Stainless steel.

C. Finish:
1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz. /sq. ft. of zinc.
2. Aluminum: Mill finish.

2.3 GATE HARDWARE

A. Hinges:
1. Rated heavy duty and sized for the supported gate, with large bearing surfaces for clamping in position.
2. Hinges must not twist or turn under the action of the gate.
3. Hinges must not allow the gate to be removed.
4. The gates must be capable of being opened and closed easily by one person.
5. Hinges must be suitable for exterior use.
6. Weldable Gate Hinges: Butts 205 as specified in Section 08 71 63.

B. Latches:
1. Padlockable vertical slide bolt assembly.
2. Installed assembly must be capable of retaining gate in a closed position.
3. Installed assembly must be capable of withstanding a force of 500 pounds in any direction at any point in such a manner as to create the greatest stress on the locked assembly, without releasing the mechanism or allowing the gate to open. After the force is removed, the mechanism and gate must be without damage and continue to function as designed.
4. Latches must be arranged for locking with specified locking hardware.
5. Gates and posts must be modified as required to receive hardware, including locking and operating mechanisms as herein specified.

C. Hold-Open-Stop
1. Mechanical device which automatically engages the free end of the gate leaf when in the full open position and holds it in the open position until manually released.
2. Provide hold open stops for manually operated swinging vehicle gates.

D. Padlocks
1. Padlocks must be Master Padlock #6230.

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for a certified survey of property lines and legal boundaries, site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.
1. Do not begin installation before final grading is completed unless otherwise permitted by Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 ADJUSTING

A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Lubricate hardware and other moving parts.

**END OF SECTION 32 31 13.53**

# SECTION 32 90 00 - PLANTING

## PART 1 GENERAL

### 1.1 SUMMARY

A. Section Includes
   1. Planting guidelines, including soil amendments and landscaping materials.

B. Related Sections
   1. Section 31 20 00 – Earth Moving.
   2. Section 32 92 00 – Turf and Grasses

C. Warranty: Sample of special warranty.

### 1.2 REFERENCES

A. American Association of Nurserymen: Horticultural Standards, [Date] edition.

### 1.3 SUBMITTALS

A. Submit samples for import topsoil if required, soil amendment, existing site soil, lawn seed, decomposed granite and mulch (approximately 2 cups volume each), 30 days prior to commencement of work.
   1. Place a permanent label on each sample which identifies the product.

B. Soils Reports
   1. Submit soil reports for existing soil and import topsoil if required, 30 days prior to commencement of work.
   2. Submit another soils report after recommended soil amendments have been incorporated during soils preparation work.

C. Within 30 days of Notice to Proceed, document with receipts or invoices that all plants have been located and secured for the work by ordering, paying deposits, or as required. Provide name and location of nursery, contact person, and telephone number.

D. Notice of Shipment: At time of delivery, submit notice from nursery containing the following: Name and location of shipper; date of shipment; name of commodity; quantity; certificate that material complies with the specifications; size; statement of root pruning, including dates; and statement that plants are acclimated and have been growing outside.

E. Submit certificates of conformance for amendment, mulch, fertilizer, import topsoil, lawn seed, and sod. Furnish a certificate with each delivery to the site of material in containers, or in bulk. Certificate to state source, quantity or weight, type and analysis, and date of delivery. Deliver all certificates to Owner's Representative.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery, and while stored at site.

B. Do not prune trees or shrubs prior to delivery. Do not bend or bind-tie trees in such a manner as to damage bark, break branches, or destroy natural shape. Provide protecting covering during delivery.

1.5 MAINTENANCE

A. Upon acceptance by the Owner's Representative, commence landscape Maintenance Period. It shall last for a period of not less than 90 days. During the Maintenance Period:
   1. Weed, mow, edge, feed and maintain in a healthy state, all lawn areas.
   2. Prune, trim, shape, feed, stake, tie, guy, spray for pests, and maintain in a healthy state, all trees, with replacement as required.
   3. Repair, adjust, clean, and generally maintain irrigation system in optimum operating mode.
   4. Hose down, remove litter, debris and clippings, rake, vacuum, to leave area in neat, clean appearance.
   5. Lawns shall be fully germinated and established with no bare spots after at least one mowing before Contractor can be released from Maintenance Period.

1.6 WARRANTY

A. Special Warranty: Contractor's standard or custom warranty in which Contractor and Installer jointly agree to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond Contractor's/Installer's control.
      b. Structural failures including plantings falling or blowing over.
      c. Faulty performance of tree stabilization.
   2. Repair or replace within 30 days following receipt of notification.
   3. Warranty Period: Two years from Date of Project completion.

**PART 2 PRODUCTS**

2.1 SOIL PRODUCTS AND AMENDMENT

A. Topsoil, imported or otherwise, shall be reasonably free of debris or rocks, and shall not contain any noxious weeds, seeds, or stolons.

B. NPK fertilizer shall be 18-18-6 commercial fertilizer with micronutrients.

C. Fertilizer tablets shall be 21 gram 20-10-5 planting tablets.

D. Soil amendment shall be nitrolized shredded redwood, fir bark or cedar particles, graded from 0 to1/4 inch.

2.2 PLANT MATERIALS

A. Plant materials shall be furnished in quantities required to complete the Work as indicated in the Contract Documents and as specified. Quality and size of plant material shall be in accordance with the current edition of “Horticultural Standards” for #1 Grade Nursery Stock as adopted by American Association of Nurserymen. In all cases, botanical names shall take preference over common names.

B. Plants shall be nursery grown under climatic conditions similar to those at the site.

C. If documentation is submitted that any plant specified is not obtainable, substituting of nearest variety will be considered.

D. Plants shall be symmetrical, typical for variety and species; sound, healthy, vigorous and free from plant disease, insects and their eggs, and shall have healthy normal root systems, filling their containers, but not root bound.

E. Container stock shall be grown for at least six months in containers in which they are to be delivered, but shall not be root bound. Stock shall be acceptable size for container specified.

F. At least one tree and shrub of each variety shall have a securely attached waterproof tag from the nursery, bearing legible designation of botanical and common name.

2.3 MISCELLANEOUS LANDSCAPE MATERIALS

A. Tree stakes shall be treated lodgepole pine (or equal), 2-inch diameter.

B. Tree ties shall be as detailed on Drawings.

C. Weed control shall be Round Up, Eptam applied per manufacturer’s instructions.

D. Pre-emergent herbicide shall be Treflan EC.

E. Hydroseed Materials shall be as specified in Section 32 92 00.

## PART 3 EXECUTION

3.1 GENERAL

A. Prior to the work of this section, carefully inspect the existing grades and the installed Work of other trades and verify that the planting may be completed in accordance with the Contract Documents.

B. Irrigation system shall be in full working order prior to installation of planting.

C. Proceed with landscape work as rapidly as portions of site become available, working within seasonal limitations for each kind of landscape work required.

D. Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate, as required. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.

E. Do not continue planting when conditions detrimental to plant growth are encountered such as rubble fill, adverse drainage conditions, or obstructions. Consult with the Owner's Representative, regarding what, if any, planting adjustments may be made.

3.2 PREPARATION OF PLANTING AREAS

A. Planting areas shall be completely free of trash and debris. Rocks larger than 2 inches shall be removed. Finish grading shall be completed before planting begins. Unless shown otherwise, finish grade at edge of planting shall be 1 inch below surface of curbs and paved areas. Surfaces shall be sloped with due regard for drainage.

B. Prior to placing soil amendment in areas to receive seeding, disc or scarify the subgrade to a depth of at least 8 inches. Irregularities in the surface shall be corrected to prevent depressions where water would pond.

C. Apply soil amendment to landscape areas to receive groundcover or lawn at the rate of five cubic yards per 1,000 square feet and lawn fertilizer 18-18-6 at the rate of 10 pounds per 1,000 square feet. Uniformly blend amendment and fertilizer into top 6 inches of soil.

3.3 PLANTING TREES AND SHRUBS

A. Deliver trees and shrubs after preparations for planting have been completed. Plant immediately. If planting is delayed more than six hours after delivery, set trees or shrubs in shade, protect from weather and mechanical damage, and keep roots moist.

B. Do not remove container-grown stock from containers until planting time.

C. Plants shall be planted in holes twice the diameter and twice the depth of their nursery containers. Plant holes shall have a layer of tamped topsoil placed with the crown 2 inches higher than adjacent finish grade. Slope backfill upwards to the center.

D. Place fertilizer tablets. Backfill around the roots shall be firmly tamped to prevent settling before watering. Provide bermed watering basins for trees in shrub areas, water thoroughly after planting, and stake as shown.

3.4 MISCELLANEOUS

A. Planting areas except hydroseeded lawn areas shall be saturated with water immediately after planting.

B. Treat planting areas with a pre-emergent herbicide. Follow application procedures recommended by the manufacturer.

C. Prune, thin out, and shape trees in accordance with standard horticultural practice. Do not cut tree leaders. Remove only injured or dead branches from trees. Remove and replace misformed stock resulting from improper pruning.

3.5 CLEANUP AND PROTECTION

A. During landscape Work, keep pavements clean and work area in orderly condition.

B. Protect landscape Work and materials from damage. Maintain protection until planting becomes fully established. Treat, repair, or replace damaged landscape work as required.

3.6 INSPECTION

A. Planting Work shall be completed prior to final inspection by the Owner's Representative. When all punch list items from this inspection are completed to the satisfaction of the Owner's Representative, acceptance shall be given to begin the Maintenance Period.

**END OF SECTION 32 92 00**

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# SECTION 32 92 00 - TURF AND GRASSES

## PART 1 GENERAL

### 1.1 SUMMARY

A. Section Includes:
   1. Hydroseeding.

B. Related Sections:
   1. Section 32 90 00 - Planting.

### 1.2 SUBMITTALS

A. Submit under provisions of Division 1.

B. Submit a minimum of two (2) seed mixes for review.

C. Submit fertilizer certificates of compliance including seed inspection certificates by State or Federal Authorities.

D. Submit stabilization measures required for seed mix selected.

### 1.3 PROJECT CONDITIONS

A. Do not place hydroseed materials prior to October 1, nor later than May 31, unless otherwise approved by the Owner's Representative.

## PART 2 PRODUCTS

### 2.1 HYDROSEEDING MATERIALS

A. Hydroseed:
   1. Seed mix shall be native or adaptive, and selected to be compatible with the regional climate.
   2. Seed germination rate shall be 90 percent minimum.

B. Fungicide: As recommended by the seed distributor.

C. Hydroseed Binder:
   1. Binder for hydroseeding shall be concentrated liquid chemical that forms a plastic film upon drying and allows water and air to penetrate.
   2. Binder film shall be nonflammable, shall have an effective life of at least one year, shall be miscible with water at the time of mixing application, shall be nontoxic to plant or animal life, and shall be nonstaining to concrete or painted surfaces.
   3. In cured state, binder shall not be re-emulsifiable.
   4. Binder Material shall be registered with and licensed by the State of California, Department of Food and Agriculture, as an "auxiliary soil chemical."
   5. Submit a Certificate of Compliance for binder.

2.2 OTHER LANDSCAPE MATERIALS

A. Pre-emergent herbicide: Shall be “Treflan EC,” “Tupersan,” or approved equal.

B. NPK Fertlizer: Shall be 18-18-6 commercial fertilizer with micronutrients.

## PART 3 EXECUTION

3.1 HYDROSEED

A. Hydroseed Installation
1. Soil in all seeding areas shall be cultivated with soil amendment and fertilizer prior to hydroseeding as specified in Section 32 90 00. Rocks and debris larger than 1 inch in diameter which are brought to the surface during cultivation shall be removed from the site.
2. The finish grade of hydroseeded areas shall be as shown on the grading plans (per the Contract Documents) and smooth, with no abrupt change in surface appearance unless otherwise noted on the Contract Documents. Finished grade shall allow for positive drainage without ponding.
3. Hydroseeding shall not commence until all other planting has been completed, and finish grades have been approved by the Owner’s Representative.
4. Hydromulch slurry preparation shall take place at the site. Begin with adding water to the tank with engine at half throttle. When water level has reached the height of the agitator shaft, and good recirculation is established, add seed mixture, chemical additives, then fertilizer. Pulp shall be added after the tank is at least one third full, and engine shall be opened to full throttle when tank is half full. Spraying shall commence only after all materials are thoroughly mixed.
5. Hydromulch slurry: As specified below, or in accordance with the seed distributor.
   a. Seed Mixture 0.50 lbs/1000 SF (Turf) / 0.25 lbs/1000 SF (Wildflower and Dryland Grass)
   b. Fiber 46 lbs/1000 SF
   c. Fungicide 2 oz /1000 SF
   d. NPK Fertilizer 7 lbs/1000 SF
   e. Binder 5 lbs/1000 SF
6. Mix to homogenous slurry.
7. Moisten areas to be hydroseeded to 2-inch depth just prior to application of slurry.
8. Slurry shall be evenly applied under high pressure in a uniform coating. Exercise care around plants and structures. Immediately remove any oversprayed slurry from walks or buildings that are inadvertently sprayed.
9. Irrigation during the germination period shall keep the hydromulch sufficiently moist at all times to promote dense uniform establishment of grass, without creating washouts. Irrigation system shall be tested for proper coverage prior to hydroseeding.
10. Re-seed bare spots until an even stand of grass results and is approved by the Owner’s Representative.

**END OF SECTION 32 92 00**

# SECTION 33 05 00 - COMMON WORK RESULTS FOR UTILITIES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 DEFINITIONS

A. Exposed Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.

B. Concealed Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

C. CMP: Corrugated Metal Pipe

D. DIP: Ductile Iron Pipe

E. HDPE: High Density Polyethylene Pipe

F. RCP: Reinforced Concrete Pipe

G. VCP: Vitrified Clay Pipe

### 1.3 QUALITY ASSURANCE

A. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

### 1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION**

3.1 IDENTIFICATION

A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.
   1. Locate pipe markers on exposed piping according to the following:
      a. Near each valve and control device.
      b. Near each branch, excluding short takeoffs for equipment and terminal units. Mark each pipe at branch if flow pattern is not obvious.
      c. Near locations where pipes pass through walls or floors or enter inaccessible enclosures.
      d. At manholes and similar access points that permit view of concealed piping.
      e. Near major equipment items and other points of origination and termination.

B. Adjusting: Relocate identifying devices that become visually blocked by work of this or other Divisions.

**END OF SECTION 33 05 00**

# SECTION 33 05 13 – MANHOLES AND STRUCTURES

## PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Modular precast concrete manhole bases, sections with tongue-and-groove joints, covers, and accessories for sanitary sewer and storm drain systems. Section also includes cast in place manhole bases.

1.2 RELATED SECTIONS

A. Section 30 20 00 Earthwork.

B. Section 31 23 33 Trenching and Backfill.

1.3 REFERENCES

A. All construction and materials covered by this Section shall be in accordance with the County of Sacramento Standard Construction Specifications Revised January 1, 2016. Where inconsistencies exist between this Section and the County of Sacramento Standard Construction Specifications, the County of Sacramento Standard Construction Specifications shall take precedence.

B. American Concrete Institute (ACI) 308 - Standard Specification for Curing Concrete.

C. ACI 318 - Building Code Requirements for Structural Concrete.

D. American Society for Testing and Materials (ASTM) A48/A48M - Standard Specification for Gray Iron Castings.

E. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

F. ASTM C150 - Standard Specification for Portland Cement.

G. ASTM C443 REV A- Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.

H. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections.

I. ASTM C497 - Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.

J. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals.

K. ASTM C891 - Standard Practice for Installation of Underground Precast Concrete Utility Structures.

L. ASTM C1244 - Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill.

M. Corps of Engineers Specification No. CRD-C572 - Handbook for Concrete and Cement Corps of Engineers Specification for Polyvinylchloride Waterstop.

N. The term "State Standard Specifications" is understood to refer to the Standard Specifications, State of California, Business, Transportation and Housing Agency, Department of Transportation (CALTRANS), May 2006 edition. In cases of conflict between the State Standard Specifications and these specifications, these specifications shall govern.
   1. Any provisions for measurement and payment specified within the State Standard Specifications shall be disregarded and the provisions of this contract shall govern.

1.4 SUBMITTALS

A. Product Data: Submit product technical data acknowledging that products meet requirements of standards referenced.

B. Manufacturer's Installation Instructions: Indicate special procedures required to install products specified.

C. Shop Drawings: Submit product drawings to ensure that products meet the dimensions and standards referenced.

## PART 2 - PRODUCTS

2.1 MANHOLE SECTIONS, BASES, RISERS, AND TOPS

A. Concrete: State Standard Specifications, CALTRANS Section 90-10, Minor Concrete, conforming to ACI 308, ACI 318, and ASTM C150.

B. Manhole sections, bases, risers and tops: Precast reinforced concrete per ASTM C478, with resilient connectors per ASTM C923.

C. Provide precast reinforced manholes, frame and cover as indicated on Drawings and as detailed. Inside dimensions, depth, clear lid opening, and pipe penetrations shall be as indicated on the Drawings. Cone section shall be eccentric.

D. Cast-in-place concrete bases may be used as an alternative to a precast concrete bases. Concrete shall conform to CALTRANS Section 90 and shall be Class “A” containing six packs of Portland Cement per cubic yard of concrete with a minimum design compressive strength of 3,000 psi after 28-days. Reinforcing bars shall be of intermediate grade billet steel conforming to ASTM A615 and shall be the size shown on the Drawings. Provide waterstop for cast-in-place bases in accordance with manufacturer’s instruction. PVC waterstops shall be manufactured from virgin polyvinyl chloride conforming to the Corps of Engineers Specification No. CRD-C572.

E. For pipe penetrations through manholes, core through, install gasket around pipe, grout penetration on both sides and install a minimum of 6 inches (thickness and distance) around collar outside of the manhole or inlet structure penetration. Connections shall be A-lok for ductile iron pipe, Kor-n-seal for PVC pipe, or equal.

2.2 MANHOLE FRAME AND COVER

A. Frame and Cover: Cast iron per ASTM A48 Class 35B and conforming to Section 55-2.03 and 75-1.02 of the CALTRANS Standard Specifications. Manhole frame and cover shall be D&L Supply E-1025, South Bay Foundry SBF 1900 BS, or equal, secured with tamper resistant bolts.

B. Provide Frame and Cover as detailed and shall be H-20 traffic rated.

2.3 MANHOLE SEALANT GASKETS

A. All Precast reinforced concrete sewer manhole sections shall be joined with rubber gaskets conforming to ASTM C443. Sealant gaskets shall be Ram-Nek, Kent Seal, or equal. Use of mortar will not be allowed.

**PART 3 - EXECUTION**

3.1 INSTALLATION

A. Installation of manhole structures shall conform to ASTM C478 and ASTM C891.

B. Excavation and backfill for manholes shall conform to the applicable provisions of Section 30 20 00, Earthwork and Section 31 23 33, Trenching and Backfill.

C. Place concrete base pad, trowel top surface level. Set precast manhole base unit level on the base material or concrete work slab as specified herein for a cast-in-place base.

D. Place manhole sections plumb and level, trim to correct elevations, anchor to base pad. Place manhole cylinder plumb and level, to correct dimensions and elevations.

E. Cut and fit for pipe.

F. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour as required.

G. Set cover frames and cover level without tipping, to correct elevations.

3.2 TESTING

A. Precast, reinforced, concrete manhole bases, risers and tops shall be tested in accordance with ASTM C497 by an approved testing laboratory, for concrete compression tests on cores drilled from 5 percent of the lot.

B. When the groundwater table is too low to permit visual detection of leaks, 20 percent of the total of all manholes shall be hydrostatically tested. The test shall consist of plugging all inlets and outlets and filling the manhole with water to a height determined by the Owner's Representative. Leakage in each manhole shall not exceed 0.2 gallon per hour per foot of head above the invert over a period of 30 minutes. A manhole may be filled 24 hours prior to time of testing, if desired, to permit normal absorption into the pipe walls to take place. Repair all manholes that do not meet the leakage test, or are unsatisfactory from visual inspection, to conform to the requirements herein, at no additional cost to the Owner. If more than 25 percent of the manholes tested fail the hydrostatic test, the Contractor will be required to test all or as many manholes as the Owner's Representative may deem necessary.

C. Manhole vacuum testing per ASTM C1244 will be acceptable as an alternative to hydrostatic testing. A minimum of 9 inches of mercury shall be held for a minimum time of one minute.

D. Precast, reinforced, concrete manhole bases, risers and covers shall be subject to rejection for failure to conform to any of the Specification requirements. In addition, individual sections of manhole risers and covers may be rejected for any of the following reasons:
   1. Fracture or cracks passing through the wall, except for a single end crack that does not exceed the depth of the joint.
   2. Defects that indicate imperfect proportioning, mixing, or molding.
   3. Surface defects indicating honeycombed or open texture.
   4. Damaged ends, where such damage would prevent making a satisfactory joint as determined by the Owner's Representative.
   5. The internal diameter of the manhole section varying more than 1 percent from the nominal diameter.
   6. Any continuous crack having a surface width of 0.01 inch or more and extending for a length of 12 inches or more, regardless of the position in the section wall.

**END OF SECTION 33 05 13**

# SECTION 33 11 00 - WATER UTILITY DISTRIBUTION PIPING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
1. Pipe and fittings.
2. Nonpressure transition couplings.
3. Pressure pipe couplings.
4. Expansion joints and deflection fittings.
5. Encasement for piping.

### 1.3 DEFINITIONS

A. DI: Ductile Iron

B. PVC: Polyvinyl Chloride

### 1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Product Data: Submit copies of manufacturer’s specifications and installation instructions for each material. Include certification or other data verifying compliance with required characteristics. Indicate by transmittal form that copy of each has been distributed to the Installer.

### 1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

### 1.6 PROJECT CONDITIONS

A. Interruption of Existing Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Owner’s representative no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Owner's representative’s written permission.

## PART 2 - PRODUCTS

2.1 DUCTILE-IRON, CULVERT PIPE AND FITTINGS

A. Pipe: ASTM A 716, for push-on joints.

B. Standard Fittings: AWWA C110, ductile or gray iron, for push-on joints.

C. Compact Fittings: AWWA C153, for push-on joints.

D. Gaskets: AWWA C111, rubber.

2.2 PVC PIPE AND FITTINGS

A. PVC Pressure Piping:
1. Pipe: AWWA C900, Class 200 PVC pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: AWWA C900, Class 200 PVC pipe with bell ends
3. Gaskets: ASTM F 477, elastomeric seals.

B. PVC Water-Service Piping:
1. Pipe: ASTM D 1785, Schedule 80 PVC, with plain ends for solvent-cemented joints.
2. Fittings: ASTM D 2467, Schedule 80 PVC, socket type.

## PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

F. Install pressure piping according to the following:

1. Install piping with restrained joints at tee fittings and at horizontal and vertical changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
2. Install piping with minimum cover from the top of the pipe to finished grade, or a minimum of 24 inches from the top of the pipe to the street subgrades, whichever is greater.
3. Install ductile-iron pressure piping according to AWWA C600 or AWWA M41.
4. Install ductile-iron special fittings according to AWWA C600.
5. Install PVC pressure piping according to AWWA M23, or ASTM D 2774 and ASTM F 1668.
6. Install PVC water-service piping according to ASTM D 2774 and ASTM F 1668.

G. Install corrosion-protection piping encasement over the following underground metal piping according to ASTM A 674 or AWWA C105:

1. Ductile-iron pipe and fittings.
2. Expansion joints and deflection fittings.

## 3.3 PIPE JOINT CONSTRUCTION

A. Join pressure piping according to the following:
1. Join ductile-iron pressure piping according to AWWA C600 or AWWA M41 for push-on joints.
2. Join ductile-iron special fittings according to AWWA C600 or AWWA M41 for push-on joints.
3. Join PVC pressure piping according to AWWA M23 for gasketed joints.
4. Join PVC water-service piping according to ASTM D 2855 for solvent-cemented joints.
5. Join dissimilar pipe materials with pressure-type couplings.

## 3.4 IDENTIFICATION

A. Materials and their installation are specified in Section 312000 "Earth Moving." Arrange for installation of blue warning tape directly over piping and at outside edge of underground structures.
1. Use detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

## 3.5 FIELD QUALITY CONTROL

RFI 0367 — SITE - Waterline Testing Requirement Clar. — Camera testing is not required at waterline

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:
   a. Alignment: Less than full diameter of inside of pipe is visible between structures.
   b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
   c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
   d. Infiltration: Water leakage into piping.
   e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Pressure Piping: Perform hydrostatic test after thrust blocks, supports, and anchors have hardened. Test at pressure not less than 1-1/2 times the maximum system operating pressure, but not less than 150 psig.
   a. Ductile-Iron Piping: Test according to AWWA C600, "Hydraulic Testing" Section.
   b. PVC Piping: Test according to AWWA M23, "Testing and Maintenance" Chapter.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.6 CLEANING

A. Clean interior of piping of dirt and superfluous materials. Flush with potable water.

B. Disinfect per AWWA standards.

**END OF SECTION 33 41 00**

# SECTION 33 31 00 - SANITARY UTILITY SEWERAGE PIPING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
1. Pipe and fittings.
2. Nonpressure transition couplings.
3. Pressure pipe couplings.
4. Expansion joints and deflection fittings.
5. Backwater valves.
6. Cleanouts.
7. Drains.
8. Encasement for piping.
9. Manholes.

### 1.3 DEFINITIONS

A. ABS: Acrylonitrile butadiene styrene plastic

B. PVC: Polyvinyl Chloride

C. RCP: Reinforced Concrete

### 1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Product Data: Submit copies of manufacturer’s specifications and installation instructions for each material. Include certification or other data verifying compliance with required characteristics. Indicate by transmittal form that copy of each has been distributed to the Installer.

### 1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes according to manufacturer's written rigging instructions.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
   1. Notify Owner's representative no fewer than two days in advance of proposed interruption of service.
   2. Do not proceed with interruption of service without Owner's representative's written permission.

**PART 2 - PRODUCTS**

2.1 PVC PIPE, PIPING 12 INCHES AND UNDER

A. Pipe: PVC pipe shall be bell-and-spigot type conforming to ASTM D3034, Type PSM, SDR 35 of materials specified in ASTM D1784, Class 12454 or 12364. Bells shall be integral with pipe. Spigot end pipe with separate double hub couplings is not acceptable. Type PSM, SDR 26 PVC pipe and fittings conforming to ASTM D3034 shall be utilized for piping larger that 12 inches in diameter, piping installed deeper than 15 feet, or piping installed in close proximity to domestic water lines as specified in Section 33 31 00, Part 3.1K. High-Density Polyethylene (HDPE) is not an acceptable product and will not be considered for product substitution.

B. Joints: Joints shall be PVC specified in ASTM D3212, elastomeric joints using elastomeric seals complying with ASTM F477.

C. Fittings: SDR 35 PVC conforming D3034 for PSM type, ASTM D2241, and ASTM D1784, Class 12454 or 12364. The strength class of fittings shall be no less than the strength class of any adjoining pipe.

RFI 0102 *Sewer Pipe Material*
*Disregard and use PVC per submittal package 0001-33 31 00-0*

2.2 ~~DUCTILE IRON PIPE~~

A. Pipe: DIP pipe shall be Class 50 AWWA C151 with hub and spigot ends. Pipe shall be furnished in minimum standard lengths of 20 feet.

B. Joints: DIP with elastomeric rubber ring joints conforming to AWWA C111 for push-on or mechanical joints

C. Fittings: Fittings shall be ductile iron pipe conforming to AWWA C153, size 3 through 24 inch, and AWWA C110 greater than 24 inch, and shall be 350 psi working pressure rated. Couplings, sleeves, and accessories shall be manufactured by U.S. Pipe TrimTyte, Union Foundry, Tyler, or equal.

D. Pipe Lining: Interior of DIP pipe and fittings shall be lined with cement mortar in accordance with AWWA C104. Cement shall be ASTM C150, Type II or V, low alkali, containing less than 0.60 percent alkalis.

2.3 ACCESSORIES

A. Cleanouts shall be as indicated on the Drawings and as specified in Section 33 39 23 Sanitary Sewerage Cleanouts.

B. All ductile iron pipe and fittings shall be wrapped in polyethylene per AWWA C105.

**PART 3 - EXECUTION**

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sewer piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

F. Install gravity-flow, nonpressure drainage piping according to the following:
   1. Install piping pitched down in direction of flow.
   2. Install piping with 60-inch minimum cover.
   3. Install hub-and-spigot, cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
   4. Install hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
   5. Install ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
   6. Install ABS sewer piping according to ASTM D 2321 and ASTM F 1668.
   7. Install PVC cellular-core piping according to ASTM D 2321 and ASTM F 1668.
   8. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.
   9. Install PVC profile gravity sewer piping according to ASTM D 2321 and ASTM F 1668.
   10. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."

G. Install force-main pressure piping according to the following:
   1. Install piping with restrained joints at tee fittings and at horizontal and vertical changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
   2. Install piping with 72-inch minimum cover.
   3. Install ductile-iron pressure piping according to AWWA C600 or AWWA M41.
   4. Install ductile-iron special fittings according to AWWA C600.
   5. Install PVC pressure piping according to AWWA M23, or ASTM D 2774 and ASTM F 1668.
   6. Install PVC water-service piping according to ASTM D 2774 and ASTM F 1668.

H. Install corrosion-protection piping encasement over the following underground metal piping according to ASTM A 674 or AWWA C105:
   1. Hub-and-spigot, cast-iron soil pipe and fittings.
   2. Hubless cast-iron soil pipe and fittings.
   3. Ductile-iron pipe and fittings.
   4. Expansion joints and deflection fittings.

## 3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure drainage piping according to the following:
   1. Join hub-and-spigot, cast-iron soil piping with gasketed joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
   2. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.
   3. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.
   4. Join ductile-iron culvert piping according to AWWA C600 for push-on joints.
   5. Join ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
   6. Join ABS sewer piping according to ASTM D 2321 and ASTM D 2751 for elastomeric-seal joints.
   7. Join PVC cellular-core piping according to ASTM D 2321 and ASTM F 891 for solvent-cemented joints.
   8. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasketed joints.
   9. Join PVC profile gravity sewer piping according to ASTM D 2321 for elastomeric-seal joints or ASTM F 794 for gasketed joints.
   10. Join fiberglass sewer piping according to ASTM D 3839 for elastomeric-seal joints.
   11. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
   12. Join dissimilar pipe materials with nonpressure-type flexible couplings.

B. Join force-main pressure piping according to the following:
   1. Join ductile-iron pressure piping according to AWWA C600 or AWWA M41 for push-on joints.
   2. Join ductile-iron special fittings according to AWWA C600 or AWWA M41 for push-on joints.
   3. Join PVC pressure piping according to AWWA M23 for gasketed joints.
   4. Join PVC water-service piping according to ASTM D 2855 for solvent-cemented joints.
   5. Join dissimilar pipe materials with pressure-type couplings.

3.4 BACKWATER VALVE INSTALLATION

A. Install horizontal-type backwater valves in piping where indicated.

B. Install combination horizontal and manual gate-valve type in piping and in manholes where indicated.

C. Install terminal-type backwater valves on end of piping and in manholes where indicated.

3.5 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
   1. Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
   2. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.
   3. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.
   4. Use Extra-Heavy-Duty, top-loading classification cleanouts in roads.

B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding earth grade.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.6 DRAIN INSTALLATION

A. Install type of drains in locations indicated.
   1. Use Light-Duty, top-loading classification drains in earth or unpaved foot-traffic areas.
   2. Use Medium-Duty, top-loading classification drains in paved foot-traffic areas.
   3. Use Heavy-Duty, top-loading classification drains in vehicle-traffic service areas.
   4. Use Extra-Heavy-Duty, top-loading classification drains in roads.

B. Embed drains in 4-inch minimum concrete around bottom and sides.

C. Fasten grates to drains if indicated.

D. Set drain frames and covers with tops flush with pavement surface.

E. Assemble trench sections with flanged joints.

F. Embed trench sections in 4-inch minimum concrete around bottom and sides.

3.7 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants according to ASTM C 891.

C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.

D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere unless otherwise indicated.

3.8 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318.

3.9 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Section 221413 "Facility Storm Drainage Piping."

B. Connect force-main piping to building's storm drainage force mains specified in Section 221413 "Facility Storm Drainage Piping." Terminate piping where indicated.

C. Make connections to existing piping and underground manholes.
   1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
   2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
   3. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.
      a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
      b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
   4. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

D. Connect to sediment interceptors specified in Section 221323 "Sanitary Waste Interceptors."

E. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
   1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.
      a. Unshielded flexible couplings for same or minor difference OD pipes.
      b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
      c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.
   2. Use pressure-type pipe couplings for force-main joints.

## 3.10 CLOSING ABANDONED SEWER SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:
   1. Close open ends of piping with at least thick, brick masonry bulkheads.
   2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

B. Abandoned Manholes and Structures: Excavate around manholes and structures as required and use one procedure below:
   1. Remove manhole or structure and close open ends of remaining piping.
   2. Remove top of manhole or structure down to at least 36 inches below final grade. Fill to within 12 inches of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.

C. Backfill to grade according to Section 312000 "Earth Moving."

## 3.11 IDENTIFICATION

A. Materials and their installation are specified in Section 312000 "Earth Moving." Arrange for installation of orange warning tape directly over piping and at outside edge of underground structures.
   1. Use detectable warning tape over ferrous piping.
   2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

## 3.12 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
   1. Submit separate reports for each system inspection.
   2. Defects requiring correction include the following:
      a. Alignment: Less than full diameter of inside of pipe is visible between structures.
      b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
      c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
      d. Infiltration: Water leakage into piping.
      e. Exfiltration: Water leakage from or around piping.
   3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
   4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
   1. Do not enclose, cover, or put into service before inspection and approval.
   2. Test completed piping systems according to requirements of authorities having jurisdiction.
   3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.

4. Submit separate report for each test.
5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
   a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
   b. Option: Test plastic piping according to ASTM F 1417.
   c. Option: Test concrete piping according to ASTM C 924.
6. Force-Main Storm Drainage Piping: Perform hydrostatic test after thrust blocks, supports, and anchors have hardened. Test at pressure not less than 1-1/2 times the maximum system operating pressure, but not less than 150 psig.
   a. Ductile-Iron Piping: Test according to AWWA C600, "Hydraulic Testing" Section.
   b. PVC Piping: Test according to AWWA M23, "Testing and Maintenance" Chapter.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.13 CLEANING

A. Clean interior of piping of dirt and superfluous materials. Flush with water.

**END OF SECTION 33 41 00**

# SECTION 33 32 00 – WASTEWATER UTILITY PUMPING STATIONS

## PART 1 - GENERAL

1.1 PRECAST PUMPING STATIONS DESIGN CRITERIA

1.2 DESCRIPTION: Site assembled precast wastewater utility pumping

1.3 SECTION INCLUDES

A. Site assembled and tested precast wastewater utility pumping stations, including:
1. Precast concrete wet-well and valve vault.
2. Pumps and mountings.
3. Control panels.
4. Piping integral to pumping station.
5. Odor control system.

1.4 ACTION SUBMITTALS

A. Product Data: Provide manufacturer's technical data including station capacities and operating characteristics.

B. Pump Performance Curves.

C. Shop Drawings: Show fabrication and installation details.

1.5 CLOSEOUT SUBMITTALS

A. Field Reports: Provide quality-control test reports documenting station operation performance.

B. Warranty: Signed copy of manufacturer's warranty.

C. Operation and Maintenance Manual: Include approved submittals and schedule for maintenance requirements.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: NPCA-certified plant, with experience and demonstrated capability to produce work specified in this Section

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

Bull 5.0 Waste Water Utility Pumping
See next sheet

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of pumping stations that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures including precast concrete structures, hatches, and other accessories.
   b. Faulty operation of pumps, controls, or pumping and piping system accessories.
   c. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Period for Complete Packaged Pump Station provided by a Single Source Supplier (Including Concrete, Pumps, and Control Panel): One year from date of Substantial Completion.

**PART 2 – PRODUCTS**

2.1 MANUFACTURER

A. Basis of Design: Provide site assembled precast wastewater utility pumping station, including specified controls, pumps, valves, internal piping, and precast concrete well and valve vault to be manufactured and furnished by **Jensen Precast**, (855) 468-5600, PumpStations@jensenprecast.com, www.JensenEngineeredSystems.com or approved equal.

2.2 PRECAST PUMPING STATIONS DESIGN CRITERIA

A. Description: Site assembled precast wastewater utility pumping station including controls, pumps, valves, internal piping, precast concrete well, and valve vault.

A.1) Pump Station at M7

1. Pump Station Peak Design Flow: 38.5 gpm.

2. Force Main: New, as shown on Drawings.
   a. Length: 109 feet.
   b. Inlet Pipe Size: 6” NPS.
   c. Discharge Pipe Size: 6” NPS.
   d. Pipe Type: PVC.
   e. Discharge Elevation: 49.5 feet

3. Design Elevations:
   a. Inlet Piping: 144 feet
   b. Wet Well Finish Grade: 58.2 feet
   c. Wet Well Rim: 58.2 feet

4. Wet Well: Precast concrete.
    a. Capacities and Characteristics: Provide base, barrel, and flat top precast sections as follows to correspond to height of precast structures indicated:

        1) Diameter or Dimensions: 48 inches.
        2) Inlet Pipe Size: 6” NPS.

5. Valve Vault: Precast concrete.
    a. Capacities and Characteristics: Provide precast sections as follows:

        1) Diameter or Dimensions: 48 inches.
        2) Height: 54 inches.
        3) Inlet Pipe Size: 6” NPS.

A.2) Pump Station at M4

1. Pump Station Peak Design Flow: 139 gpm.

2. Force Main: New, as shown on Drawings.
    a. Length: 140 feet.
    b. Inlet Pipe Size: 6” NPS.
    c. Discharge Pipe Size: 6” NPS.
    d. Pipe Type: PVC.
    e. Discharge Elevation: 52.2 feet

3. Design Elevations:
    a. Inlet Piping: 142 feet
    b. Wet Well Finish Grade: 57.97 feet
    c. Wet Well Rim: 57.97 feet

4. Wet Well: Precast concrete.
    a. Capacities and Characteristics: Provide base, barrel, and flat top precast sections as follows to correspond to height of precast structures indicated:

        1) Diameter or Dimensions: 48 inches.
        2) Inlet Pipe Size: 6” NPS.

5. Valve Vault: Precast concrete.
    a. Capacities and Characteristics: Provide precast sections as follows:

        1) Diameter or Dimensions: 48 inches.
        2) Height: 54 inches.
        3) Inlet Pipe Size: 6” NPS.

2.3 PRECAST CONCRETE STRUCTURES

A. General: Size indicated, with provision for sealant at joints, meeting ASTM C 913, designed according to ASTM C 890 for A-16 (AASHTO HS20-44), heavy traffic, structural loading.

B. Round Precast Concrete Wells: ASTM C 478, precast, reinforced concrete.

1. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
2. Flexible Resilient Pipe Connectors: ASTM C 923:

C. Precast Concrete Vaults: ASTM C 858, precast, reinforced concrete.

1. Resilient Pipe Connectors: ASTM C 890, cast or fitted into manhole walls, for each pipe connection.

D. Joint Sealant: ASTM C 990, bitumen or butyl rubber.

2.4 PRECAST CONCRETE MATERIALS AND MIX DESIGN

A. General: Precast concrete according to ACI 318/318R.

B. Concrete Design Mix: 4,000 psi minimum, with 0.45 maximum water/cementitious materials ratio.

2.5 ACCESS DOORS AND FRAMES

A. Access Door: Single-leaf opening. 30” X 36” Aluminum access hatch manufactured by USF Fabrication, angle frame. Includes: lift assist, bituminous paint, flush lifting handle, 316 stainless steel nuts & bolts, hinges, slamlock, and hold-open arm.

1. Loading Capacity: Support AASHTO H20 concentrated wheel load, without impact.

2.6 WET-WELL ACCESSORIES

A. Pipe Supports: Manufacturer’s standard.

B. Guide Rail Assembly: Guide rails, stainless steel, Type 316, with pump guide brackets configured to match requirements of selected pumps.

C. Flexible Resilient Pipe Connectors: Flexible connector, ASTM C 923.

D. Well Protective Liner: Liner shall be Dura Plate 100 as manufactured by A-LOK® Products, Incorporated, Tullytown, Pennsylvania.

1. Liner Composition - The liner, channel joints, H-joints and corner joints shall be manufactured from an Acrylic PVC Alloy.

E. Ventilation: PVC piping, with internal insect screening.

2.7 PUMPS

A. Basis of Design: Furnish and install 2 Homa submersible nonclog type centrifugal pumps with a self-engaging Autocoupling Assembly, or a comparable product approved by Engineer, in each lift station.

B. General Conditions:

1. As this pump will be utilized for solids handling, it must be capable of either repeatedly passing spherical solids up to 2 inch in diameter.

2. Pumps shall be designed to handle raw, unscreened sewage, stormwater, sludge, or similar contaminated liquid, with induction type electric motor assembled in a single body, watertight NEMA Type B chamber.

3. The pumps shall be capable of maintaining their watertight integrity submerged under 80 feet of water.

4. For all sewage pump stations, the pumps must comply with NEC Class 1, Division 1, Group C & D hazardous locations.

C. Materials of Construction: Major castings: ASTM A48 Class 40B Cast Iron. - Wear Ring: ASTM Bl44 Bronze. - Shaft: AISI 430F Stainless Steel. - Fasteners: AISI 304 Stainless Steel. - O-Rings:

Nitrile Rubber. - Shaft Seals: Silicon Carbide/Silicon Carbide (impeller and motor side). Cable
Jacket: Neoprene. - Cable Entry: elastomer grommet, stainless steel washers- Protective
Coating: High Solids Epoxy

D. Pump System Characteristics: As required to meet performance requirements.

D.1) Lift Station at M7

1. Number of Pumps: Two.
2. Minimum Capacity: 38.5 gpm.
3. Motor Size: 1.2 hp.
4. Speed: 3450 rpm.

E. Pumping Station Electrical Characteristics:

1. Electrical Service:
   a. Volts: 230 V.
   b. Phases: Single.
   c. Frequency: 60Hz.

2. Full-Load Amperes: 5.4.

D.2) Lift Station at M4

RFI 0101 — Sewer Lift Pump TDH

Pump#1: L=30ft, TDH=26ft
Pump#2: Slated for 100% redundancy

1. Number of Pumps: Two.
2. Minimum Capacity: 139 gpm.
3. Motor Size: 2.6 hp.
4. Speed: 3450 rpm.

F. Pumping Station Electrical Characteristics:

1. Electrical Service:

a. Volts: 230 V.
b. Phases: Single.
c. Frequency: 60Hz.

2. Full-Load Amperes: 12.

2.8 PUMPING STATION CONTROLS

A. Control Sequence of Operation: Cycle each pump on and off automatically to maintain well wastewater level. Automatic control operates both pumps in parallel if well level rises above starting point of low-level pump, until shutoff level is reached. Automatic alternator, with manual disconnect switch, changes sequence of lead-lag sewage pumps at completion of each pumping cycle.

B. Motor Controllers: Magnetic, full voltage, nonreversing. Include undervoltage release, thermal overload heaters in each phase, manual reset buttons, and hand-automatic selector switches. Include circuit breakers to provide branch-circuit protection for each controller.

C. Install labels to identify switches and controls.

D. Control Panel: Complying with UL 508A, with weatherproof enclosure, covered compartments sized to accommodate controllers, circuit breakers, transformers, alternators, and programmable logic controller.

1. Basis of Design Product: Provide Orenco Systems, Inc., MVP-DAX Series Duplex Control Panels, or a comparable product approved by Engineer.
2. Enclosure: NEMA 250, Type 4.
3. Control panel must be supplied with a dead front panel door. PLC module
4. Secondary Main Disconnect: A secondary main disconnect panel must be installed in the immediate vicinity of the primary control panel. This main disconnect must have the ability to be locked out/tagged out during control panel maintenance.

E. Level Control System: Senses variations of wastewater level in well. The system shall utilize a submersible pressure transducer as the primary level detection device.

Redundant back up will be provided by two intrinsically safe, non-mercury mechanical floats.

1. Basis of Design (Pressure Transducer): Dwyer Instruments PBLTX Submersible Level Transmitter, or pre-approved equal.
2. Basis of Design (Mechanical Float): Conery 2900 – B6 Internally Weighted, Non-Mercury Float Switch.

2.9 PIPING

A. Ductile-Iron, Mechanical-Joint Pipe and Fittings:

1. Ductile-Iron Pipe: AWWA C151/A21.51, with mechanical-joint bell and plain spigot end unless flanged ends are indicated.

    a. Provide flanged ends within well and vault.

2. Ductile-Iron Fittings: AWWA C110/A21.10, mechanical-joint, ductile- or gray-iron standard pattern or AWWA C153/A21.53, ductile-iron compact pattern.

3. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

4. Application: Buried service between well and vault.

B. Stainless-Steel Pipe and Fittings:

1. Pipe and Fittings: ASME A112.3.1, socket and spigot ends.

2. Application: Within submersed portion of well where indicated on approved Shop Drawings.

C. Check Valves: Flanged swing check valves with outside lever, suitable for use in raw wastewater equipped with the following:

D. Isolation Valves: Flanged eccentric plug valves.

E. Air Vacuum/Air Release Combination Valves: Manufacturer's standard.

2.10 FABRICATION

A. Precast Concrete Structures:

1. ASTM C 478 for precast wells.
2. ASTM C 478 for precast vaults.
3. Fabricate structures with continuous joints to provide watertight construction.
4. Prepare valve and meter vaults with factory installed piping, valves, sleeves and other devices required.

**PART 3 - EXECUTION**

3.1 EARTHWORK

A. Refer to Division 31 Section "Earth Moving" for general and trench excavation and backfilling.

3.2 PRECAST CONCRETE STRUCTURES

A. Install precast concrete structure sections with sealants per ASTM C 891.

3.3 PIPING

A. Gravity Flow Piping: Install ductile-iron, gravity sewer piping per ASTM A 746.

1. Install piping pitched down in direction of flow minimum **2** percent unless otherwise indicated.

RFI 0102 — Sewer Pipe Material — PVC sewer piping material shall be used

2. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place-concrete supports or anchors.

B. Pressure Piping: Install ductile-iron pressure piping per AWWA C600 or AWWA M41.

1. Install piping with restrained joints at tee fittings and changes in direction. Use corrosion-resistant rods or cast-in-place-concrete supports or anchors

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a pump station manufacturer's authorized service representative to assist in testing and startup.

B. Tests and Inspections:

1. Test completed piping systems according to requirements of authorities having jurisdiction. Submit reports.

2. After installing wastewater pumping stations and after electrical circuitry has been energized, test pumps and controls for compliance with requirements.

3. After electrical circuitry has been energized, start units to confirm the station can run at pre-specified design parameters.

4. Test piping for leaks and defects.

5. Test and adjust controls and safeties.

6. Force Main: Test at pressure not less than 1-1/2 times the maximum system operating pressure, but not less than 150 psig.

C. Remove and replace components of the wastewater pumping stations that do not pass tests and inspections and retest as specified above.

**END OF SECTION 33 32 00**

# SECTION 33 32 00 – WASTEWATER UTILITY PUMPING STATIONS

## PART 1 - GENERAL

1.1 PRECAST PUMPING STATIONS DESIGN CRITERIA

1.2 DESCRIPTION: Site assembled precast wastewater utility pumping

1.3 SECTION INCLUDES

A. Site assembled and tested precast wastewater utility pumping stations, including:
1. Precast concrete wet-well and valve vault.
2. Pumps and mountings.
3. Control panels.
4. Piping integral to pumping station.
5. Odor control system.
6. All other appurtenances as shown on Reference Drawing C405 (Jensen Precast Sewer Lift Station Assembly.

RFI 107 Odor Control System
Provide waste vent piping, details forthcoming in B4

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1.4 ACTION SUBMITTALS

A. Product Data: Provide manufacturer's technical data including station capacities and operating characteristics.

B. Pump Performance Curves.

C. Shop Drawings: Show fabrication and installation details.

1.5 CLOSEOUT SUBMITTALS

A. Field Reports: Provide quality-control test reports documenting station operation performance.

B. Warranty: Signed copy of manufacturer's warranty.

C. Operation and Maintenance Manual: Include approved submittals and schedule for maintenance requirements.

1.6 QUALITY ASSURANCE

A. Concrete Manufacturer Qualifications: NPCA-certified plant, with experience and demonstrated capability to produce work specified in this Section

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B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of pumping stations that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures including precast concrete structures, hatches, and other accessories.
   b. Faulty operation of pumps, controls, or pumping and piping system accessories.
   c. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Period for Complete Packaged Pump Station provided by a Single Source Supplier (Including Concrete, Pumps, and Control Panel): One year from date of Substantial Completion.

**PART 2 – PRODUCTS**

2.1 MANUFACTURER

A. Basis of Design: Provide site assembled precast wastewater utility pumping station, including specified controls, pumps, valves, internal piping, and precast concrete well and valve vault to be manufactured and furnished by Jensen Precast or approved equal as shown on plans, Contact Mariam Ahmad (775) 440-2000. 35

2.2 PRECAST PUMPING STATIONS DESIGN CRITERIA

A. Description: Site assembled precast wastewater utility pumping station including controls, pumps, valves, internal piping, precast concrete well, and valve vault. Meet/exceed criteria as shown on drawing C401. 35

1. Pump Station Peak Design Flow: 139 gpm.

2. Force Main: New, as shown on Drawings.
   a. Length: 50 feet max.
   b. Inlet Pipe Size: 6” NPS. 35
   c. Discharge Pipe Size: 3” NPS.
   e. Discharge Elevation: per plan

3. Design Elevations:
   a. Inlet Piping: 42.70 feet
   b. Wet Well Finish Grade: 56.8 feet (Estimated - Contractor shall match FG)
   c. Wet Well Rim: 56.8 feet (Estimated – Contractor shall match FG)
   d. Wet Well Discharge Piping: 55.14 feet 35

4. Wet Well: Precast concrete.
   a. Capacities and Characteristics: Provide base, barrel, and flat top precast sections as follows to correspond to height of precast structures indicated:

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      1) Diameter or Dimensions: 60 inches or as sized to accommodate duty point of 139 GPM.
      2) Inlet Pipe Size: 6” NPS.
      3) Discharge Spool Pipe Size: 3” NPS; reduce as necessary to 6”

5. Valve Vault: Precast concrete.
   a. Capacities and Characteristics: Provide precast sections:

      1) Diameter or Dimensions: 60 inches.
      2) Height: 48 inches.
      3) Inlet Pipe Size: 3” NPS
      4) Discharge Spool Pipe Size: 3” NPS

2.3 PRECAST CONCRETE STRUCTURES

A. General: Size indicated, with provision for sealant at joints, meeting ASTM C 913, designed according to ASTM C 890 for A-16 (AASHTO HS20-44), heavy traffic, structural loading.

B. Round Precast Concrete Wells: ASTM C 478, precast, reinforced concrete.

1. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
2. Flexible Resilient Pipe Connectors: ASTM C 923:

C. Precast Concrete Vaults: ASTM C 858, precast, reinforced concrete.

1. Resilient Pipe Connectors: ASTM C 890, cast or fitted into manhole walls, for each pipe connection.

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D. Joint Sealant: ASTM C 990, bitumen or butyl rubber.

2.4 PRECAST CONCRETE MATERIALS AND MIX DESIGN

A. General: Precast concrete according to ACI 318/318R.

B. Concrete Design Mix: 4,000 psi minimum, with 0.45 maximum water/cementitious materials ratio.

2.5 ACCESS DOORS AND FRAMES

A. Access Door: Single-leaf opening. 28” X 40” Aluminum access hatch manufactured by USF Fabrication, angle frame. Includes: lift assist, bituminous paint, flush lifting handle, 316 stainless steel nuts & bolts, hinges, slamlock, and hold-open arm.

1. Loading Capacity: Support AASHTO H20-44 concentrated wheel load, without impact.

2.6 WET-WELL ACCESSORIES

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A. Pipe Supports: Manufacturer's standard.

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B. Guide Rail Assembly: Manufacturer's standard or provide guide rails, stainless steel, Type 316, with pump guide brackets configured to match requirements of selected pumps.

C. Flexible Resilient Pipe Connectors: Flexible connector, ASTM C 923.

D. Exterior water barrier: BASF Sonoshield HLM 5000 or approved equal.

2.7 PUMPS

A. Basis of Design: Furnish and install 2 Homa submersible non-clog type centrifugal pumps with a self-engaging Autocoupling Assembly, or a comparable product approved by Engineer, in each lift station.

B. General Conditions:

1. As this pump will be utilized for solids handling, it must be capable of repeatedly passing spherical solids up to 3 inch in diameter or have the ability to macerate all solids prior to the solid entering the volute by using a rotating cutter mounted on the shaft immediately adjacent to the impeller.

2. Pumps shall be designed to handle raw, unscreened sewage, stormwater, sludge, or similar contaminated liquid, with induction type electric motor assembled in a single body, watertight NEMA Type B chamber.

3. The pumps shall be capable of maintaining their watertight integrity submerged under 80 feet of water.

4. For all sewage pump stations, the pumps must comply with NEC Class 1, Division 1, Group C & D hazardous locations.

C. Materials of Construction: Major castings: ASTM A48 Class 40B Cast Iron. - Wear Ring: ASTM Bl44 Bronze. - Shaft: AISI 430F Stainless Steel. - Fasteners: AISI 304 Stainless Steel. - O-Rings:

Nitrile Rubber. - Shaft Seals: Silicon Carbide/Silicon Carbide (impeller and motor side). Cable
Jacket: Neoprene. - Cable Entry: elastomer grommet, stainless steel washers- Protective
Coating: High Solids Epoxy

D. Pump System Characteristics: As required to meet performance requirements.

RFI 0101 — Sewer Lift Pump TDH

Based on Force main length of 30' for a single pump. The second should be 100% redundancy.

1. Number of Pumps: Two.
2. Minimum Capacity: 139 gpm.
3. Motor Size: 3.8 hp.
4. Total Dynamic Head: 31.2 ft.
5. Speed: 1160 rpm.
6. Hydraulic Operating Efficiency: 52.3 percent, minimum.
7. Shut-Off Head: 43.6 feet.

F. Pumping Station Electrical Characteristics:

1. Electrical Service:

a. Volts: 480 V.
b. Phases: Three.
c. Frequency: 60 Hz.

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2. Cable lengths: Provide unspliced lengths for pumps and level detection per plan.

2.8 PUMPING STATION CONTROLS

A. Control Sequence of Operation: Cycle each pump on and off automatically to maintain well wastewater level. Automatic control operates both pumps in parallel if well level rises above starting point of low-level pump, until shutoff level is reached. Automatic alternator, with manual disconnect switch, changes sequence of lead-lag sewage pumps at completion of each pumping cycle.

B. Motor Controllers: Magnetic, full voltage, non-reversing. Include under-voltage release, thermal overload heaters in each phase, manual reset buttons, and hand-automatic selector switches. Include circuit breakers to provide branch-circuit protection for each controller.

C. Install labels to identify switches and controls.

D. Control Panel: Complying with UL 508A, with weatherproof enclosure, covered compartments sized to accommodate controllers, circuit breakers, transformers, alternators, and programmable logic controller.

1. Basis of Design Product: Provide California Motor Control Systems, Inc., Duplex Control Panels, or Equivalent.
2. Enclosure: NEMA 3R.
3. Control panel must be supplied with a dead front panel door. PLC module.
4. Secondary Main Disconnect: A secondary main disconnect panel must be installed in the immediate vicinity of the primary control panel. This main disconnect must have the ability to be locked out/tagged out during control panel maintenance.

E. Level Control System: Senses variations of wastewater level in well. The system shall utilize a submersible pressure transducer as the primary level detection device.

Redundant back up will be provided by two intrinsically safe, non-mercury mechanical floats.

1. Basis of Design (Pressure Transducer): APG PT-500C Submersible Level Transmitter, or Equivalent.
2. Basis of Design (Mechanical Float): OPTI-FLOAT Internally Weighted, Non-Mercury Float Switch, or Equivalent.

2.9 PIPING

A. Ductile-Iron, Mechanical-Joint Pipe and Fittings:

1. Ductile-Iron Pipe: AWWA C151/A21.51, with mechanical-joint bell and plain spigot end unless flanged ends are indicated.

    a. Provide flanged ends within well and vault.

2. Ductile-Iron Fittings: AWWA C110/A21.10, mechanical-joint, ductile- or gray-iron standard pattern or AWWA C153/A21.53, ductile-iron compact pattern.

3. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

4. Application: Buried service between well and vault.

B. Stainless-Steel Pipe and Fittings:

1. Pipe and Fittings: ASME A112.3.1, socket and spigot ends.

2. Application: Within submersed portion of well where indicated on approved Shop Drawings.

C. Check Valves: Flanged swing check valves with outside lever, suitable for use in raw wastewater equipped with the following:

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D. Isolation Valves: Flanged eccentric plug valves.

E. Air Vacuum/Air Release Combination Valves: Manufacturer's standard.

2.10 VENT PIPE, ODOR CONTROL, PAD, AND SECURITY ENCLOSURE

A. Ventilation: 4” PVC piping with odor control valve attached.
B. Odor control valve shall be: Wager 1800 Odor Control Valve, mounted vertically with attached rain shield.
C. Pipe shall be PVC-coated GRS 12” prior to entering foundation and as it exits through concrete pad. Pipe stub-up shall be centered on pad.
D. Confirm vent final location as shown on plans.
E. Provide 2’x2’x1’(min. depth) concrete pad. Install concrete footing with tamper-proof security cage (e.g.: irrigation cage) not to exceed 24” max. height.

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Contractor may alternately specify an odor control system integrated with a security enclosure such as Wagger model #2050-50.

2.11 FABRICATION

A. Precast Concrete Structures:

1. ASTM C 478 for precast wells.
2. ASTM C 478 for precast vaults.
3. Fabricate structures with continuous joints to provide watertight construction.
4. Prepare valve and meter vaults with factory installed piping, valves, sleeves and other devices required.

**PART 3 - EXECUTION**

3.1 EARTHWORK

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A. Refer to Division 31 Section "Earth Moving" for general and trench excavation and backfilling.

3.2 PRECAST CONCRETE STRUCTURES

A. Install precast concrete structure sections with sealants per ASTM C 891.
B. Contractor is responsible for matching RIM elevations to final grade for wet and dry well.

3.3 VENT PIPE

A. Confirm final location as shown on plans. Install concrete footing with tamper-proof irrigation cage.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a pump station manufacturer's authorized service representative to assist in testing and startup. Submit commissioning plan and checklist for review at least 2 weeks prior to day of commissioning.

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B. Tests and Inspections:

1. Test completed piping systems according to requirements of authorities having jurisdiction. Submit reports.

2. After installing wastewater pumping stations and after electrical circuitry has been energized, test pumps and controls for compliance with requirements.

3. After electrical circuitry has been energized, start units to confirm the station

can run at pre-specified design parameters.

4. Test piping for leaks and defects.

5. Test and adjust controls and safeties.

6. Force Main: Test at pressure not less than 1-1/2 times the maximum system operating pressure, but not less than 150 psig.

C. Remove and replace components of the wastewater pumping stations that do not pass tests and inspections and retest as specified above.

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D. Submit commissioning report indicating successful completion of testing plan and criteria requirements. Provide company, signature, name, and title of certifying entity.

**END OF SECTION 33 32 00**

# SECTION 33 41 00 - STORM UTILITY DRAINAGE PIPING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:
1. PE Pipe and fittings.
2. PVC Pipe and fittings.
3. Concrete Pipe and fittings.
4. Cleanouts.
5. Drains.
6. Encasement for piping.
7. Manholes.
8. Catch Basins.
9. Stormwater Inlets.
10. Pipe Outlets.
11. Concrete.
12. Backwater valves.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Manholes: Include plans, elevations, sections, details, frames, and covers.

### 1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

### 1.5 DEFINITIONS

A. CMP: Corrugated Metal Pipe

B. HDPE: High Density Polyethylene Pipe

C. RCP: Reinforced Concrete Pipe

### 1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect pipe, pipe fittings, and seals from dirt and damage.

B. Handle according to manufacturer's written rigging instructions.

1.7 PROJECT CONDITIONS

A. Interruption of Existing Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
   1. Notify Owner's representative no fewer than two days in advance of proposed interruption of service.
   2. Do not proceed with interruption of service without Owner's representative's written permission.

**PART 2 - PRODUCTS**

2.1 GENERAL

A. It shall be the Contractor's option to install PVC Pipe and Fittings or Concrete Pipe and Fittings as listed in the following sections unless specific pipe and fitting requirements are noted on the Drawings. All fittings and pipe connections shall be watertight.

2.2 PE PIPE AND FITTINGS

A. Corrugated PE Drainage Pipe and Fittings NPS 3 to NPS 10: AASHTO M 252M, Type S,, with smooth waterway for coupling joints.
   1. Silttight Couplings: PE sleeve with ASTM D1056, Type 2, Class A, Grade 2 gasket material that mates with tube and fittings.

B. Corrugated PE Pipe and Fittings NPS 12 to NPS 60: AASHTO M 294M, Type S, with smooth waterway for coupling joints.
   1. Silttight Couplings: PE sleeve with ASTM D1056, Type 2, Class A, Grade 2 gasket material that mates with tube and fittings.

2.3 PVC PIPE AND FITTINGS

A. PVC Corrugated Sewer Piping:
   1. Pipe: ASTM F 949, PVC, corrugated pipe with bell-and-spigot ends for gasketed joints.
   2. Fittings: ASTM F 949, PVC molded or fabricated, socket type.
   3. Gaskets: ASTM F 477, elastomeric seals.

B. PVC Profile Sewer Piping:
   1. Pipe: ASTM F 794, PVC profile, gravity sewer pipe with bell-and-spigot ends for gasketed joints.
   2. Fittings: ASTM D 3034, PVC with bell ends.
   3. Gaskets: ASTM F 477, elastomeric seals.

C. PVC Type PSM Sewer Piping:
   1. Pipe: ASTM D 3034, SDR 35, PVC Type PSM sewer pipe with bell-and-spigot ends for gasketed joints.
   2. Fittings: ASTM D 3034, PVC with bell ends.
   3. Gaskets: ASTM F 477, elastomeric seals.

D. PVC Gravity Sewer Piping:
   1. Pipe and Fittings: ASTM F 679, Min 46 psi Pipe Stiffness, PVC gravity sewer pipe with bell-and-spigot ends and with integral ASTM F 477, elastomeric seals for gasketed joints.

## 2.4 CONCRETE PIPE AND FITTINGS

A. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76. Appropriate pipe class shall be determined by the depth of cover listed below unless noted otherwise on the Drawings:
   1. Bell-and-spigot ends and gasketed joints with ASTM C 443 , rubber gaskets.
   2. Class III, Wall B min. for cover depths from 2 feet to 3 feet
   3. Class II, Wall B min. for cover depths greater than 3 feet up to 9 feet.
   4. Class III, Wall B min. for cover depths of greater than 9 feet up to 14 feet.
   5. Class IV, Wall B min. for cover depths of greater than 14 feet up to 21 feet.
   6. Class V, Wall B min. for cover depths greater than 21 feet up to 30 feet.

## 2.5 CLEANOUTS

A. Plastic Cleanouts:
   1. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

## 2.6 DRAINS

A. Cast-Iron Area Drains:
   1. Description: ASME A112.6.3 gray-iron round body with anchor flange and round grate. Include bottom outlet with inside calk or spigot connection, of sizes indicated.
   2. Top-Loading Classification: Heavy Duty.

## 2.7 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105.
B. Material: Linear low-density polyethylene film of 0.008-inch or high-density, cross-laminated polyethylene film of 0.004-inch minimum thickness.
C. Form: Sheet or tube.
D. Color: Black or natural.

## 2.8 MANHOLES

A. Standard Precast Concrete Manholes:
   1. Description: ASTM C 478 , precast, reinforced concrete, of depth indicated, with provision for mortar joints.
   2. Diameter: 48 inches minimum unless otherwise indicated.
   3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.
   4. Base Section: 9-inch minimum thickness for floor slab and 6-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
   5. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
   6. Top Section: Concentric-cone type unless eccentric-cone or flat-slab-top type is indicated on the Drawings, and top of cone of size that matches grade rings.

7. Grade Rings: Reinforced-concrete rings, 9 to 18-inch total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Manhole Frames and Covers:
1. Description: Ferrous; 24-inch ID by 4 to 6-inch riser with 4-inch minimum width flange and 25-1/4 to 26-inch diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."
2. Material: ASTM A 48/A 48M, Class 35 gray iron unless otherwise indicated.

## 2.9 CATCH BASINS

A. Standard Precast Concrete or Cast in Place Catch Basins as noted on the Drawings.

## 2.10 STORMWATER INLETS

A. Combination Inlets: Made with vertical curb and horizontal gutter openings as noted on the Drawings.
B. Frames and Grates: Heavy duty, hot dipped galvanized.

## 2.11 PIPE OUTLETS

A. Riprap Basins: Broken, irregularly sized and shaped, graded stone according to NSSGA's "Quarried Stone for Erosion and Sediment Control."
1. Average Size: NSSGA No. R-5, screen opening 5 inches.

## 2.12 CONCRETE

A. General: Cast-in-place concrete complying with ACI 318, and the following:
1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix for Cast in Place Concrete: Class 3 concrete, 2500 psi minimum at 28 days, with 0.58 maximum water/cementitious materials ratio unless noted otherwise on the Drawings.
1. Reinforcing Bars: ASTM A 615, Grade 60 deformed steel as noted on the Drawings.

## 2.13 BACKWATER VALVES

A. Cast-Iron Backwater Valves:
1. Description: ASME A112.14.1, gray-iron body and bolted cover, with bronze seat.
2. Horizontal type; with swing check valve and hub-and-spigot ends.
3. Combination horizontal and manual gate-valve type; with swing check valve, integral gate valve, and hub-and-spigot ends.
4. Terminal type; with bronze seat, swing check valve, and hub inlet.

B. Plastic Backwater Valves:

1. Description: Horizontal type; with PVC body, PVC removable cover, and PVC swing check valve.

## PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

D. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

3.3 CHANNEL DRAINAGE SYSTEM INSTALLATION

A. Install with top surfaces of components, except piping, flush with finished surface.

B. Assemble channel sections to form slope down toward drain outlets. Use sealants, adhesives, fasteners, and other materials recommended by system manufacturer.

C. Embed channel sections and drainage specialties in 4-inch minimum concrete around bottom and sides.

D. Fasten grates to channel sections if indicated.

E. Assemble channel sections with flanged or interlocking joints.

F. Embed channel sections in 4-inch minimum concrete around bottom and sides.

3.4 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Section 221413 "Facility Storm Drainage Piping."

B. Connect force-main piping to building's storm drainage force mains specified in Section 221413 "Facility Storm Drainage Piping." Terminate piping where indicated.

C. Make connections to existing piping and underground manholes.
   1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
   2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
   3. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.
      a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
      b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
   4. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

D. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
   1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.
      a. Unshielded flexible couplings for same or minor difference OD pipes.
      b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
      c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.
   2. Use pressure-type pipe couplings for force-main joints.

## 3.5 IDENTIFICATION

A. Materials and their installation are specified in Section 312000 "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.
   1. Use warning tape or detectable warning tape over ferrous piping.
   2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

**END OF SECTION 33 41 00**

# SECTION 33 46 00 - SUBDRAINAGE

## PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Soil materials are specified in Section 312000 "Earth Moving."

## PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces and areas for suitable conditions where subdrainage systems are to be installed.

B. Verify that drainage panels installed as part of foundation wall waterproofing is properly positioned to drain into subdrainage system.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.3 PIPING INSTALLATION

A. Install piping beginning at low points of system, true to grades and alignment indicated, with unbroken continuity of invert. Bed piping with full bearing in filtering material. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions and other requirements indicated.
   1. Excavate recesses in trench bottom for bell ends of pipe. Lay pipe with bells facing upslope and with spigot end entered fully into adjacent bell.

B. Use increasers, reducers, and couplings made for different sizes or materials of pipes and fittings being connected. Reduction of pipe size in direction of flow is prohibited.

C. Install thermoplastic piping according to ASTM D 2321.

3.4 PIPE JOINT CONSTRUCTION

A. Special Pipe Couplings: Join piping made of different materials and dimensions with special couplings made for this application. Use couplings that are compatible with and fit materials and dimensions of both pipes.

3.5 BACKWATER VALVE INSTALLATION

A. Comply with requirements for backwater valves specified in Section 334100 "Storm Utility Drainage Piping."

B. Install horizontal backwater valves in header piping downstream from perforated subdrainage piping.

C. Install horizontal backwater valves in piping in manholes or pits where indicated.

3.6 CONNECTIONS

A. Comply with requirements for piping specified in Section 334100 "Storm Utility Drainage Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect low elevations of subdrainage system to building's solid-wall-piping storm drainage system.

**END OF SECTION 33 46 00**

LEED-NC

# LEED-NC Version 3.3 Registered Project Checklist

Solano County SB 1022 Classroom & Vocational Building A

| Yes | ? | No | | | | | Status | Owner | Follow-up |
|---|---|---|---|---|---|---|---|---|---|
| 14 | 2 | 10 | **Sustainable Sites** | | | **26** Points | | | |
| Y | | | Prereq 1 | **Construction Activity Pollution Prevention** | Required | | Attempted | JD | SWPPP and erosion control plan to be prepared and submitted per State |
| 1 | | | Credit 1 | **Site Selection** | 1 | | Attempted | JD | Site appears to meet all required criteria for this credit. |
| 5 | | | Credit 2 | **Development Density & Community Connectivity** | 5 | | Attempted | JD / BR | Review the requirements used for Stanton project will apply. |
| | 1 | | Credit 3 | **Brownfield Redevelopment** | 1 | | Attempted | Owner to provide hazmat report | Site maybe contaminated based on the soil testing |
| | | 6 | Credit 4.1 | **Alternative Transportation**, Public Transportation Access | 6 | | Not Att. | None | Only one bus serves the site; station is more than 1/4 mile from the facility. |
| | | 1 | Credit 4.2 | **Alternative Transportation, Bicycle Storage & Changing Rooms** | 1 | | Not Att. | None | New buildings will not have bicycle facilities. |
| 3 | | | Credit 4.3 | **Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles | 3 | | Attempted | JD / BR | Based upon parking requirements for the site. |
| 2 | | | Credit 4.4 | **Alternative Transportation**, Parking Capacity | 2 | | Attempted | JD / BR | Based upon parking requirements for the site. |
| | | 1 | Credit 5.1 | **Site Development,** Protect or Restore Habitat | 1 | | Not Att. | None | Highly unlikely based upon site layout. |
| | | 1 | Credit 5.2 | **Site Development,** Maximize Open Space | 1 | | Not Att. | None | Highly unlikely based upon site layout. |
| 1 | | | Credit 6.1 | **Stormwater Design,** Quantity Control | 1 | | Attempted | JD | Highly likely based on City/County requirements for pre/post mitigation. |
| | 1 | | Credit 6.2 | **Stormwater Design,** Quality Control | 1 | | Attempted | JD | Highly likely based on treatment options selected, but requires confirmation. |
| | | 1 | Credit 7.1 | **Heat Island Effect,** Non-Roof | 1 | | Not Att. | None | Unlikely due to extensive AC pavement, lack of tree coverage. |
| 1 | | | Credit 7.2 | **Heat Island Effect,** Roof | 1 | | Attempted | BR | Requires use of cool roof or solar panels mounted to the top. |
| 1 | | | Credit 8 | **Light Pollution Reduction** | 1 | | Attempted | BR / GN | Highly likely based on site requirements. |
| Yes | ? | No | | | | | | | |
| 6 | 2 | 2 | **Water Efficiency** | | | **10** Points | | | |
| Y | | | Prereq 1 | **Water Use Reduction** | Required | | Attempted | HS | |
| 2 | | | Credit 1, Pt. 1 | **Water Efficient Landscaping**, Reduce by 50% | 2 | | Attempted | JD / BR | Will select plantings that require no permanent irrigation. |
| | 2 | | Credit 1, Pt. 2 | **Water Efficient Landscaping**, No Potable Use or No Irrigation | 2 | | Attempted | JD / BR | Some plantings may require a permanent irrigation system for water quality; JD to |
| | | 2 | Credit 2 | **Innovative Wastewater Technologies** | 2 | | Not Att. | None | Not likely based on building requirements. |
| 4 | | | Credit 3 | **Water Use Reduction**, 30% / 35% / 40% Reduction | 2 to 4 | | Attempted | HS | 45% water reduction using high efficiency fistures |
| Yes | ? | No | | | | | | | |
| 16 | 2 | 17 | **Energy & Atmosphere** | | | **35** Points | | | |
| Y | | | Prereq 1 | **Fundamental Commissioning of the Building Energy Systems** | Required | | Attempted | HS | |
| Y | | | Prereq 2 | **Minimum Energy Performance** | Required | | Attempted | HS | |
| Y | | | Prereq 3 | **Fundamental Refrigerant Management** | Required | | Attempted | HS | |
| 4 | 2 | 13 | Credit 1 | **Optimize Energy Performance** | 1 to 19 | | Attempted | HS | Points are associated with Bldg. A Updated energy model to include outside air ventilation requirements. |

LEED-NC

# LEED-NC Version 3.3 Registered Project Checklist

Solano County SB 1022 Classroom & Vocational Building A

| Yes | ? | No | | | | Status | Owner | Follow-up |
|---|---|---|---|---|---|---|---|---|
| 7 | | | Credit 2 | **On-Site Renewable Energy** | 1 to 7 | Attempted | HS / GN | Estimated 25% of electrical usage provided by 80Kw PV system. |
| 2 | | | Credit 3 | **Enhanced Commissioning** | 2 | Attempted | HS | |
| | | 2 | Credit 4 | **Enhanced Refrigerant Management** | 2 | Not Att. | None | Not likely based on building requirements. |
| 3 | | | Credit 5 | **Measurement & Verification** | 3 | Attempted | HS | Sub-metering will be provided to allow detailed measurements of electrical systems. |
| | | 2 | Credit 6 | **Green Power** | 2 | Not Att. | None | |

| Yes | ? | No | | | |
|---|---|---|---|---|---|
| 6 | 3 | 5 | **Materials & Resources** | **14** Points | |

| Y | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Prereq 1 | **Storage & Collection of Recyclables** | Required | Attempted | BR | |
| | | 3 | Credit 1.1 | **Building Reuse**, Maintain 55%, 75%, 95% of Existing Walls, Floors & Roof | 1 to 3 | Not Att. | | No portion of an existing building shall be reused with the construction. |
| | | 1 | Credit 1.2 | **Building Reuse**, Maintain Interior Nonstructural Elements | 1 | Not Att. | | No portion of an existing building shall be reused with the construction. |
| 2 | | | Credit 2 | **Construction Waste Management**, Divert 50% / 75% from Disposal | 1 to 2 | Attempted | | |
| | 2 | | Credit 3 | **Materials Reuse**, 5% / 10% | 1 to 2 | Attempted | | |
| 1 | 1 | | Credit 4 | **Recycled Content**, 10% / 20% (post-consumer + ½ pre-consumer) | 1 to 2 | Attempted | | |
| 2 | | | Credit 5 | **Regional Materials**, 10% / 20% Extracted, Processed & Manufactured Regionally | 1 to 2 | Attempted | | |
| | | 1 | Credit 6 | **Rapidly Renewable Materials** | 1 | Not Att. | None | Not likely based on building requirements. |
| 1 | | | Credit 7 | **Certified Wood** | 1 | Attempted | JM | 50% of all wood would need to be certified in accordance with the Forest Stewardship Council's principles and criteria. Add this language to the spec. This will add some cost to the project and could be skipped if other credits are more easily obtainable. |

| Yes | ? | No | | | |
|---|---|---|---|---|---|
| 10 | 5 | | **Indoor Environmental Quality** | **15** Points | |

| Y | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Y | | | Prereq 1 | **Minimum IAQ Performance** | Required | Attempted | BR / HS | |
| | | | Prereq 2 | **Environmental Tobacco Smoke** (ETS) **Control** | Required | Attempted | BR / HS | |
| | 1 | | Credit 1 | **Outdoor Air Delivery Monitoring** | 1 | Attempted | HS | Provide CO2 monitoring for zone ventilation control. |
| | 1 | | Credit 2 | **Increased Ventilation** | 1 | Attempted | HS | Provide increased outside air ventilation over minimum requirements. |
| 1 | | | Credit 3.1 | **Construction IAQ Management Plan**, During Construction | 1 | Attempted | HS | |
| 1 | | | Credit 3.2 | **Construction IAQ Management Plan**, Before Occupancy | 1 | Attempted | HS | |
| 1 | | | Credit 4.1 | **Low-Emitting Materials**, Adhesives & Sealants | 1 | Attempted | BR / HS | |
| 1 | | | Credit 4.2 | **Low-Emitting Materials**, Paints & Coatings | 1 | Attempted | BR / HS | |
| 1 | | | Credit 4.3 | **Low-Emitting Materials**, Flooring Systems | 1 | Attempted | BR / HS | |
| 1 | | | Credit 4.4 | **Low-Emitting Materials**, Composite Wood & Agrifiber Products | 1 | | BR / HS | |

LEED-NC

# LEED-NC Version 3.3 Registered Project Checklist

Solano County SB 1022 Classroom & Vocational Building A

| Yes | ? | No | | | | Status | Owner | Follow-up |
|---|---|---|---|---|---|---|---|---|
| | 1 | | Credit 5 | **Indoor Chemical & Pollutant Source Control** | 1 | Attempted | BR / HS | |
| 1 | | | Credit 6.1 | **Controllability of Systems**, Lighting | 1 | Attempted | BR / HS | Possible if workstations provided with task lighting. |
| | 1 | | Credit 6.2 | **Controllability of Systems**, Thermal Comfort | 1 | Attempted | HS | Provide occupants with local thermostat controls, supply air registers, and operable windows |
| 1 | | | Credit 7.1 | **Thermal Comfort**, Design | 1 | Attempted | HS | |
| 1 | | | Credit 7.2 | **Thermal Comfort**, Verification | 1 | Attempted | BR / HS | KitJDell to work with the County to develop a survey for occupants. Plan development based on survey results will be the responsibility of the County. |
| | 1 | | Credit 8.1 | **Daylight & Views**, Daylight | 1 | Attempted | BR / HS | |
| 1 | | | Credit 8.2 | **Daylight & Views**, Views | 1 | Attempted | BR / HS | Windows for viewing. |

| Yes | ? | No | | |
|---|---|---|---|---|
| 3 | 2 | 1 | **Innovation & Design Process** | 6 Points |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | | | Credit 1.1 | **Innovation in Design**: Green Housekeeping | 1 | Attempted | JD / BR | Review the requirements from Stanton; dependent on products used. |
| 1 | | | Credit 1.2 | **Innovation in Design**: Green Education | 1 | Attempted | JD / BR | Discuss with the County how a green education program can be implemented. |
| | 1 | | Credit 1.3 | **Innovation in Design**: Low Emitting Furniture Systems | 1 | Attempted | JD / BR | Review the requirements from Stanton; dependent on furniture purchased. |
| | 1 | | Credit 1.4 | **Innovation in Design**: Energy Star Equipment | 1 | Attempted | JD / BR | Stanton: Use of EnergyStar equipment (microwaves, etc.) |
| | | 1 | Credit 1.5 | **Innovation in Design**: 100% Onsite Power Generation | 1 | Attempted | JD / BR | Not possible with amount of roof area. |
| 1 | | | Credit 2 | **LEED® Accredited Professional** | 1 | Attempted | BR | LEED AP's for the project: Gordon Rogers |

| Yes | ? | No | | |
|---|---|---|---|---|
| 1 | 2 | 1 | **Regional Priority** | 4 Points |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 1 | Credit 1 | **Regional Priority**: SSc4.1 | 1 | Not Att. | None | Site will not have public access. |
| | | 1 | Credit 2 | **Regional Priority**: SSc7.1 | 1 | Attempted | JD | To be reviewed during site calculations. |
| | | 1 | Credit 3 | **Regional Priority**: WEc2 | 1 | | HS | |
| | 1 | | Credit 4 | **Regional Priority**: WEc3 | 1 | | HS | |
| 1 | | | Credit 5 | **Regional Priority**: EAc2 | 1 | | HS | |
| | 1 | | Credit 6 | **Regional Priority**: EQc8.1 | 1 | | BR / HS | |

| Yes | ? | No | |
|---|---|---|---|
| 56 | 18 | 36 | **Project Totals (pre-certification estimates)** |

**Certified** 40-49 points **Silver** 50-59 points **Gold** 60-79 points **Platinum** 80+ points

1 Points noted as orange are anticipated as being achieved. Final credit count includes these points.

LEED-NC

# LEED-NC Version 3.3 Registered Project JDecklist

Solano County SB 1022 Classroom & Vocational Building B

| Yes | ? | No | | | | | Status | Owner | Follow-up |
|---|---|---|---|---|---|---|---|---|---|
| **14** | **2** | **10** | **Sustainable Sites** | | **26** Points | | | | |
| Y | | | Prereq 1 | **Construction Activity Pollution Prevention** | Required | | Attempted | JD | SWPPP and erosion control plan to be prepared and submitted per State |
| 1 | | | Credit 1 | **Site Selection** | 1 | | Attempted | JD | Site appears to meet all required criteria for this credit. |
| 5 | | | Credit 2 | **Development Density & Community Connectivity** | 5 | | Attempted | JD / BR | Review the requirements used for Stanton project will apply. |
| | 1 | | Credit 3 | **Brownfield Redevelopment** | 1 | | Attempted | Owner to provide | Site maybe contaminated based on the soile testing |
| | | 6 | Credit 4.1 | **Alternative Transportation**, Public Transportation Access | 6 | | Not Att. | None | Only one bus serves the site; station is more than 1/4 mile from the facility. |
| | | 1 | Credit 4.2 | **Alternative Transportation, Bicycle Storage & Changing Rooms** | 1 | | Not Att. | None | New buildings will not have bicycle facilities. |
| 3 | | | Credit 4.3 | **Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles | 3 | | Attempted | JD / BR | Based upon parking requirements for the site. |
| 2 | | | Credit 4.4 | **Alternative Transportation**, Parking Capacity | 2 | | Attempted | JD / BR | Based upon parking requirements for the site. |
| | | 1 | Credit 5.1 | **Site Development,** Protect or Restore Habitat | 1 | | Not Att. | None | Highly unlikely based upon site layout. |
| | | 1 | Credit 5.2 | **Site Development,** Maximize Open Space | 1 | | Not Att. | None | Highly unlikely based upon site layout. |
| 1 | | | Credit 6.1 | **Stormwater Design,** Quantity Control | 1 | | Attempted | JD | Highly likely based on City/County requirements for pre/post mitigation. |
| | 1 | | Credit 6.2 | **Stormwater Design,** Quality Control | 1 | | Attempted | JD | Highly likely based on treatment options selected, but requires confirmation. |
| | | 1 | Credit 7.1 | **Heat Island Effect,** Non-Roof | 1 | | Not Att. | None | Unlikely due to extensive AC pavement, lack of tree coverage. |
| 1 | | | Credit 7.2 | **Heat Island Effect,** Roof | 1 | | Attempted | BR | Requires use of cool roof or solar panels mounted to the top. |
| 1 | | | Credit 8 | **Light Pollution Reduction** | 1 | | Attempted | BR / GN | Highly likely based on site requirements. |
| Yes | ? | No | | | | | | | |
| **4** | **4** | **2** | **Water Efficiency** | | **10** Points | | | | |
| Y | | | Prereq 1 | **Water Use Reduction** | Required | | Attempted | HS | |
| 2 | | | Credit 1, Pt. 1 | **Water Efficient Landscaping**, Reduce by 50% | 2 | | Attempted | JD / BR | Will select plantings that require no permanent irrigation. |
| | 2 | | Credit 1, Pt. 2 | **Water Efficient Landscaping**, No Potable Use or No Irrigation | 2 | | Attempted | JD / BR | Some plantings may require a permanent irrigation system for water quality; JD to |
| | | 2 | Credit 2 | **Innovative Wastewater Technologies** | 2 | | Not Att. | None | Not likely based on building requirements. |
| 2 | 2 | | Credit 3 | **Water Use Reduction**, 30% / 35% / 40% Reduction | 2 to 4 | | Attempted | HS | Possible depending on fixtures selected? |
| Yes | ? | No | | | | | | | |
| **15** | **3** | **17** | **Energy & Atmosphere** | | **35** Points | | | | |
| Y | | | Prereq 1 | **Fundamental Commissioning of the Building Energy Systems** | Required | | Attempted | HS | |
| Y | | | Prereq 2 | **Minimum Energy Performance** | Required | | Attempted | HS | |
| Y | | | Prereq 3 | **Fundamental Refrigerant Management** | Required | | Attempted | HS | |
| 3 | 3 | 13 | Credit 1 | **Optimize Energy Performance** | 1 to 19 | | Attempted | HS | Points are assoicated with Bldg. B Updated energy model to include outside air ventilation requirements. |
| 7 | | | Credit 2 | **On-Site Renewable Energy** | 1 to 7 | | Attempted | HS / GN | Estimated 25% of electrical usage provided by 80Kw PV system. |

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# LEED-NC Version 3.3 Registered Project JDecklist

Solano County SB 1022 Classroom & Vocational Building B

| Yes | ? | No | | | | | Status | Owner | Follow-up |
|---|---|---|---|---|---|---|---|---|---|
| 2 | | | Credit 3 | **Enhanced Commissioning** | 2 | | Attempted | HS | |
| | | 2 | Credit 4 | **Enhanced Refrigerant Management** | 2 | | Not Att. | None | Not likely based on building requirements. |
| 3 | | | Credit 5 | **Measurement & Verification** | 3 | | Attempted | HS | Sub-metering will be provided to allow detailed measurements of electrical systems. |
| | | 2 | Credit 6 | **Green Power** | 2 | | Not Att. | None | |

| Yes | ? | No | | | |
|---|---|---|---|---|---|
| 6 | 3 | 5 | **Materials & Resources** | **14** Points | |

| Y | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Prereq 1 | **Storage & Collection of Recyclables** | Required | | Attempted | BR | |
| | | 3 | Credit 1.1 | **Building Reuse**, Maintain 55%, 75%, 95% of Existing Walls, Floors & Roof | 1 to 3 | | Not Att. | | No portion of an existing building shall be reused with the construction. |
| | | 1 | Credit 1.2 | **Building Reuse**, Maintain Interior Nonstructural Elements | 1 | | Not Att. | | No portion of an existing building shall be reused with the construction. |
| 2 | | | Credit 2 | **Construction Waste Management**, Divert 50% / 75% from Disposal | 1 to 2 | | Attempted | | 75% Waste reduction |
| | 2 | | Credit 3 | **Materials Reuse**, 5% / 10% | 1 to 2 | | Attempted | | |
| 1 | 1 | | Credit 4 | **Recycled Content**, 10% / 20% (post-consumer + ½ pre-consumer) | 1 to 2 | | Attempted | | |
| 2 | | | Credit 5 | **Regional Materials**, 10% / 20% Extracted, Processed & Manufactured Regionally | 1 to 2 | | Attempted | | |
| | | 1 | Credit 6 | **Rapidly Renewable Materials** | 1 | | Not Att. | None | Not likely based on building requirements. |
| 1 | | | Credit 7 | **Certified Wood** | 1 | | Attempted | JM | 50% of all wood would need to be certified in accordance with the Forest Stewardship Council's principles and criteria. Add this language to the spec. This will add some cost to the project and could be skipped if other credits are more easily obtainable. |

| Yes | ? | No | | | |
|---|---|---|---|---|---|
| 8 | 6 | 1 | **Indoor Environmental Quality** | **15** Points | |

| Y | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Y | | | Prereq 1 | **Minimum IAQ Performance** | Required | | Attempted | BR / HS | |
| Y | | | Prereq 2 | **Environmental Tobacco Smoke** (ETS) **Control** | Required | | Attempted | BR / HS | |
| | 1 | | Credit 1 | **Outdoor Air Delivery Monitoring** | 1 | | Attempted | HS | Provide CO2 monitoring for zone ventilation control. |
| | 1 | | Credit 2 | **Increased Ventilation** | 1 | | Attempted | HS | Provide increased outside air ventilation over minimum requirements. |
| 1 | | | Credit 3.1 | **Construction IAQ Management Plan**, During Construction | 1 | | Attempted | HS | |
| 1 | | | Credit 3.2 | **Construction IAQ Management Plan**, Before Occupancy | 1 | | Attempted | HS | |
| 1 | | | Credit 4.1 | **Low-Emitting Materials**, Adhesives & Sealants | 1 | | Attempted | BR / HS | |
| 1 | | | Credit 4.2 | **Low-Emitting Materials**, Paints & Coatings | 1 | | Attempted | BR / HS | |
| 1 | | | Credit 4.3 | **Low-Emitting Materials**, Flooring Systems | 1 | | Attempted | BR / HS | |
| 1 | | | Credit 4.4 | **Low-Emitting Materials**, Composite Wood & Agrifiber Products | 1 | | Attempted | BR / HS | |
| | 1 | | Credit 5 | **Indoor Chemical & Pollutant Source Control** | 1 | | Attempted | BR / HS | |

LEED-NC

# LEED-NC Version 3.3 Registered Project JDecklist

Solano County SB 1022 Classroom & Vocational Building B

| Yes | ? | No | | | | Status | Owner | Follow-up |
|---|---|---|---|---|---|---|---|---|
| | | 1 | Credit 6.1 | **Controllability of Systems**, Lighting | 1 | Attempted | BR / HS | Possible if workstations provided with task lighting. |
| | 1 | | Credit 6.2 | **Controllability of Systems**, Thermal Comfort | 1 | Attempted | HS | Provide occupants with local thermostat controls, supply air registers, and operable windows |
| 1 | | | Credit 7.1 | **Thermal Comfort**, Design | 1 | Attempted | HS | |
| 1 | | | Credit 7.2 | **Thermal Comfort**, Verification | 1 | Attempted | BR / HS | Kitchell to work with the County to develop a survey for occupants. Plan development based on survey results will be the responsibility of the County. |
| | 1 | | Credit 8.1 | **Daylight & Views**, Daylight | 1 | Attempted | BR / HS | |
| | 1 | | Credit 8.2 | **Daylight & Views**, Views | 1 | Attempted | BR / HS | |
| Yes | ? | No | | | | | | |
| 3 | 2 | 1 | **Innovation & Design Process** | | 6 Points | | | |
| 1 | | | Credit 1.1 | **Innovation in Design**: Green Housekeeping | 1 | Attempted | JD / BR | Review the requirements from Stanton; dependent on products used. |
| 1 | | | Credit 1.2 | **Innovation in Design**: Green Education | 1 | Attempted | JD / BR | Discuss with the County how a green education program can be implemented. |
| | 1 | | Credit 1.3 | **Innovation in Design**: Low Emitting Furniture Systems | 1 | Attempted | JD / BR | Review the requirements from Stanton; dependent on furniture purchased. |
| | 1 | | Credit 1.4 | **Innovation in Design**: Energy Star Equipment | 1 | Attempted | JD / BR | Stanton: Use of EnergyStar equipment (microwaves, etc.) |
| | | 1 | Credit 1.5 | **Innovation in Design**: 100% Onsite Power Generation | 1 | Attempted | JD / BR | Not possible with amount of roof area. |
| 1 | | | Credit 2 | **LEED® Accredited Professional** | 1 | Attempted | BR | LEED AP's for the project: Gordon Rogers |
| Yes | ? | No | | | | | | |
| 1 | 2 | 3 | **Regional Priority** | | 4 Points | | | |
| | | 1 | Credit 1 | **Regional Priority**: SSc4.1 | 1 | Not Att. | None | Site will not have public access. |
| | | 1 | Credit 2 | **Regional Priority**: SSc7.1 | 1 | Attempted | JD | To be reviewed during site calculations. |
| | | 1 | Credit 3 | **Regional Priority**: WEc2 | 1 | | HS | |
| | 1 | | Credit 4 | **Regional Priority**: WEc3 | 1 | | HS | |
| 1 | | | Credit 5 | **Regional Priority**: EAc2 | 1 | | HS | |
| | 1 | | Credit 6 | **Regional Priority**: EQc8.1 | 1 | | BR / HS | |
| Yes | ? | No | | | | | | |
| 51 | 22 | 39 | **Project Totals (pre-certification estimates)** | | | | | |

**Certified** 40-49 points **Silver** 50-59 points **Gold** 60-79 points **Platinum** 80+ points

1 Points noted as orange are anticipated as being achieved. Final credit count includes these points.

# Mitigation Monitoring and Reporting Program for Claybank Adult Detention Facility Expansion Project Fairfield, Solano County, California

**State Clearinghouse Number 2006052071**

Prepared for:

**Solano County Department of General Services**
**Division of Architectural Services**
675 Texas Street, Suite 2500
Fairfield, CA 94533
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Contact: Kanon Artiche, Solano County Architect

Prepared by:

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Contact: Jason Brandman, Project Manager

July 6, 2007

## MITIGATION MONITORING AND REPORT PROGRAM

Table 1 is the Mitigation Monitoring and Reporting Program for the Claybank Adult Detention Facility Expansion Project. The mitigation measures in the table represent the final language of all project mitigation measures, including revisions to the text of certain measures that was noted in the Responses to Comments on the Draft Environmental Impact Report (EIR) and Draft EIR Errata. Both documents are incorporated by reference into this Mitigation Monitoring and Reporting Program.

Following direction from the Solano County Board of Supervisors to implement all mitigation measures, all measures described in the Mitigation Monitoring and Reporting Program will be implemented through a combination of one or more of the following, as appropriate to the nature of the measure: (1) incorporation into project design; (2) incorporation into agreements with contractors and other parties concerning project design and construction; or (3) carried out directly by County staff.

.

## Table 1: Claybank Adult Detention Facility Expansion Project Mitigation Monitoring and Reporting Program

| EIR Section | Mitigation Measures | Method of Verification | Timing of Verification | Responsible for Verification | Verification of Completion | |
|---|---|---|---|---|---|---|
| | | | | | Date | Initial |
| **4.2 Air Quality** | **MM AIR-2.** During construction of either phase of the proposed project, the County of Solano shall require the construction contractor(s) to implement BAAQMD's basic and enhanced dust control procedures required for all construction sites. Elements of the basic and enhanced dust control program are as follows:<br>• Water all active construction areas at least twice daily.<br>• Cover all trucks hauling soil, sand, and other loose materials or require all trucks to maintain at least two feet of freeboard (i.e., the minimum required space between the top of the load and the top of the trailer).<br>• Pave, apply water three times daily, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas, and staging areas at construction sites.<br>• Sweep daily (with water sweepers) all paved access roads, parking areas, and staging areas at construction sites.<br>• Sweep streets daily (with water sweepers) if visible soil material is carried onto adjacent public streets.<br>• Hydroseed or apply (non-toxic) soil stabilizers to inactive construction areas (previously graded areas inactive for ten days or more).<br>• Enclose, cover, water twice daily or apply (non-toxic) soil binders to exposed stockpiles (dirt, sand, etc.).<br>• Limit traffic speeds on unpaved roads to 15 mph.<br>• Install sandbags or other erosion control measures to prevent silt runoff to public roadways.<br>• Replant vegetation in disturbed areas as quickly as possible. | Site inspection and documentation | During construction | County of Solano Department of General Services and/or Bay Area Air Quality Management District | | |

| EIR Section | Mitigation Measures | Method of Verification | Timing of Verification | Responsible for Verification | Verification of Completion | |
|---|---|---|---|---|---|---|
| | | | | | Date | Initial |
| | **MM AIR-3.** The County shall include the measures listed below in the project construction contract documents for both phases of the proposed project to minimize construction equipment exhaust emissions:<br>• To the extent that equipment is available and cost effective, the construction contractor shall use construction equipment operated on alternative fuels or electrical equipment, and/or retrofit engines in construction equipment to minimize exhaust emissions.<br>• The construction contractor shall minimize the simultaneous operation of multiple pieces of equipment at the construction site.<br>• The construction contractor shall discourage idling of construction equipment and vehicles (or minimize idling time to a maximum of five minutes when construction equipment is not in use). The contractor will post temporary signs on the construction site to remind equipment operators to minimize idling time.<br>• Employ construction activity management techniques such as extending the construction period outside the ozone season of May through October. | Site inspection and documentation | During construction | County of Solano Department of General Services and/or Bay Area Air Quality Management District | | |
| **4.3 Biological Resources** | **MM BIO-1a** Prior to any ground-disturbing activities on the project site for either Phase I or Phase II, a qualified biologist shall conduct a focused burrowing owl survey to determine the presence or absence of this species onsite. The survey shall be conducted according to the standard protocol established by CDFG and the Burrowing Owl Consortium (BOC). If burrowing owls are determined to be present on the project site, mitigation for potential impacts to owls should follow the guidelines outlined by the BOC, including passive relocation. If vegetation removal or ground disturbance | Receipt of focused survey or pre-construction survey | Prior to any ground-disturbing activities for either Phase I or Phase II | County of Solano Department of General Services and/or California Department of Fish and Game | | |

| EIR Section | Mitigation Measures | Method of Verification | Timing of Verification | Responsible for Verification | Verification of Completion | |
|---|---|---|---|---|---|---|
| | | | | | Date | Initial |
| | begins within 30 days of the focused survey and no burrowing owls were found, no pre-construction survey would be required. If vegetation removal or ground disturbance activities begins after 30 days of the focused survey, a pre-construction survey would be required to be performed no earlier than 30 days prior to vegetation removal or ground disturbance. | | | | | |
| | **MM BIO-1b** If suitable avian nesting habitat is intended to be removed during the nesting season (February 1 through August 31) for either Phase I or Phase II, a qualified biologist shall conduct a nesting bird survey no more than 14 days prior to tree pruning, tree removal, staging, ground disturbing or construction activities to identify any potential nesting activity. Surveys shall be conducted a minimum of three separate days during the 14 days prior to disturbance. If passerine birds are found to be nesting, or there is evidence of nesting behavior within 250 feet of the construction area, a 250-foot buffer shall be required around the nests. No vegetation removal or ground disturbance shall occur within the 250-foot buffer. For raptor species—birds of prey such as hawks and owls—this buffer shall be 500 feet. A qualified biologist shall monitor the nests closely until it is determined that the nests are no longer active, at which time construction activities may commence within the buffer area. Construction activity may encroach into the buffer area at the discretion of the biological monitor. | Receipt of nesting bird survey | Prior to any ground-disturbing activities between February 1 and August 31 for either Phase I or Phase II | County of Solano Department of General Services and/or California Department of Fish and Game | | |
| **4.4 Cultural Resources** | **MM CUL-1.** If a potentially significant cultural resource is encountered during subsurface earthwork activities for either Phase I or Phase II, all construction activities within a 100-foot radius of the find shall cease until a qualified archaeologist determines whether the resource requires further study. The County shall | Notification of find | During subsurface earthwork activities for either Phase I or Phase II | County of Solano Department of General Services | | |

| EIR Section | Mitigation Measures | Method of Verification | Timing of Verification | Responsible for Verification | Verification of Completion | |
|---|---|---|---|---|---|---|
| | | | | | Date | Initial |
| | include a standard inadvertent discovery clause in every construction contract to inform contractors of this requirement. Any previously undiscovered resources found during construction shall be recorded on appropriate Department of Parks and Recreation (DPR) forms and evaluated for significance in terms of California Environmental Quality Act criteria by a qualified archaeologist. Potentially significant cultural resources consist of, but are not limited to, stone, bone, fossils, wood, or shell artifacts or features, including hearths, structural remains, or historic dumpsites. If the resource is determined to be significant under CEQA, the qualified archaeologist shall prepare and implement a research design and archaeological data recovery plan for the recovery that will capture those categories of data for which the site is significant. The archaeologist shall also perform appropriate technical analyses, prepare a full written report and file it with the appropriate information center, and provide for the permanent curation of the recovered materials. | | | | | |
| | **MM CUL-3.** In the event a fossil is discovered during construction for Phase I or II of the proposed project, excavations within 100 feet of the find shall be temporarily halted or delayed until the discovery is examined by a qualified paleontologist, in accordance with Society of Vertebrate Paleontology standards. The County shall include a standard inadvertent discovery clause in every construction contract to inform contractors of this requirement. The paleontologist shall notify the County of Solano to determine procedures to be followed before construction is allowed to resume at the location of the find. If the find is determined to be significant and the County determines that avoidance is not feasible, the paleontologist shall design and carry out a data recovery plan consistent with the Society of | Notification of find | During construction for Phase I or Phase II | County of Solano Department of General Services | | |

| EIR Section | Mitigation Measures | Method of Verification | Timing of Verification | Responsible for Verification | Verification of Completion | |
|---|---|---|---|---|---|---|
| | | | | | Date | Initial |
| | Vertebrate Paleontology standards. The plan shall be submitted to Solano County for review and approval. Upon approval, the plan shall be incorporated into the project. | | | | | |
| | **MM CUL-4.** If human remains are encountered during earth-disturbing activities for either Phase I or Phase II, all work in the adjacent area shall stop immediately and the Solano County Coroner's office shall be notified. If the remains are determined to be Native American in origin, both the Native American Heritage Commission and any identified descendants shall be notified by the coroner and recommendations for treatment solicited (CEQA Guidelines § 15064.5; Health and Safety Code § 7050.5; Public Resources Code §§ 5097.94 and 5097.98). | Notification of find | During earth-disturbing activities for either Phase I or Phase II | County of Solano Department of General Services and/or Solano County Coroner's Office | | |
| **4.6 Hazards and Hazardous Materials** | **MM HAZ-1.** Prior to the commencement of ground disturbing activities for either Phase I or Phase II, the construction contractor shall conduct a pre-construction meeting with all construction personnel who will be onsite during ground disturbing activities to discuss potential hazardous materials that may be encountered during subsurface earthwork activities. Potential hazardous materials may include contaminated soil, debris, and refuse associated with the former Nike Ajax missile launcher site, and debris and refuse associated with the operations of the Claybank Adult Detention Facility. If potential hazardous materials are encountered during subsurface earthwork activities, construction activities shall cease in the vicinity of the find and a licensed hazardous materials disposal contractor shall evaluate the find and recommend proper abatement or removal and disposal procedures. Any recommendations made by the licensed hazardous materials disposal contractor regarding proper abatement | Site inspection and documentation | Prior to the commencement of ground-disturbing activities for either Phase I or Phase II | County of Solano Department of General Services | | |

| EIR Section | Mitigation Measures | Method of Verification | Timing of Verification | Responsible for Verification | Verification of Completion | |
|---|---|---|---|---|---|---|
| | | | | | Date | Initial |
| | and disposal procedures shall be implemented as part of the proposed project. | | | | | |
| | **MM HAZ-2a.** *Asbestos:* Prior to any Phase I interior renovation activities, the County of Solano shall retain a licensed and certified asbestos abatement contractor to properly encapsulate or remove and dispose of any ACBMs that may be disturbed by construction or renovation. | Acceptance of work | Prior to any Phase I interior renovation activities | County of Solano Department of General Services | | |
| | **MM HAZ-2b.** *Lead:* Prior to any Phase I interior renovation activities, the County of Solano shall do the following:<br>• Identify methods for resurfacing, removal, or cutting of any surface containing lead<br>• Comply with CAL OSHA Lead-In-Workplace standards and applicable air monitoring requirements when disturbing surfaces containing lead<br>• Conduct lead dust clearance sampling upon completion of work to verify no public health hazards remain | Acceptance of work | Prior to any Phase I interior renovation activities | County of Solano Department of General Services | | |
| **4.9 Noise** | **MM NOI-1a.** Construction contractors for Phases I and II of the proposed project shall be required to ensure that construction equipment is well tuned and maintained according to the manufacturer's specifications, and that the equipment's standard noise reduction devices are in good working order. | Site inspection and documentation | During construction for Phases I and II | County of Solano Department of General Services | | |
| | **MM NOI-1b.** In accordance with City requirements, construction activities for Phases I and II of the proposed project shall be limited to between 7:00 a.m. and 10:00 p.m. daily. | Site inspection and documentation | During construction for Phases I and II | County of Solano Department of General Services | | |

| EIR Section | Mitigation Measures | Method of Verification | Timing of Verification | Responsible for Verification | Verification of Completion | |
|---|---|---|---|---|---|---|
| | | | | | Date | Initial |
| | **MM NOI-1c.** Construction equipment noise for Phases I and II of the proposed project shall be minimized during project construction by muffling and shielding intakes and exhaust on construction equipment (per the manufacturers' specifications) and by shrouding or shielding impact tools. All equipment shall have sound-control devices no less effective than those provided by the manufacturer. | Site inspection and documentation | During construction for Phases I and II | County of Solano Department of General Services | | |
| | **MM NOI-1d.** Construction activities contractors for Phases I and II of the proposed project shall locate fixed construction equipment (such as compressors and generators) and construction staging areas as far as possible from adjacent residences. Activities within these staging areas shall conform to the time limitations established in Mitigation Measure NOI-1b. | Site inspection and documentation | During construction for Phases I and II | County of Solano Department of General Services | | |
| **4.12 Transportation** | **MM TRANS-1a.** Prior to occupancy of Phase I of the proposed project, the County of Solano shall pay its fair share for costs associated with installation of a traffic signal at the intersection of Clay Bank Road/Claybank Adult Detention Facility access road as part of the Laurel Creek Plaza project. | Acceptance of improvements | Prior to occupancy of Phase I | County of Solano Department of General Services | | |
| | **MM TRANS-1b.** In the event that the Laurel Creek Plaza improvements are not constructed by the opening of Phase I, the County shall implement interim improvements to improve the operation of the Clay Bank Road/Claybank Adult Detention Facility access road. These improvements are as follows:<br>• Re-stripe southbound Clay Bank Road to add a left-turn lane at the Claybank Adult Detention Facility access road.<br>• Re-stripe Clay Bank Road between the Claybank Adult Detention Facility access road and Western | Acceptance of improvements | Prior to the opening of Phase I in the event that MM TRANS-1a is not in place | County of Solano Department of General Services and/or City of Fairfield | | |

| EIR Section | Mitigation Measures | Method of Verification | Timing of Verification | Responsible for Verification | Verification of Completion | |
|---|---|---|---|---|---|---|
| | | | | | Date | Initial |
| | Street to add a two-way left-turn lane. | | | | | |
| | **MM TRANS-4.** Prior to the entitlement of the 513th bed of Phase II, the County of Solano shall adopt one or a combination of the following parking strategies to ensure that adequate parking is provided onsite:<br>• **Increase Parking Supply:** Provide more onsite parking capacity through reconfiguration (i.e., re-striping) of existing parking areas or development of new parking areas.<br>• **Use Existing Parking Capacity More Efficiently:** Provide information (e.g., signage, brochures, email, etc.) to staff and visitors about onsite parking; regulate parking through the use of reserved parking areas, time restrictions, or a permit system; or provide pedestrian improvements to encourage parking in areas further from the building entrance.<br>• **Reduce Parking Demand:** Provide information to staff and visitors (e.g., signage, brochures, email, etc.) about public transportation, rideshare programs, and bicycle/pedestrian facilities; sell public transportation tickets onsite; encourage carpooling or vanpooling among staff through the provision of vehicles or preferred parking spaces; offer commute alternative travel reimbursement (per mile or per day) for carpooling or commuting by public transportation, bicycle, or on foot; provide secure onsite bicycle storage facilities; conduct annual staff transportation surveys to determine success of and beneficial improvements to alternative transportation programs. | Approval of parking strategy | Prior to the entitlement of the 513th bed of Phase II | County of Solano Department of General Services | | |

RFI 0094 Trench Backfill Inspection Requirements Confirms testing at 24" vertical intervals

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**GEOTECHNICAL INVESTIGATION**
**CLAYBANK ADULT DETENTION**
**VOCATIONAL EDUCATION BUILDINGS**
**FAIRFIELD, CALIFORNIA**

February 8, 2015

Project 1784.021

Prepared For:
URS
Attn: Mr. Mike Egge
2870 Gateway Drive, Suite 300
Sacramento, California 95833

CERTIFICATION

This document is an instrument of service, prepared by or under the direction of the undersigned professionals, in accordance with the current ordinary standard of care. The service specifically excludes the investigation of radon, asbestos or other hazardous materials. The document is for the sole use of the client and consultants on this project. No other use is authorized. If the project changes, or more than two years have passed since issuance of this report, the findings and recommendations must be reviewed by the undersigned.

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MILLER PACIFIC ENGINEERING GROUP

GEOTECHNICAL INVESTIGATION
CLAYBANK ADULT DETENTION
VOCATIONAL EDUCATION BUILDINGS
FAIRFIELD, CALIFORNIA

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MILLER PACIFIC ENGINEERING GROUP

GEOTECHNICAL INVESTIGATION
CLAYBANK ADULT DETENTION
VOCATIONAL EDCUATION BUILDINGS
FAIRFIELD, CALIFORNIA

## I. INTRODUCTION

This report presents the results of our Geotechnical Investigation for the planned Vocational Education Building Project at the Claybank Adult (Stanton) Detention Facility at 2500 Clay Bank Road in Fairfield, California. As shown on the Site Location Map, Figure 1, the project site is located in the northeast corner of the city of Fairfield, California.

The purpose of our current services is to evaluate the site's soil, rock and groundwater conditions in order to provide geotechnical recommendations for use by the Project's Design Team. Our currently authorized services includes new subsurface exploration in addition to review of our data at the recently-completed (adjacent) Detention Center as it relates to the current improvement plans. We have prepared this report which includes the following:

(1) Brief summary of the site's geologic setting, seismicity and subsurface conditions.

(2) 2013 CBC site response coefficients for structural design under seismic loads.

(3) Discussion of expansive soil behavior and potential impacts to new improvements, and recommendations to reduce those impacts.

(4) Geotechnical recommendations for site preparation, grading, and compaction

(5) Geotechnical criteria for foundation design including allowable bearing pressures, soil concrete friction values, lateral resistance, limiting foundation depth and width.

(6) Geotechnical recommendations for the structural section design of asphalt pavements for the "Truck Pad," driveways and parking areas, and,

(7) Geotechnical recommendations for backfill of utility trenches and confirmation that standard trenching details are appropriate.

## II. PROJECT DESCRIPTION

The planned project will be an extension of the adjacent Claybank Adult Detention Facility that is located to the immediate northeast of the planned new work. The planned Vocational Education Project will consist of two new buildings including a two-story, +/- 20,000 square foot vocational education building and a single-story, +/- 10,000 square foot "classroom block". The building structure type is not finalized, but we understand they will likely be either tilt-up concrete or CMU-block buildings with slab floors. A large paved "truck pad" for driver training is planned

on the north side of the vocational education building and west side of the classroom building as shown on the Site Plan, Figure 2. New paved vehicle parking and driveway aisles are also planned along with ancillary work such as new underground utilities, exterior concrete flatwork and other items. The project site elevations are several feet below planned grades so new imported fill will be required for the planned work.

Based on our geotechnical services for the recently completed Claybank (Stanton) Correctional Facility, the primary geotechnical issue expected at the site is weak and expansive on-site soils. To reduce expansive soil impacts on buildings and surface flatwork/paving, lime-treatment was selected to improve performance of buildings and surface hardscape at the adjacent project.

## III. SITE CONDITIONS

### A. Local Geology

The site is situated in the Great Valley Geomorphic Province of California. This province is characterized as a relatively un-deformed sedimentary basin bounded by highly deformed rock units of the Coast Ranges to the west and by the gently sloping western foothills of the Sierra Nevada mountain range to the east. The Sacramento Valley, which forms the northern portion of the Great Valley Province, is composed of unconsolidated and recent age alluvial sediments. The underlying bedrock is inferred to be comprised of undifferentiated early Tertiary marine deposits.

According to geologic mapping by the USGS (Graymer, 2002) the northwestern portion of the site is underlain by alluvium while the majority of the project area is underlain by Tehama formation. Alluvium typically consists of sands, silts, clays and gravels deposited by water. The Tehama formation consists of siltstone, sandstone, tuff and conglomerate as reported by the USGS. A Regional Geologic Map is presented on Figure 3.

### B. Site Topography and Surface Conditions

The project area has a gentle slope to the west and is generally covered by low seasonal grasses. The northeastern portion of the site were used as a staging area during the recent construction of the Claybank (Stanton) Correctional Facility and this area has been covered with a thin layer of gravel and/or baserock. A large stockpile of construction spoils is located on the southern portion of the site and this stockpile seems to be a mix of lime treated soil, natural soils and some construction debris. Overall site elevations average about +50 feet.

### C. Field Exploration and Laboratory Testing

We drilled six geotechnical borings at the site on January 15, 2015 using truck-mounted drilling equipment. The boring locations are shown on Figure 2 and the soil and rock materials encountered were logged and samples were obtained for laboratory testing. The subsurface

exploration program is discussed in more detail in Appendix A. Soil and Rock Classification Charts are presented along with the Boring Logs on Figures A-1 through A-10 of Appendix A.

Laboratory testing of samples from our exploratory borings included moisture content, dry density, unconfined compressive strength, corrosion and plasticity tests. The results of the moisture, density and strength tests are presented on the boring logs. The results of the plasticity tests are presented on Figure A-11. The results of the corrosion tests are presented on Figure A-12. The laboratory testing program is discussed in more detail in Appendix A.

D. Subsurface Conditions

Our borings show that the subsurface profile consists of approximately three to four feet of medium stiff to very stiff, high-plasticity clay alluvium. The alluvium is underlain by weathered, siltstone bedrock that is highly to completely weathered and drilled with relatively low difficulty to the maximum explored depth of 28 feet. Additional descriptions of the on-site soils and rock are included in the boring logs.

We did not encounter groundwater in any of our borings at the time of our exploration but note the borings were grouted soon after completion and a stabilized depth to water may not have been observed. We anticipate groundwater levels will vary depending on the time of year and may be near the ground surface during the wetter periods of the year and especially during high rainfall winters.

E. Seismicity

1. Active Faults in the Region - The project site is located within a seismically active region that includes all of the central and northern Coast Ranges. Several active faults are present in the area both east and west of the site including the Great Valley, Cordelia and Green Valley Faults. An “active” fault is one that shows displacement within the last 11,000 years and, therefore, is considered more likely to generate a future earthquake than a fault that shows no sign of recent rupture. The California Division of Mines and Geology (1998) has mapped various active and inactive faults in the region. These faults, defined as either California Building Code Source Type “A” or “B,” are shown in relation to the project site on the attached Active Fault Map, Figure 4. The Great Valley Fault and Cordelia Fault are the nearest known active faults and are approximately 10 miles and 12 kilometers away, respectively, of the site.

The movement between rock formations along either side of a fault may be horizontal, vertical, or a combination and is radiated outward in the form of energy waves. The amplitude and frequency of earthquake ground motions partially depends on the material through which it is moving. The earthquake force is transmitted through hard rock in short, rapid vibrations, while this energy movement becomes a long, high-amplitude motion when moving through soft ground materials such as bay mud.

2. Historic Fault Activity - Numerous earthquakes have occurred in the region within historic times. The results of our computer database search indicate that 25 earthquakes (Richter Magnitude 5.0 or larger) have occurred within 150 kilometers (93 miles) of the site area between 1900 and 2015. The five most significant historic earthquakes to affect the project site are summarized in Table A.

TABLE A
SIGNIFICANT EARTHQUAKE ACTIVITY
CLAYBANK VOCATIONAL EDUCATION
FAIRFIELD, CALIFORNIA

| Epicenter (Latitude, Longitude) | Historic Richter Magnitude | Year |
|---|---|---|
| 38.216, -122.312 | 6.0 | 2014 |
| 38.379, -122.413 | 5.0 | 2000 |
| 37.737, -121.740 | 5.0 | 1980 |
| 38.296, -122.755 | 5.7 | 1969 |
| 37.750, -122.550 | 7.7 | 1906 |

References: Sources: USGS (2015)

3. Probability of Future Earthquakes - The historical records do not directly indicate either the maximum credible earthquake or the probability of such a future event. To evaluate earthquake probability in this region, the USGS has assembled a group of researchers into the "Working Group on California Earthquake Probabilities" (2007) to estimate the probabilities of earthquakes on active faults. Potential sources were analyzed considering fault geometry, geologic slip rates, geodetic strain rates, historic activity, and micro-seismicity, to arrive at estimates of probabilities of earthquakes with a Moment Magnitude greater than or equal to 6.7 by 2037.

The probability studies focus on seven "fault systems" within the Bay Area. Fault systems are composed of different, interacting fault segments capable of producing earthquakes within the individual segment or in combination with other segments of the same fault system. The probabilities for the individual fault segments in the San Francisco Bay Area are presented on Figure 4.

In addition to the seven fault systems, the studies included probabilities of "background earthquakes." These earthquakes are not associated with the identified fault systems and may occur on lesser faults (i.e., West Napa) or previously unknown faults (i.e., the 1989 Loma Prieta and 2000 Mt. Veeder - Napa earthquakes). When the probabilities on all seven fault systems and the background earthquakes are combined mathematically, there is a 63 percent chance for

a magnitude 6.7 or larger earthquake to occur in the Bay Area by the year 2037. Smaller earthquakes (between magnitudes 6.0 and 6.7), capable of considerable damage depending on proximity to urban areas, have about a 92 percent chance of occurring in the Bay Area by 2037 (USGS, 2007).

Additional studies by the USGS regarding the probability of large earthquakes in the Bay Area are ongoing. These current evaluations include data from additional active faults and updated geological data.

F. Other Geologic Hazards

We evaluated potential geologic hazards that could affect the site and their significant adverse impacts on structures for human occupancy. The principle geologic hazards associated with the planned development of this site are strong seismic ground shaking and moderately to highly-expansive near-surface soils. We judge that other geologic hazards such as liquefaction, slope stability, fault rupture and settlements due to soft soils are of minor concern.

Seismic Shaking: The site will likely experience seismic ground shaking similar to other areas in the seismically active San Francisco Bay Area. Earthquakes along several active faults in the region, as shown on Figure 4, could cause moderate to strong ground shaking at the site. The intensity of earthquake motion will depend on the characteristics of the generating fault, distance to the fault and rupture zone, earthquake magnitude, earthquake duration, and site-specific geologic conditions. Relatively thin soil deposits underlie the site and, where explored, were generally found to be relatively stiff. Empirical relations developed for rock and stiff soil sites (Idriss, 1995) provide approximate estimates of median peak ground accelerations. A summary of the principal known active faults affecting the site, their closest distance to the site, moment magnitude of characteristic earthquake and probable peak ground accelerations (Deterministic) which a quake on the fault could generate at the site are shown in Table B.

TABLE B
ESTIMATED PEAK GROUND ACCELERATION
FOR PRINCIPAL ACTIVE FAULTS
CLAYBANK VOCATIONAL EDUCATION
FAIRFIELD, CALIFORNIA

| Fault | Moment Magnitude for Characteristic Earthquake | Closest Estimated Distance (kilometers) | Median Peak Ground Acceleration (g)(2) |
|---|---|---|---|
| Los Medanos – Roe Island | 6.8 | 11.2 | 0.49 |
| Great Valley | 6.7 | 10.2 | 0.47 |
| Vaca Fault Zone | 6.4 | 4.8 | 0.38 |
| Cordelia | 6.5 | 12.0 | 0.22 |
| Green Valley | 6.8 | 14.4 | 0.21 |

(1) Caltrans ARS Online, Version 2.3.06, Accessed 1/12/2015.
(2) Values Calculated Using $Vs^{30}$ = 560 m/s for very dense soil and soft rock, Site Class C.

The potential for strong seismic shaking at the project site is high. The closest known active fault to the site is the Los Medanos – Roe Island Fault. However, the Vaca-Kirby Montezuma Hills Fault is not included by the California Geological Survey as an active source for seismic resistant design per the 2013 CBC. The Green Valley Fault southwest of the site is the closest known active fault to the site. The locations of additional known active faults relative to the project site are shown on Figure 3.

*Seismic Shaking Mitigation Measures - Mitigation measures should include designing the improvements and structures in accordance with the most recent version of the California Building Code (2013). Recommended CBC seismic coefficients are provided in Section IV-B of this report.*

Expansive Soil: Expansive soil occurs when clay particles interact with water causing volume changes in the clay soil. The clay soil may swell when saturated and shrink when dried. This phenomenon generally decreases in magnitude with increasing confinement pressures at greater depths. These volume changes may damage shallow and/or lightly loaded foundations, flatwork, and pavements.

Our exploration and laboratory (plasticity) testing, along with experiences at nearby sites, indicates that the near surface alluvial soil is generally highly plastic clay soil prone to shrink and swell cycles associated with expansive soil. Potential for distress from expansive soil shrink/swell is therefore considered to be significant at the project site. Since the current site grades are low,

the planned new soil fill will cover the existing site soils and reduce their expansive potential so they do not adversely affect surface improvements. Therefore, the quality of imported fill will generally control site expansive soil behavior.

*Expansive Soil Mitigation Measures – Distress caused by expansive soils can be effectively mitigated by careful adherence to the site preparation and grading and foundation design criteria presented in sections IV-C and IV-D, respectively. On-site soils, moisture conditioned to above optimum and covered with several feet of non-expansive fill or lime treated fill, will be mitigated so they are not a geologic hazard.*

Corrosion: Soils with relatively low resistivity to electrical current (less than 1,000 ohm-centimeter) or soils with high chlorides or sulfates may be corrosive to embedded steel of concrete structures. Corrosion test results are included on Figure A-12 and indicate moderately corrosive soils potentially exist at the project site. Additional discussion of corrosion potential is included on Figure A-12.

*Corrosion Mitigation Measures – Type II Portland Cement should be used for foundations along with a typical three-inch concrete cover for reinforcing steel. Buried steel pipe or other metallic structures will be subject to some increased levels of corrosion so should be designed with sacrificial thicknesses or avoided in favor of non-metallic structures.*

## IV. CONCLUSIONS AND RECOMMENDATIONS

### A. Conclusions

We conclude that the conditions at the site can be suitable for the proposed building and the primary geotechnical issues that should be considered during design include seismic ground shaking, uniform foundation support across the building footprints and potentially expansive near-surface soils. Shallow foundations can be used for the planned buildings and asphalt paving/concrete slabs are also feasible for exterior hardscape.

The underlying native alluvial soils at the site classify as medium to high plasticity clay (CL/CH) which will undergo seasonal volume changes that can be damaging to lightly-loaded foundations and surficial flatwork. These soils should therefore be lime-treated to reduce expansive behavior or “capped” with at least two feet of non-expansive fill soils prior to building or parking lot construction. Detailed recommendations for site grading, lime treatment or non-expansive import fill, foundations and other items are included in the following sections.

### B. Seismic Design

The site will experience strong ground shaking from future earthquakes in the seismically active San Francisco Bay Region, and the effects will be similar to many other locations with similar

soil conditions and distances to earthquake epicenters. Mitigation of strong ground shaking may include structural design in conformance with the provisions of the most recent version (2013) of the California Building Code (CBC) or site specific accelerations presented in the following sections.

Based on the interpreted subsurface conditions and closest fault type and distance, we recommend the seismic coefficients and site values shown in Table C to calculate the design base shear of the new construction. The intent of the CBC is to design structures to prevent collapse and protect life safety. Significant structural damage can still occur during a seismic event.

TABLE C
2013 CBC SEISMIC DESIGN FACTORS
CLAYBANK VOCATIONAL EDUCATION
FAIRFIELD, CALIFORNIA

| Factor Name | Coefficient | CBC Table | Value |
|---|---|---|---|
| Site Class[1] | $S_{A,B,C,D,E, or F}$ | 1613.5.2 | $S_C$ |
| Spectral Acc. (short) | $S_s$ | 1613.5.1 | 1.92g |
| Spectral Acc. (1-sec) | $S_1$ | 1613.5.1 | 0.65 g |
| Site Coefficient[2] | $F_a$ | 1613.5.3 (1) | 1.00 |
| Site Coefficient | $F_v$ | 1613.5.3 (2) | 1.30 |
| Spectra Parameter | $S_{MS}$ | Equation 16A-37 | 1.92 g |
| Spectra Parameter | $S_{M1}$ | Equation 16A-38 | 0.85 g |

1) Soil Profile/Site Class $S_C$ Description: Dense Soil / Soft Rock, Shear Wave Velocity between 1200 (360) and 2500 (760) feet per second (m/s), Standard Penetration Test N value greater than 50, and Undrained Shear Strength greater than 2000 (100) psf (kPa).

C. Site Preparation and Grading

1. Site Preparation. In general, this work should include removing significant root systems (i.e. roots greater than about 2 inches in diameter) and scraping any grass or weeds and their root crowns from the ground surface in planned building and truck pad/parking lot/driveway areas. Although not anticipated, if remnants of old structures such as foundations, septic lines, tanks or leach fields are encountered, they should be removed and restored with properly moisture conditioned and compacted fill as described in the following section. Debris and vegetation scrapings will not be suitable for structural fill and should be removed from the site. Alternatively, vegetation scrapings may be used in landscape areas.

After “clearing and grubbing” described above is completed, and assuming new fill is placed in the project area to raise grades, the existing ground surface should be scarified to a depth of about

eight inches, moisture conditioned to above optimum and compacted to at least 90% (ASTM D1557). If grading occurs later in the summer or during the fall months, onsite soils may have dried to deeper depths and deeper moisture conditioning may be required to reduce expansive potential at the finished ground surface. When the construction schedule is determined, we should evaluate soil moisture contents at depth greater than about eight inches and provide supplemental recommendations about the need for deeper moisture conditioning.

After the existing ground surface has been recompacted as described above, fill should be placed to the design building pad and hardscape subgrade elevations. If "low quality" soils are imported (i.e. soils that do not meet the plasticity requirements noted below), they could be lime treated to reduce their expansive potential. Since the upper 18-inches of imported (low quality) soils would be lime treated, only the soils below this thickness would need to be compacted at above optimum moisture content and to at least 90% relative compaction prior to the lime treatment process.

2. Lime-Treatment. As noted previously, lime-treatment will result in significant improvements to low quality imported fill or to the weak and expansive on-site clays by increasing their strength (R-Value) and reducing the thickness of structural slabs and pavements. From experience with the adjacent buildings and parking lots, lime treatment will also be cost-effective, given soil materials that are likely available for import. Lime treatment should be performed on the entire "structural area", including the building footprints, exterior concrete flatwork and asphalt paved roadways and "truck pad".

During the lime treat process, we recommend a minimum 5.0% high-calcium lime by weight be mixed with the on-site soils to a depth of 18 inches below the finished subgrade elevations. Unit weight of soil for lime application should be assumed at 120 pcf. Lime treated soils should then be thoroughly mixed, moisture conditioned and then compacted to at least 95% and to a firm and unyielding surface. Lime treatment should be performed in general accordance with Caltrans standard specifications by an experienced contractor.

Because different lime contractors use different types of lime and quality of the lime may also vary from one contractor to another, we may need to adjust the lime percentage if high-calcium lime is not used at the project site. Based on our experiences with other sites, lime-treatment of the subgrade soils should yield an R-Value of at least 40 compared to untreated import or on-site soils which could be designed for an R-Value of 10.

Lime treatment should extend at least three feet beyond the limits of the building or exterior slabs/driveways so that the overlying structure is uniformly supported on the improved soils (i.e. no "edge effects" exist that would compromise performance). Note, that lime treatment does "sterilize" the soils, so landscaping in lime treated soils will not perform well. Therefore, areas to

be landscaped adjacent to hardscape will need to be overexcavated and lime treated soils replaced with untreated soils.

3. "Conventional Grading". Lime treatment could be avoided at the site if higher quality imported soils are at least two feet thick under structural improvements. Underlying expansive soils would need to be at above optimum moisture prior to placing the higher quality fill and depending when construction commences, this may or may not require overexcavation, moisture conditioning and recompaction of the existing soils. Higher quality fill materials should be placed in thin lifts at +/- 2% of optimum moisture content and to at least 90% relative compaction (ASTM D1557).

4. Fill Materials. Most of the on-site natural soil materials appear suitable for use as compacted fill provided lime treatment will be performed as previously described. The existing site stockpile, if oversized construction debris and/or any organic materials are removed, could be used to raise grades. Lower quality imported fill could also be used provided it is lime treated as noted above. This lower quality fill, if imported, should be free or organic materials and contain rocks no larger than about two inches in diameter so lime treatment can occur without damage to the mixing equipment. "High quality" imported fill materials used to raise building site grades, roadways or other structural elements of the project should consist of soil materials spread uniformly and continuously over the entire building pad and to a minimum depth of two feet as previously noted. This "high quality" structural fill shall be free of organic matter, have a Liquid Limit of less than 40, a Plasticity Index of less than 15, have a minimum R-value of 40, and conform to the gradation limits in Table D.

TABLE D
FILL GRADATION CRITERIA
CLAYBANK VOCATIONAL EDUCATION
FAIRFIELD, CALIFORNIA

| Particle Size | Percent Finer by Dry Weight |
|---|---|
| 4 inch | 100 |
| No. 4 sieve | 20 - 100 |
| No. 200 sieve | 0 - 50 |

5. Compaction. Untreated "low quality" soils (which can be used to backfill overexcavations and raise grades to the bottom of the lime treatment zone) should be moisture conditioned to at least 2% above optimum, placed in loose horizontal lifts of 8-inches thick or less, and uniformly compacted to a minimum of 90% relative compaction to produce a firm non-yielding surface within areas of structural improvements. Compaction should also extend a minimum of 5 feet beyond

the footprint of all structural improvements. Soils should be maintained at above-optimum moisture content until covered with additional soils so drying does not occur. "High quality" imported fill should be compacted at near optimum moisture contents and to at least 90% relative compaction.

Where subgrade soils will be covered with concrete slabs or baserock and subjected to vehicle loads, compaction should be further increased to at least 95% in the upper 8-inches of subgrade below new baserock. Relative compaction, maximum dry density, and optimum moisture content should be determined in accordance with ASTM Test Method D 1557, "Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using a 10-lb. Rammer and 18-inch Drop".

D. Foundation Design Criteria

Provided that the subgrade soils are properly prepared as described above, shallow spread footings are judged to be an appropriate foundation type for the project. The criteria presented in Table E should be used for foundation design. Footing dimensions should be sized to avoid significantly different foundation load pressures, i.e. vary the footing width for the design load rather than dig all footings to a uniform width. Footing excavations must be maintained in a moist condition until concrete is placed and if "shrinkage" cracks are observed in the excavations, moistening should commence until concrete is placed.

RFI 0092

UNDER SLAB AGGREGATE BASE COURSE

3/4" CRUSHED ROCK IN LEIU OF AB IS ACCEPTABLE UNDER SLABS ON GRADE

MILLER PACIFIC ENGINEERING GROUP

TABLE E
FOUNDATION DESIGN CRITERIA
CLAYBANK VOCATIONAL BUILDINGS
FAIRFIELD, CALIFORNIA

Shallow Footings:

| | |
|---|---|
| Minimum width: | |
| Single-story | 12 inches |
| Two-story | 15 inches |
| Minimum embedment depth below lowest adjacent grade[1]: | 18 inches |
| Allowable bearing pressure: | |
| Dead plus live loads: | 2,500 psf |
| Total design loads: | 3,300 psf |
| Base friction coefficient: | 0.35 |
| Lateral Passive Resistance[1]: (per foot of depth) | 350 pcf |

Notes:

(1) Since the foundation excavations may expose untreated/expansive soils, periodic watering of the excavations must occur so shrinkage crack do not develop prior to concrete placement.

(2) Ignore upper 6-inches of passive resistance unless surface is confined by paving or slab on grade floor.

Reinforced concrete slab-on-grade floors are judged to be appropriate for the buildings and site conditions. The concrete slabs-on-grade may be poured monolithically with the foundations or separated with a cold joint at the Structural Engineer's discretion. We recommend that interior concrete slabs have a minimum thickness of 5-inches and be reinforced with steel reinforcing bars (not mesh). Slabs should be placed on a moist subgrade as previously described to reduce potential for future expansive behavior.

To reduce (i.e. improve) interior moisture conditions, a four inch layer of clean, free draining, ¾-inch angular gravel or crushed base rock should be placed beneath interior concrete slabs to form a capillary moisture break. The base rock must be placed on a properly moisture conditioned and compacted subgrade that has been approved by the Geotechnical Engineer. A plastic membrane vapor barrier, 15 mils or thicker, should be placed over the compacted base rock. The vapor barrier shall meet the ASTM E 1745 Class A requirements and be installed per ASTM 1643. Eliminating the capillary moisture break and/or plastic vapor barrier may result in excess moisture

intrusion through the floor slabs resulting in poor performance of floor coverings, mold growth or other adverse conditions.

We note that over time, placing sand between the vapor barrier and concrete is becoming less common because of elevated interior moisture contents. If sand is used, it should be dry, and if it is not used, the slab should be carefully designed with a lower water-cement ratio as eliminating the sand can cause cracking or "curling" of the new concrete.

For slabs that are not sensitive to moisture vapor (i.e. exterior walkways or other hardscape that is not subjected to vehicle loads), sand and a vapor barrier is not required.

E. Concrete Walkway Slabs

Exterior concrete walkways should be at least 4-inches thick and reinforced with #4 bars at 12 inches on center in both directions. We recommend crack control joints no farther than 6 feet apart in both directions and that the reinforcing bars, if used, extend through the control joints. Exterior concrete slabs shall be underlain with 4 inches or more of Caltrans Class 2 Aggregate Base compacted to at least 92 percent relative compaction.

Even with lime treatment or a two-foot layer of "high quality" import soils, some small movement or offset at sidewalk joints should be expected as the underlying expansive soils shrink and swell from seasonal moisture changes. For improved performance and reduced risks of cracking, the slabs can be thickened to 5 inches.

F. Utility Trench Excavations and Backfill

Depending on when they occur, excavations for utilities will generally be in lime treated soils, imported fill, stiff alluvial soils or for deeper excavations, weathered bedrock. Depending on when excavations are performed, groundwater may also be encountered. The Siltstone rock we encountered in our borings was not particularly hard and we judge excavations should be feasible with conventional excavation equipment such as backhoes and medium-sized excavators.

Trench excavations having a depth of 5 feet or more must be excavated and shored in accordance with OSHA regulations and a soil type "B". Bedding materials for utility pipes should be well graded sand with 90 to 100 percent of particles passing the No. 4 sieve and no more than 5 percent finer than the No. 200 sieve. In wet trenches, open-graded 3/4 by 1 1/2-inch rock (or similar dimension) should be used beneath the bedding as necessary to create a stable trench bottom. To provide uniform support and minimize differential expansion beneath structures, the upper 3 feet of trench backfill should consist of Class 2 Aggregate Base, "high quality" fill or lime-treated soils. Beneath structures and improvements, moisture condition on-site soils to above the optimum moisture content and uniformly compact the backfill to at least 90 percent relative compaction as described in Site Grading above. In landscape areas, compact the backfill to at

least 85 percent relative compaction. Use equipment and methods that are suitable for work in confined areas without damaging utility conduits.

G. Driveway and Parking Subgrade Preparation and Pavement Structural Section

Site grading for pavement areas should be performed as described in Section V.C, including lime treatment or import of at least two feet of "high quality" fill soil below new aggregate baserock. We have prepared the following Table F with alternative asphalt pavement sections based on lime-treated subgrade soils or the use of imported fill, either of which should provide a minimum R-value of 40. The project Civil Engineer should determine an appropriate Traffic Index (TI) for the various areas of the project but we anticipate a TI of 4 would be appropriate for passenger car parking areas while the truck pad might be more appropriately designed with a TI of between 5 and 7 (depending on size of trucks, their weight, and frequency of usage).

TABLE F
ALTERNATIVE ASPHALT PAVEMENT SECTIONS
CLAYBANK VOCATIONAL BUILDINGS
FAIRFIELD, CALIFORNIA

| Traffic Index (TI) | Asphalt Concrete (inches) | Imported fill or Lime-Treated Subgrade Class 2 Aggregate Base (inches) |
|---|---|---|
| 4.0 | 2.5 | 6 |
| 5.0 | 3.0 | 6 |
| 6.0 | 3.5 | 6 |
| 7.0 | 4.0 | 7 |
| 8.0 | 4.5 | 9 |

(1) To reduce the thickness of new pavement sections, 1 inch of asphalt is roughly equivalent to 2 inches of baserock. Minimum asphalt thickness is shown above.

H. Site and Foundation Drainage

Careful consideration should be given to design of finished grades at the site. We recommend that the building areas be raised slightly and that the adjoining landscaped areas be sloped downward at least 0.25 feet for 5 feet (5 percent) from the perimeter of building foundations. Where hard surfaces, such as concrete or asphalt adjoin foundations, slope these surfaces at least 0.10 feet in the first 5 feet (2 percent). Roof gutter downspouts may discharge onto pavements, but should avoid landscaped areas adjacent to the structure. If feasible, provide area drains for landscape planters adjacent to buildings and parking areas and collect downspout discharges into a tight pipe collection system that discharges well away from the building foundations. Site drainage improvements should be connected into a storm drainage system or established drainage channel, if possible.

## V. SUPPLEMENTAL GEOTECHNICAL SERVICES

We must review the grading plans and specifications for site development and foundation design when they are nearing completion to confirm that the intent of our recommendations has been understood and incorporated, and to provide supplemental recommendations if needed.

During construction, we must inspect geotechnical items relating to site preparation and foundation excavations. We must verify subgrade preparation and compaction (including overexcavation), proper moisture conditioning of soils, and fill placement and compaction. We should also observe foundation excavations and other geotechnical work items such as subgrade preparation for exterior flatwork.

## VI. LIMITATIONS

This report has been prepared in accordance with generally accepted geotechnical engineering practices in the San Francisco Bay Area at the time the report was prepared. This report has been prepared for the exclusive use of URS and/or its assignees specifically for this project. No other warranty, expressed or implied, is made. Our evaluations and recommendations are based on the data obtained during our subsurface exploration program and our experience with soils in this geographic area.

Our approved scope of work did not include an environmental assessment of the site. Consequently, this report does not contain information regarding the presence or absence of toxic or hazardous wastes.

The evaluations and recommendations do not reflect variations in subsurface conditions that may exist between boring locations or in unexplored portions of the site. Should such variations become apparent during construction, the general recommendations contained within this report will not be considered valid unless MPEG is given the opportunity to review such variations and revise or modify our recommendations accordingly. No changes may be made to the general recommendations contained herein without the written consent of MPEG.

We recommend that this report, in its entirety, be made available to project team members, contractors, and subcontractors for informational purposes and discussion. We intend that the information presented within this report be interpreted only within the context of the report as a whole. No portion of this report should be separated from the rest of the information presented herein. No single portion of this report shall be considered valid unless it is presented with and as an integral part of the entire report.

LIST OF REFERENCES

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SITE: LATITUDE, 38.2732°
LONGITUDE, -122.0020°

## SITE LOCATION

N.T.S.

NORTH

REFERENCE: Google Earth, 2015

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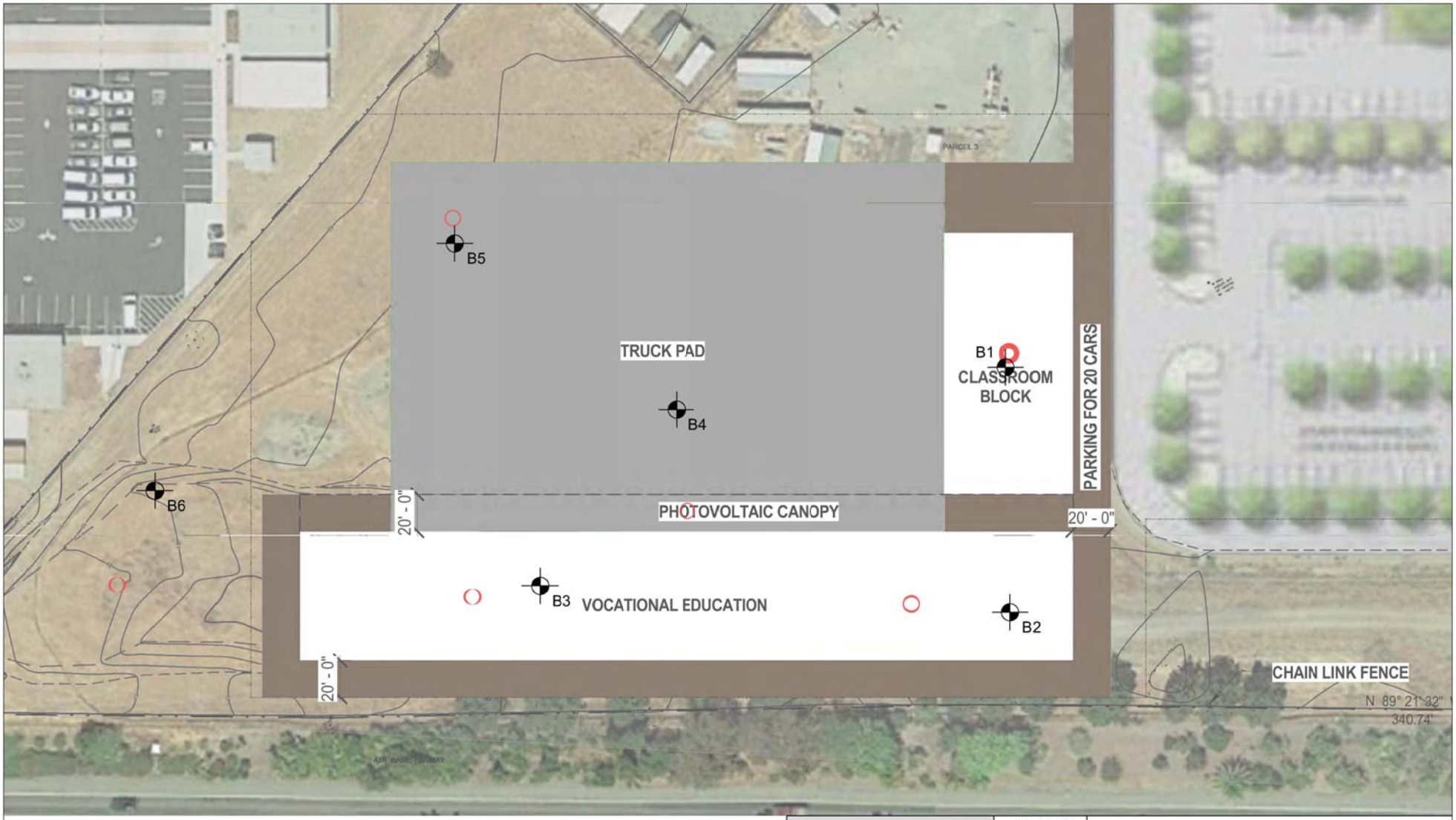
SITE LOCATION MAP

Claybank Detention Facility
Vocational Education Buildings
Fairfield, California

Project No. 1784.021 Date: 1/12/15

Drawn NGK
Checked

1
FIGURE




MPEG Boring Location, January 2015

REFERENCE: Site Plan Provided by Kitchell

SCALE
0 25 50 100 FEET

NORTH

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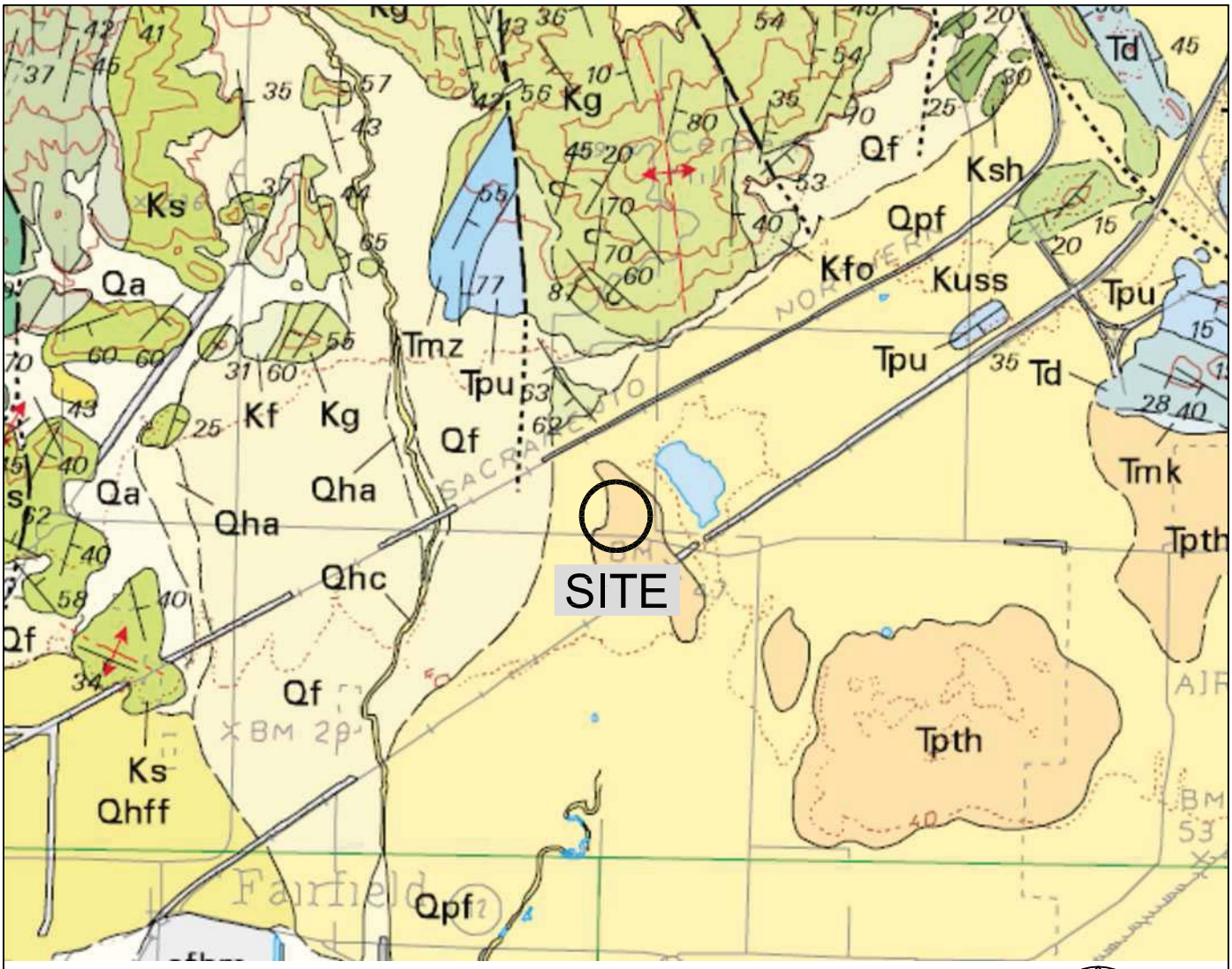
SITE PLAN

Claybank Detention Facility
Vocational Education Buildings
Fairfield, California

Project No. 1784.021 Date: 1/21/15

Designed MPM
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2
FIGURE




LEGEND:

## REGIONAL GEOLOGIC MAP

N.T.S.

NORTH

| | |
|---|---|
| Qf | Alluvial fan deposits (Holocene to Late Pleistocene) - Poorly sorted, moderately to poorly sorted sands, clays, silts and gravels. |
| Qpf | Alluvial fan deposits (Late Pleistocene) - Poorly sorted, moderately to poorly sorted sands, clays, silts and gravels. |
| Tpth | Tehama Formation (Pliocene) - Poorly consolidated, nonmarine, siltstone, sandstone, tuff and conglomerate. |
| Kfo | Forbes Formation (Late Cretaceous) - Thick bedded to massive wacke with siltstone and shale with shells. |
| Kg | Guinda Formation (Late Cretaceous) - Thick bedded to massive wacke with siltstone and shale. |

REFERENCE: Graymer, R.W., Jones, D.L., and Brabb, E.E., "Geologic map and map database of northeastern San Francisco Bay region, California -- most of Solano County and parts of Napa, Marin, Contra Costa, San Joaquin, Sacramento, Yolo, and Sonoma Counties," USGS, Miscellaneous Field Studies Map MF-2403, 2002.

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REGIONAL GEOLOGIC MAP

Claybank Detention Facility
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Fairfield, California

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Checked

3
FIGURE




LEGEND

SITE: LATITUDE, 38.2732°
LONGITUDE, -122.0020°

NORTH

| FAULT | TYPE | CBC DESCRIPTION |
|---|---|---|
| | "A" | CAPABLE OF LARGE MAGNITUDE EARTHQUAKES AND HIGH RATE OF SEISMIC ACTIVITY |
| | "B" | CAPABLE OF LARGE MAGNITUDE EARTHQUAKES OR HIGH RATE OF SEISMIC ACTIVITY |

21% PROBABILITY OF M≥6.7 BETWEEN 2008-2038 FOR FAULTS SHOWN. OVERALL PROBABILITY OF 63% IN BAY AREA OF ONE OR MORE M≥6.7 EARTHQUAKES FROM 2008-2038.

REFERENCES:

1) ACTIVE FAULT MAP MODIFIED FROM SUMMARY OF EARTHQUAKE PROBABILITIES IN THE S.F. BAY REGION, 2008-2038, THE 2007 WORKING GROUP ON CALIFORNIA EARTHQUAKE PROBABILITIES, 2008.

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ACTIVE FAULT MAP

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4
FIGURE

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# APPENDIX A
# SUBSURFACE EXPLORATION AND LABORATORY TESTING

## 1.0 Subsurface Exploration

We explored subsurface conditions at the site by drilling six soil borings on January 15, 2015 at the locations shown on Figure 2. The test borings were drilled to a maximum depth of approximately 28 feet using truck-mounted drilling equipment with 6-inch solid flight augers.

The soils encountered were logged and identified by our Field Geologist in general accordance with ASTM Standard D 2487, "Field Identification and Description of Soils (Visual-Manual Procedure)." This standard is briefly explained on Figure A-1, Soil Classification Chart and Key to Log Symbols and Figure A-2, Rock Classification Chart. The boring logs are presented on Figures A-3 to A-10.

We obtained “undisturbed” samples using a 3-inch diameter, split-barrel modified California sampler with 2.5 by 6-inch tube liners. The sampler was driven with a 140-pound hammer falling 30 inches. The number of blows required to drive the sampler 18 inches was recorded and is reported on the boring logs as blows per foot for the last 12 inches of driving. The samples obtained were examined in the field, sealed to prevent moisture loss, and transported to our laboratory.

## 2.0 Laboratory Testing

We conducted laboratory tests on selected intact samples to verify field identifications and to evaluate engineering properties. The following laboratory tests were conducted in accordance with the standard test method cited:

- Laboratory Determination of Water (Moisture Content) of Soil, Rock, and Soil-Aggregate Mixtures, ASTM D 2216;
- Density of Soil in Place by the Drive-Cylinder Method, ASTM D 2937;
- Unconfined Compressive Strength of Cohesive Soil, ASTM D 2166; and
- Liquid Limit, Plastic Limit and Plasticity Index, ASTM D 4318.

The moisture content, dry density, and unconfined compression test results are shown on the exploratory Boring Logs, Figures A-3 through A-10. The plasticity index test results are shown on Figure A-11.

A sample of near surface soils were submitted to Cooper Testing Laboratory of Palo Alto, California for corrosivity testing in accordance with California Test (CT) Nos. 643, CT 422, and CT 417. Results of the corrosion tests are shown on Figure A-12.

The exploratory boring logs, description of soils encountered and the laboratory test data reflect conditions only at the location of the boring at the time they were excavated or retrieved. Conditions may differ at other locations and may change with the passage of time due to a variety of causes including natural weathering, climate and changes in surface and subsurface drainage.

| MAJOR DIVISIONS | | SYMBOL | DESCRIPTION |
|---|---|---|---|
| COARSE GRAINED SOILS over 50% sand and gravel | CLEAN GRAVEL | GW | Well-graded gravels or gravel-sand mixtures, little or no fines |
| | | GP | Poorly-graded gravels or gravel-sand mixtures, little or no fines |
| | GRAVEL with fines | GM | Silty gravels, gravel-sand-silt mixtures |
| | | GC | Clayey gravels, gravel-sand-clay mixtures |
| | CLEAN SAND | SW | Well-graded sands or gravelly sands, little or no fines |
| | | SP | Poorly-graded sands or gravelly sands, little or no fines |
| | SAND with fines | SM | Silty sands, sand-silt mixtures |
| | | SC | Clayey sands, sand-clay mixtures |
| FINE GRAINED SOILS over 50% silt and clay | SILT AND CLAY liquid limit <50% | ML | Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity |
| | | CL | Inorganic clays of low to medium plasticity, gravely clays, sandy clays, silty clays, lean clays |
| | | OL | Organic silts and organic silt-clays of low plasticity |
| | SILT AND CLAY liquid limit >50% | MH | Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts |
| | | CH | Inorganic clays of high plasticity, fat clays |
| | | OH | Organic clays of medium to high plasticity |
| HIGHLY ORGANIC SOILS | | PT | Peat, muck, and other highly organic soils |
| ROCK | | | Undifferentiated as to type or composition |

## KEY TO BORING AND TEST PIT SYMBOLS

### CLASSIFICATION TESTS

| | |
|---|---|
| PI | PLASTICITY INDEX |
| LL | LIQUID LIMIT |
| SA | SIEVE ANALYSIS |
| HYD | HYDROMETER ANALYSIS |
| P200 | PERCENT PASSING NO. 200 SIEVE |
| P4 | PERCENT PASSING NO. 4 SIEVE |

### SAMPLER TYPE

- MODIFIED CALIFORNIA
- STANDARD PENETRATION TEST
- THIN-WALLED / FIXED PISTON
- HAND SAMPLER
- ROCK CORE
- X DISTURBED OR BULK SAMPLE

NOTE: Test boring and test pit logs are an interpretation of conditions encountered at the excavation location during the time of exploration. Subsurface rock, soil or water conditions may vary in different locations within the project site and with the passage of time. Boundaries between differing soil or rock descriptions are approximate and may indicate a gradual transition.

### STRENGTH TESTS

| | |
|---|---|
| TV | FIELD TORVANE (UNDRAINED SHEAR) |
| UC | LABORATORY UNCONFINED COMPRESSION |
| TXCU | CONSOLIDATED UNDRAINED TRIAXIAL |
| TXUU | UNCONSOLIDATED UNDRAINED TRIAXIAL |
| | UC, CU, UU = 1/2 Deviator Stress |

### SAMPLER DRIVING RESISTANCE

Modified California and Standard Penetration Test samplers are driven 18 inches with a 140-pound hammer falling 30 inches per blow. Blows for the initial 6-inch drive seat the sampler. Blows for the final 12-inch drive are recorded onto the logs. Sampler refusal is defined as 50 blows during a 6-inch drive. Examples of blow records are as follows:

- 25 sampler driven 12 inches with 25 blows after initial 6-inch drive
- 85/7" sampler driven 7 inches with 85 blows after initial 6-inch drive
- 50/3" sampler driven 3 inches with 50 blows during initial 6-inch drive or beginning of final 12-inch drive

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SOIL CLASSIFICATION CHART

Claybank Detention Facility
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Project No. 1784.021 Date: 1/20/15

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A-1
FIGURE

## FRACTURING AND BEDDING

| Fracture Classification | Spacing | Bedding Classification |
|---|---|---|
| Crushed | less than 3/4 inch | Laminated |
| Intensely fractured | 3/4 to 2-1/2 inches | Very thinly bedded |
| Closely fractured | 2-1/2 to 8 inches | Thinly bedded |
| Moderately fractured | 8 to 24 inches | Medium bedded |
| Widely fractured | 2 to 6 feet | Thickly bedded |
| Very widely fractured | greater than 6 feet | Very thickly bedded |

## HARDNESS

| | |
|---|---|
| Low | Carved or gouged with a knife |
| Moderate | Easily scratched with a knife, friable |
| Hard | Difficult to scratch, knife scratch leaves dust trace |
| Very hard | Rock scratches metal |

## STRENGTH

| | |
|---|---|
| Friable | Crumbles by rubbing with fingers |
| Weak | Crumbles under light hammer blows |
| Moderate | Indentations <1/8 inch with moderate blow with pick end of rock hammer |
| Strong | Withstands few heavy hammer blows, yields large fragments |
| Very strong | Withstands many heavy hammer blows, yields dust, small fragments |

## WEATHERING

| | |
|---|---|
| Complete | Minerals decomposed to soil, but fabric and structure preserved |
| High | Rock decomposition, thorough discoloration, all fractures are extensively coated with clay, oxides or carbonates |
| Moderate | Fracture surfaces coated with weathering minerals, moderate or localized discoloration |
| Slight | A few stained fractures, slight discoloration, no mineral decomposition, no affect on cementation |
| Fresh | Rock unaffected by weathering, no change with depth, rings under hammer impact |

NOTE: Test boring and test pit logs are an interpretation of conditions encountered at the location and time of exploration. Subsurface rock, soil and water conditions may differ in other locations and with the passage of time.

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ROCK CLASSIFICATION CHART

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Project No. 1784.021 Date: 1/20/15

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A-2
FIGURE

# BORING 1

EQUIPMENT: Truck-Mounted Mobile B-53 Drill Rig with 6-Inch Solid Flight Augers
DATE: 1/15/15
ELEVATION: 54 - feet*
*REFERENCE: Google Earth, 2015

| DRILL RATE (ft/min) | OTHER TEST DATA | UNDRAINED SHEAR STRENGTH psf (1) | BLOWS PER FOOT | MOISTURE CONTENT (%) | DRY UNIT WEIGHT pcf (2) | DEPTH meters | DEPTH feet | SAMPLE | SYMBOL (3) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | LL=59<br>PI=35 | 5200<br>UC | 28 | 19.7 | 105 | 0 | 0 | | | CLAY (CH)<br>Black, moist, stiff to very stiff, high plasticity clay, trace sand. [Alluvium?] |
| | | 1600<br>UC | 22 | 28.4 | 95 | | | | | Grades olive gray, ~10-15% fine to coarse sand. |
| | | | | | | 1 | | | | SILTSTONE<br>Green-gray with white, low hardness, friable, highly to completely weathered. [Bedrock] |
| | | | 67 | 26.6 | 92 | 2 | 5 | | | |
| | | | 59 | 24.7 | | 3 | 10 | | | |
| | | | | | | 4 | | | | |
| | | | | | | | 15 | | | |
| 1.0 | | | | | | 5 | | | | |
| | | | 44 | 27.1 | | 6 | 20 | | | |

NOTES: (1) METRIC EQUIVALENT STRENGTH (kPa) = 0.0479 x STRENGTH (psf)
(2) METRIC EQUIVALENT DRY UNIT WEIGHT kN/m$^3$ = 0.1571 x DRY UNIT WEIGHT (pcf)
(3) GRAPHIC SYMBOLS ARE ILLUSTRATIVE ONLY

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BORING LOG

Claybank Detention Facility
Vocational Education Buildings
Fairfield, California
Project No. 1784.021 Date: 1/20/15

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A-3
FIGURE

# BORING 1 (CONTINUED)

| DRILL RATE (ft/min) | OTHER TEST DATA | UNDRAINED SHEAR STRENGTH psf (1) | BLOWS PER FOOT | MOISTURE CONTENT (%) | DRY UNIT WEIGHT pcf (2) | DEPTH meters / feet | SAMPLE | SYMBOL (3) | |
|---|---|---|---|---|---|---|---|---|---|
| 1.25 | | | | | | 20 | | | SILTSTONE<br>Green-gray with white, low hardness, friable, highly to completely weathered. [Bedrock] |
| 0.63 | | | | | | 7 | | | |
| 0.8 | | | | | | 25<br>8 | | | |
| | | | | | | | | | Bottom of boring at 27.5 feet.<br>No groundwater observed during drilling. |
| | | | | | | 9 | | | |
| | | | | | | 30 | | | |
| | | | | | | 10 | | | |
| | | | | | | 35<br>11 | | | |
| | | | | | | 12 | | | |
| | | | | | | 40 | | | |

NOTES: (1) METRIC EQUIVALENT STRENGTH (kPa) = 0.0479 x STRENGTH (psf)
(2) METRIC EQUIVALENT DRY UNIT WEIGHT kN/m$^3$ = 0.1571 x DRY UNIT WEIGHT (pcf)
(3) GRAPHIC SYMBOLS ARE ILLUSTRATIVE ONLY

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FILE: 1784.021 BL.dwg

BORING LOG

Claybank Detention Facility
Vocational Education Buildings
Fairfield, California

Project No. 1784.021 Date: 1/20/15

Drawn NGK
Checked

A-4
FIGURE

# BORING 2

EQUIPMENT: Truck-Mounted Mobile B-53 Drill Rig with 6-Inch Solid Flight Augers
DATE: 1/15/15
ELEVATION: 56 - feet*
*REFERENCE: Google Earth, 2015

| OTHER TEST DATA | OTHER TEST DATA | UNDRAINED SHEAR STRENGTH psf (1) | BLOWS PER FOOT | MOISTURE CONTENT (%) | DRY UNIT WEIGHT pcf (2) | DEPTH meters | DEPTH feet | SAMPLE | SYMBOL (3) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 2250 UC | 23 | 28.5 | 88 | 0 | 0 | | | CLAY (CH) Black, moist, stiff to very stiff, high plasticity clay, trace sand. [Alluvium?] |
| | | 1800 UC | 31 | 27.0 | 96 | 1 | | | | Grades olive gray. |
| | | | 52 | 23.5 | 103 | | 5 | | | SILTSTONE Light green-gray and tan, low hardness, friable, highly to completely weathered. [Bedrock] |
| | | | 69 | 17.8 | | 2 | | | | |
| | | | | | | 3 | 10 | | | |
| | | | | | | 4 | | | | |
| | | | | | | | 15 | | | Bottom of boring at 14.5 feet. No groundwater observed during drilling. |
| | | | | | | 5 | | | | |
| | | | | | | 6 | 20 | | | |

NOTES: (1) METRIC EQUIVALENT STRENGTH (kPa) = 0.0479 x STRENGTH (psf)
(2) METRIC EQUIVALENT DRY UNIT WEIGHT kN/m$^3$ = 0.1571 x DRY UNIT WEIGHT (pcf)
(3) GRAPHIC SYMBOLS ARE ILLUSTRATIVE ONLY

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A-5
FIGURE

# BORING 3

EQUIPMENT: Truck-Mounted Mobile B-53 Drill Rig with 6-Inch Solid Flight Augers
DATE: 1/15/15
ELEVATION: 54 - feet*
*REFERENCE: Google Earth, 2015

| DRILL RATE (ft/min) | OTHER TEST DATA | UNDRAINED SHEAR STRENGTH psf (1) | BLOWS PER FOOT | MOISTURE CONTENT (%) | DRY UNIT WEIGHT pcf (2) | DEPTH meters / feet | SAMPLE | SYMBOL (3) | |
|---|---|---|---|---|---|---|---|---|---|
| | LL=35<br>PI=19 | 575<br>UC | 13 | 16.1 | 106 | 0 – 0 | | | CLAY with Sand and Gravel (CH)<br>Dark brown, moist, medium stiff to stiff, medium to high plasticity clay, ~15-20% fine to coarse sand, ~10-15% gravel. [Alluvium?] |
| | | 1000<br>UC | 21 | 19.1 | 95 | – 1 | | | Grades with trace sand and gravel. |
| | | | 25 | 20.0 | 103 | 5 – 2 | | | SILTSTONE<br>Orange and tan, low hardness, friable, highly to completely weathered. [Bedrock] |
| | | | 36 | 13.7 | | – 3 10 – | | | |
| | | | | | | – 4 | | | |
| | | | 51 | 17.0 | | 15 – 5 | | | |
| 2.0 | | | | | | – 6 20 – | | | |

NOTES: (1) METRIC EQUIVALENT STRENGTH (kPa) = 0.0479 x STRENGTH (psf)
(2) METRIC EQUIVALENT DRY UNIT WEIGHT kN/m$^3$ = 0.1571 x DRY UNIT WEIGHT (pcf)
(3) GRAPHIC SYMBOLS ARE ILLUSTRATIVE ONLY

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BORING LOG

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Vocational Education Buildings
Fairfield, California
Project No. 1784.021 Date: 1/20/15

Drawn NGK
Checked

A-6
FIGURE

# BORING 3 (CONTINUED)

| DRILL RATE (ft/min) | OTHER TEST DATA | UNDRAINED SHEAR STRENGTH psf (1) | BLOWS PER FOOT | MOISTURE CONTENT (%) | DRY UNIT WEIGHT pcf (2) | DEPTH meters / feet | SAMPLE | SYMBOL (3) | |
|---|---|---|---|---|---|---|---|---|---|
| 1.4 ↓ | | | | | | 20 | | | SILTSTONE<br>Orange and tan, low hardness, friable, highly to completely weathered. [Bedrock] |
| | | | | | | 7 | | | |
| | | | | | | 25 | | | |
| | | | | | | 8 | | | |
| | | | | | | | | | Bottom of boring at 28.0 feet.<br>No groundwater observed during drilling. |
| | | | | | | 9 | | | |
| | | | | | | 30 | | | |
| | | | | | | 10 | | | |
| | | | | | | 35 | | | |
| | | | | | | 11 | | | |
| | | | | | | 12 | | | |
| | | | | | | 40 | | | |

NOTES: (1) METRIC EQUIVALENT STRENGTH (kPa) = 0.0479 x STRENGTH (psf)
(2) METRIC EQUIVALENT DRY UNIT WEIGHT kN/m$^3$ = 0.1571 x DRY UNIT WEIGHT (pcf)
(3) GRAPHIC SYMBOLS ARE ILLUSTRATIVE ONLY

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Fairfield, California

Project No. 1784.021 Date: 1/20/15

Drawn NGK
Checked

A-7
FIGURE

# BORING 4

EQUIPMENT: Truck-Mounted Mobile B-53 Drill Rig with 6-Inch Solid Flight Augers
DATE: 1/15/15
ELEVATION: 53 - feet*
*REFERENCE: Google Earth, 2015

| OTHER TEST DATA | OTHER TEST DATA | UNDRAINED SHEAR STRENGTH psf (1) | BLOWS PER FOOT | MOISTURE CONTENT (%) | DRY UNIT WEIGHT pcf (2) | DEPTH meters | DEPTH feet | SAMPLE | SYMBOL (3) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1350 UC | 17 | 25.8 | 91 | 0 | 0 | | | CLAY (CH) Black, moist, stiff to very stiff, high plasticity clay, trace sand. [Alluvium?] |
| | | 975 UC | 28 | 26.3 | 95 | 1 | | | | Grades olive gray. |
| | | | | | | | 5 | | | SILTSTONE Light green-gray and tan, low hardness, friable, highly to completely weathered. [Bedrock] |
| | | | 34 | 28.3 | 95 | 2 | | | | |
| | | | | | | 3 | 10 | | | Bottom of boring at 9.5 feet. No groundwater observed during drilling. |
| | | | | | | 4 | | | | |
| | | | | | | | 15 | | | |
| | | | | | | 5 | | | | |
| | | | | | | 6 | 20 | | | |

NOTES: (1) METRIC EQUIVALENT STRENGTH (kPa) = 0.0479 x STRENGTH (psf)
(2) METRIC EQUIVALENT DRY UNIT WEIGHT kN/m$^3$ = 0.1571 x DRY UNIT WEIGHT (pcf)
(3) GRAPHIC SYMBOLS ARE ILLUSTRATIVE ONLY

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BORING LOG

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Fairfield, California
Project No. 1784.021 Date: 1/20/15

Drawn NGK
Checked

A-8
FIGURE

# BORING 5

EQUIPMENT: Truck-Mounted Mobile B-53 Drill Rig with 6-Inch Solid Flight Augers
DATE: 1/15/15
ELEVATION: 52 - feet*
*REFERENCE: Google Earth, 2015

| OTHER TEST DATA | OTHER TEST DATA | UNDRAINED SHEAR STRENGTH psf (1) | BLOWS PER FOOT | MOISTURE CONTENT (%) | DRY UNIT WEIGHT pcf (2) | DEPTH meters | DEPTH feet | SAMPLE | SYMBOL (3) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 550 UC | 12 | 28.3 | 87 | 0 | 0 | | | CLAY (CH) Black, moist, medium stiff to stiff, high plasticity clay, trace sand. [Alluvium?] |
| | | | 22 | 24.2 | 102 | 1 | | | | |
| | | | | | | | 5 | | | SILTSTONE Light green-gray and tan, low hardness, friable, highly to completely weathered. [Bedrock] |
| | | | | | | 2 | | | | Bottom of boring at 4.5 feet. No groundwater observed during drilling. |
| | | | | | | 3 | 10 | | | |
| | | | | | | 4 | | | | |
| | | | | | | | 15 | | | |
| | | | | | | 5 | | | | |
| | | | | | | 6 | 20 | | | |

NOTES: (1) METRIC EQUIVALENT STRENGTH (kPa) = 0.0479 x STRENGTH (psf)
(2) METRIC EQUIVALENT DRY UNIT WEIGHT kN/m$^3$ = 0.1571 x DRY UNIT WEIGHT (pcf)
(3) GRAPHIC SYMBOLS ARE ILLUSTRATIVE ONLY

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Fairfield, California
Project No. 1784.021 Date: 1/20/15

Drawn NGK
Checked

A-9
FIGURE

# BORING 6

EQUIPMENT: Truck-Mounted Mobile B-53 Drill Rig with 6-Inch Solid Flight Augers
DATE: 1/15/15
ELEVATION: 52 - feet*
*REFERENCE: Google Earth, 2015

| OTHER TEST DATA | OTHER TEST DATA | UNDRAINED SHEAR STRENGTH psf (1) | BLOWS PER FOOT | MOISTURE CONTENT (%) | DRY UNIT WEIGHT pcf (2) | DEPTH meters | DEPTH feet | SAMPLE | SYMBOL (3) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 550 UC | 13 | 23.1 | 91 | 0 | 0 | | | CLAY (CH) Black, moist, medium stiff to stiff, high plasticity clay, trace sand. [Alluvium?] |
| | | | 22 | 29.8 | 92 | 1 | | | | |
| | | | 34 | | | | 5 | | | SILTSTONE Light green-gray and tan, low hardness, friable, highly to completely weathered. [Bedrock] |
| | | | | | | 2 | | | | Bottom of boring at 5.5 feet. No groundwater observed during drilling. |
| | | | | | | 3 | 10 | | | |
| | | | | | | 4 | | | | |
| | | | | | | | 15 | | | |
| | | | | | | 5 | | | | |
| | | | | | | 6 | 20 | | | |

NOTES: (1) METRIC EQUIVALENT STRENGTH (kPa) = 0.0479 x STRENGTH (psf)
(2) METRIC EQUIVALENT DRY UNIT WEIGHT kN/m$^3$ = 0.1571 x DRY UNIT WEIGHT (pcf)
(3) GRAPHIC SYMBOLS ARE ILLUSTRATIVE ONLY

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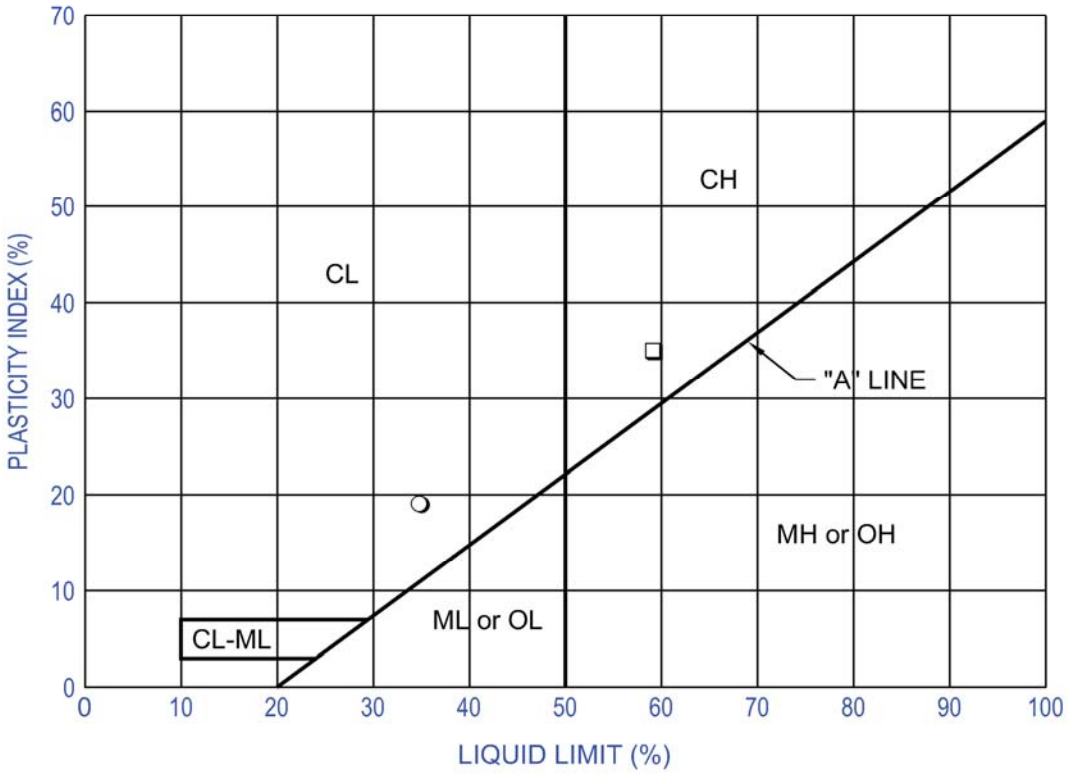
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BORING LOG

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Fairfield, California
Project No. 1784.021 Date: 1/20/15

Drawn NGK
Checked

A-10
FIGURE




| SYMBOL | SAMPLE SOURCE | CLASSIFICATION | LIQUID LIMIT (%) | PLASTIC LIMIT (%) | PLASTICITY INDEX (%) |
|---|---|---|---|---|---|
| ❑ | BORING 1<br>0.5 Feet | CLAY (CH)<br>dark brown to black | 59 | 24 | 35 |
| ❍ | BORING 3<br>1.0 Feet | CLAY with Sand and Gravel (CL)<br>dark brown | 35 | 16 | 19 |

REFERENCE: Liquid Limit, Plastic Limit, and Plasticity Index of Soils, ASTM D 4318

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PLASTICITY INDEX

Claybank Detention Facility
Vocational Education Buildings
Fairfield, California

Project No. 1784.021 Date: 1/30/15

Drawn NGK
Checked

A-11
FIGURE

KITCHELL

LEED NC 3.3 Product/Material Form

NOTE: This form can be used by the GC to document LEED related features of products and materials during construction. A separate form would be filled out by the GC or sub for each type of product/material. Refer to the LEED Reference Guide, LEED Online, and the Project Manual for LEED documentation requirements and definitions.

| | | | |
|---|---|---|---|
| Submittal Number: | | | |
| Spec Sectn Number: | | Spec Sectn Name: | |
| Product Name: | | | |
| Product Type: | | | |
| Manuf./Vender: | | Sub-Contractor: | |
| Website: | | Address: | |
| Contact Name: | | Contact Name: | |
| Contact Phone: | | Contract Phone: | |
| Contact Email: | | Fax or Email: | |

Has this product been approved as a Substitution on this project?
If this product is a Substitution, please attach the approved Substitution Request Form.

## Cost Information

Include Product/Material costs for this submittal only. Do not include labor costs.

| | | | |
|---|---|---|---|
| Cost Per Unit ($): | | Unit Type (s.f., etc): | |
| Number of Units: | | Total Cost: | |

## Durability

| | | | |
|---|---|---|---|
| Years on Market: | | Warranty Period (yrs): | |
| Example Project: | | | |
| Years in Project: | | | |

## Material Information

The following material information applies to all products and materials within specification Divisions 3-10, 31 (foundations) and 32 (paving, site improvements, and plantings).

LEED MRc4 - Recycled Content

| | |
|---|---|
| % Post-Consumer Recycled Content: | |
| % Pre-Consumer Recycled Content: | |
| Source of Information (Please Attach): | |

LEED MRc5 - Regional Materials - Locally Extracted, Harvested or Recovered (within 500 miles)

| | |
|---|---|
| City and State of Extraction, Harvest or Recovery: | |
| Distance from Extraction, Harvest, or Recovery(miles): | |
| Distance from Project (miles): | |
| % of Product Compliant (% by weight): | |
| Source of Information (Please Attach): | |

LEED MRc6 - Rapidly Renewable Materials (Harvested within 10 year cycle)

| | |
|---|---|
| % of Product Compliant (% by weight): | |
| Manufacturer letter of % rapidly renewable (Please Attach): | |

LEED MRc7 - Certified Wood

| | |
|---|---|
| Percentage of Wood in Product: | |
| FSC Certified Wood Percentage of Wood Component: | |
| Purchase Invoice (Please Attach): | |
| FSC Chain of Custody (COC) Number: | |

*Project Name:* Solano County SB1022
Classroom and Vocational Training Center

Submittal #: 0
0 0

## Indoor Air Quality Information

LEED IEQc4.3 - Flooring Materials

| | |
|---|---|
| Green Label Plus Carpet?: | |
| Green Label Carpet Cushion?: | |
| FloorScore Comlpliant Hard Surface Flooring?: | |
| Floor Sealer/Stain/Finish meets SCAQMD?: | |
| Tile Adhesive/Grout meets SCAQMD?: | |

LEED IEQc4.4 - Composite Wood and Agrifiber Products

| | |
|---|---|
| Confirm no added urea-formaldehyde?: | |

VOC Content for Adhesives, Fillers, Sealants, Paints/Primers or Coatings:

The indoor air quality information below applies to all products applied on-sire and inside the weather-proofing system for all specification divisions. Answer the following question and place an "X" next to the type of product.

LEED IEQc4.1 & 4.2

| | |
|---|---|
| VOC Content (g/L less water): | |
| Total Volume of Product Used (gallons): | |
| Applied within the building weatherproofing system?: | |
| Applied on-site?: | |
| Source of Information (Please Attach): | |

**Place an "x" next to the type of product associated with this submittal:**
**Maximum VOC limits are shown in parenthesis:**

**Architectural Applications**

| | |
|---|---|
| | Indoor Carpet Adhesive (50 g/L) |
| | Carpet Pad Adhesive (50 g/L) |
| | Wood Flooring Adhesive (100 g/L) |
| | Rubber Floor Adhesive (60 g/L) |
| | Subfloor Adhesive (50g/L) |
| | Ceramic Tile Adhesive (65 g/L) |
| | VCT & Asphalt Adhesive (50 g/L) |
| | Drywall & Panel Adhesive (50 g/L) |
| | Cove Base Adhesive (50 g/L) |
| | Multipurpose Adhesive (70 g/L) |
| | Structural Glazing Adhesive (100 g/L) |

**Specialty Applications**

| | |
|---|---|
| | PVC Welding (510 g/L) |
| | CPVC Welding (490 g/L) |
| | ABS Welding (325 g/L) |
| | Plastic Cement Welding (250 g/L) |
| | Adhesive Primer for Plastic (550 g/L) |
| | Contact Adhesive (80g/L) |
| | Special Purpose Contact Adhesive(250 g/L |
| | Struct.Wood Member Adhesive(140 g/L) |
| | Sheet Applied Rubber Lining Operations (850 g/L) |
| | Top & Trim Adhesive (250 g/L) |

**Substrate Specific Applications**

| | |
|---|---|
| | Metal to Metal (30 g/L) |
| | Plastic Foam (50 g/L) |
| | Porous Material (except wood) (50 g/L) |
| | Wood (30 g/L) |
| | Fiberglass (80 g/L) |

**Sealants**

| | |
|---|---|
| | Architectural (250 g/L) |
| | Nonmembrane Roof (300 g/L) |
| | Roadway (250 g/L) |
| | Single-Ply Roof Membrane (450 g/L) |
| | Other (420 g/L) |

**Aerosol Adheasive (% VOCs by Weight)**

| | |
|---|---|
| | General Purpose Mist Spray (65%) |
| | General Purpose Web Spray (55%) |
| | Special Purpose Aerosol Adhesive (70%) |

**Sealant Primers**

| | |
|---|---|
| | Architectural Non Porous (250 g/L) |
| | Architectural Porous (775 g/L) |
| | Other (750 g/L) |

**Interior Paints**

| | |
|---|---|
| | Flats (50 g/L) |
| | Non-Flat (150 g/L) |
| | Anti-corrosive (250 g/L) |

**Coatings**

| | |
|---|---|
| | Clear Wood Finish: Varnish (350 g/L) |
| | Clear Wood Finish: Lacquer (550 g/L) |
| | Floor Coating (100 g/L) |
| | Waterproof Sealer (250 g/L) |
| | Sanding Sealer (275 g/L) |
| | Other Sealer (200 g/L) |
| | Shellac: Clear (730 g/L) |
| | Shellac: Pigmented (550 g/L) |
| | Stain (250g/L) |