

# PROJECT MANUAL

## MOUNT DIABLO SP
## Mitchell Canyon Education Center
## Contra Costa County, California

**No. C26863001**

**August 2026**

# STATE OF CALIFORNIA
# NATURAL RESOURCES AGENCY
# DEPARTMENT OF PARKS AND RECREATION

# CALIFORNIA DEPARTMENT OF PARKS AND RECREATION

# CONSTRUCTION DOCUMENTS

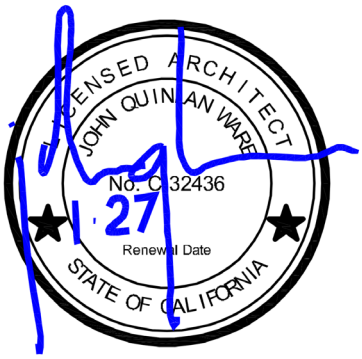
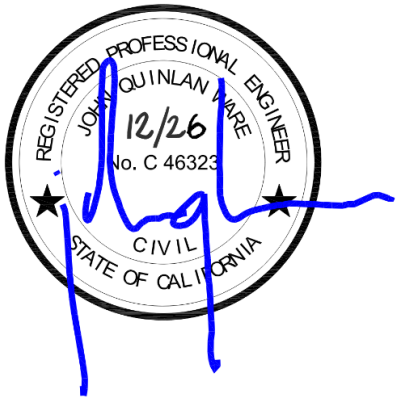
## Mitchell Canyon Education Center
## Mount Diablo State Park
## January 16, 2026

OFFICE OF THE STATE FIRE MARSHAL
APPROVED FIRE AND PANIC ONLY
01/28/26
25-0403

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.

V4

PROJECT MANUAL
for
Mount Diablo State Park
Mitchell Canyon Education Center
Clayton, CA
2026

| APPROVAL STAMP | NAME |
|---|---|
|  | John Ware<br>Ware Associates, Inc.<br>440 Grand Ave. Suite 250<br>Oakland, CA 94610<br>john@ware-associates.com |
|  | John Ware<br>Ware Associates, Inc.<br>440 Grand Ave. Suite 250<br>Oakland, CA 94610<br>john@ware-associates.com |
|  | Michael Vidra<br>CSWST2<br>78 Railroad Ave<br>Richmond, CA 94801<br>mvidra@cswst2.com |

| | |
|---|---|
|  | Marcia Vallier<br>CSWST2<br>78 Railroad Avenue<br>Richmond, CA 94801<br>mvallier@cswst2.com |
|  | Gerald Gonzales<br>Belden Consulting Engineers<br>6700 Koll Center Parkway, Suite 300<br>Pleasanton, California 94566<br>geraldg@belden.com |
|  | Marcus Tam<br>Belden Consulting Engineers<br>6700 Koll Center Parkway, Suite 300<br>Pleasanton, California 94566<br>marcust@beldeninc.com |
|  | David Maino<br>Atium Engineering<br>3533 York Lane<br>San Ramon, CA 94582<br>maino@atiumeng.com |

NATURAL RESOURCES AGENCY
DEPARTMENT OF PARKS AND RECREATION
MOUNT DIABLO SP
Mitchell Canyon Education Center
Contra Costa County, California

# TABLE OF CONTENTS


| | Number of Pages |
|---|---|
| Cover Sheet | 1 |
| Title Page | 2 |
| Table of Contents | 4 |
| Small Business (SB) Preference Notice (DPR 478PW) | 2 |
| Disabled Veteran Business Enterprise (DVBE) Notice (DPR 479IP) | 6 |
| 3Instructions to Bidders (Section 00100) (DPR 482A) | 3 |
| Bidder Declaration (GSPD 05-105) (Sample) | 2 |
| DVBE Declarations (DGS PD 843) (Sample) | 1 |
| Commercially Useful Function – Bidder Certification (DPR 87) (Sample) | 1 |
| Non-Collusion Affidavit (DPR 837) (Sample) | 1 |
| Bidder's Bond (DPR 495) (Sample) | 1 |
| California Public Contract Code Section 10162 Questionnaire (DPR 20) (Sample) | 1 |
| Darfur Contracting Act Form (DPR 74) (Sample) | 1 |
| Fair Chance Employment Act (DPR 282PW) (Sample) | 1 |
| Artificial Intelligence (AI) Disclosure Form (DPR 97B) (Sample) | 3 |
| California Civil Rights Laws Certification (DGS OLS 04) (Sample) | 1 |
| Standard Agreement (STD 213PW) (Sample) | 2 |
| Exhibit A Scope of Work (DPR 603PW) (Sample) | 1 |
| Exhibit B Budget Detail and Payment Provisions (DPR 604PW) (Sample) | 2 |
| Exhibit B, Attachment 1 - Public Works Bid Form (DPR 482B) (Sample) | 3 |
| Exhibit D Special Terms and Conditions (DPR 605PW) (Sample) | 1 |
| Payment Bond (STD 807) (Sample) | 1 |
| Performance Bond (Sample) | 1 |
| Payee Data Record (STD 204) (Sample) | 2 |
| Payee Data Record (STD 205) (Sample) | 2 |
| Contractor Certification Clause (CCC 04/2017) | 4 |
| | |
| Division 00 – Procurement and Contracting Requirements: | |
| Section 000700 – General Conditions (DPR 483) | 14 |
| Section 000802 – Supplemental Conditions | 1 |
| Section 000803 – Mined Products and Materials | 2 |
| Section 000804 – Disposal of Refuse | 1 |
| Section 000810 – Constraints and Mitigations | 6 |
| | |
| Division 01 – General Requirements: | |
| Section 011000 – Summary | 2 |
| Section 011400 – Work Restrictions | 2 |
| Section 012300 – Alternates | 2 |
| Section 012500 – Substitution Procedures | 3 |
| Section 012600 – Contract Modification Procedures | 3 |
| Section 012900 – Payment Procedures | 3 |
| Section 013100 – Project Management and Coordination | 8 |

Number of Pages

Section 013200 – Construction Progress Documentation ..... 7
Section 013300 – Submittal Procedures ..... 8
Section 014000 – Quality Requirements ..... 11
Section 014200 – References ..... 12
Section 015000 – Temporary Facilities and Controls ..... 7
Section 015639 – Temporary Tree and Plant Protection ..... 11
Section 016000 – Product Requirements ..... 6
Section 017300 – Execution ..... 11
Section 017419 – Construction Waste Management and Disposal ..... 8
Section 017700 – Closeout Procedures ..... 6

Specifications:

Section 02 41 13 – Selective Site Demotion ..... 5
Section 03 11 00 – Concrete Formwork ..... 7
Section 03 15 00 – Drilled Dowels and Epoxy Anchors ..... 6
Section 03 20 00 – Concrete Reinforcing ..... 8
Section 03 30 00 – Cast-in-Place Concrete ..... 12
Section 03 35 00 – Cast-in-Place Concrete Finishing ..... 8
Section 04 22 00 – Concrete Masonry Unit ..... 9
Section 05 05 19 – Expansion Anchors, Screw Anchors and Powder-Actuated Fasteners ..... 6
Section 05 12 00 – Structural Steel Framing ..... 14
Section 05 50 00 – Metal Fabrications ..... 13
Section 06 10 00 – Rough Carpentry ..... 9
Section 06 16 43 – Gypsum Sheathing ..... 7
Section 06 40 00 – Architectural Woodwork ..... 7
Section 06 40 10 – Exterior Architectural Woodwork ..... 10
Section 07 13 26 – Self Adhering Sheet Waterproofing ..... 5
Section 07 13 90 – Roofing Underlayment ..... 5
Section 07 21 00 – Thermal Insulation ..... 8
Section 07 25 00 – Weather Barriers ..... 9
Section 07 26 00 – Under-Slab Vapor Barriers ..... 4
Section 07 27 01 – Interior Air and Vapor Control ..... 9
Section 07 41 13 – Standing Seam Metal Roof Panels ..... 8
Section 07 46 00 – Non-Combustible Siding and Trim ..... 8
Section 07 62 00 – Sheet Metal Flashing and Trim ..... 10
Section 07 84 00 – Firestopping and Smoke Sealants ..... 8
Section 07 92 00 – Joint Sealants ..... 11
Section 08 11 13 – Hollow Metal Doors and Frames ..... 11
Section 08 11 16 – Aluminum Doors and Frames ..... 4
Section 08 16 00 – Flush Composite Doors ..... 4
Section 08 31 00 – Access Doors and Panels ..... 5
Section 08 53 14 – Fiberglass Windows and Storefronts ..... 12
Section 08 62 00 – Unit Skylights ..... 9
Section 08 71 00 – Door Hardware ..... 11
Section 08 80 00 – Glazing ..... 14
Section 08 90 00 – Louvers and Vents ..... 7
Section 09 28 13 – Cementitious Backing Boards ..... 9

Number of Pages

Section 09 29 00 – Gypsum Board ..... 11
Section 09 30 00 – Tiling ..... 8
Section 09 54 26 – Linear Acoustic Wood Ceiling Panels ..... 7
Section 09 61 19 – Concrete Floor Stain and Seal ..... 5
Section 09 67 23 – Resinous Flooring ..... 9
Section 09 80 00 – Pinnable Display Board ..... 5
Section 09 91 00 – Painting ..... 29
Section 10 21 13 – Toilet Compartments ..... 6
Section 10 28 00 – Restroom Accessories ..... 5
Section 10 71 10 – Exterior Sun Control Devices ..... 5
Section 12 24 13 – Roller Window Shades ..... 5
Section 12 26 00 – Interior Daylighting Devices ..... 5
Section 12 36 00 – Countertops ..... 11
Section 22 05 17 – Sleeves and Sleeve Seals for Plumbing Piping ..... 5
Section 22 05 18 – Escutcheons for Plumbing Piping ..... 1
Section 22 05 23 – General-Duty Valves for Plumbing Piping ..... 5
Section 22 05 29 – Hangers and Supports for Plumbing Piping and Equipment ..... 9
Section 22 05 48 – Vibration and Seismic Controls for Plumbing Piping and Equipment 4
Section 22 05 53 – Identification ..... 4
Section 22 07 00 – Plumbing Insulation ..... 9
Section 22 11 16 – Domestic Water Piping ..... 13
Section 22 11 19 – Domestic Water Piping Specialties ..... 5
Section 22 13 16 – Sanitary Waste and Pipe Venting ..... 5
Section 22 13 19 – Sanitary Waste Piping Specialties ..... 11
Section 22 14 13 – Facility Storm Drainage Piping ..... 8
Section 22 14 23 – Storm Drainage Piping Specialties ..... 4
Section 22 24 00 – Plumbing Fixtures ..... 3
Section 23 00 50 – Basic Mechanical Materials and Methods ..... 29
Section 23 05 13 – Common Motor Requirements for HVAC Equipment ..... 5
Section 23 05 29 – Hangars and Supports for HVAC Piping and Equipment ..... 9
Section 23 05 48 – Vibration and Seismic Controls for HVAC Piping and Equipment .. 14
Section 23 05 93 – Testing, Adjusting and Balancing for HVAC ..... 11
Section 23 07 00 – HVAC Insulation ..... 17
Section 23 08 00 – Commissioning of HVAC ..... 8
Section 23 09 00 – Instrumentation and Control for HVAC ..... 3
Section 23 21 25 – Refrigerant Piping ..... 3
Section 23 31 17 – Ducts ..... 18
Section 23 33 00 – Air Duct Accessories ..... 10
Section 23 34 15 – Fans ..... 7
Section 23 37 13 – Diffusers, Registers and Grilles ..... 5
Section 26 05 00 – Common Work Results for Electrical ..... 5
Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables ..... 6
Section 26 05 26 – Grounding and Bonding for Electrical Systems ..... 6
Section 26 05 33 – Raceways and Boxes for Electrical Systems ..... 11
Section 26 05 53 – Identification for Electrical Systems ..... 5
Section 26 09 23 – Lighting Control Devices ..... 7
Section 26 24 13 – Switchboards ..... 9
Section 26 24 16 – Panelboards ..... 10

Number of Pages

Section 26 27 26 – Wiring Devices ..... 9
Section 26 28 13 – Fuses..... 4
Section 26 51 00 – Interior Lighting..... 14
Section 26 56 00 – Exterior Lighting..... 8
Section 28 05 00 – General Requirements for Safety and Security ..... 13
Section 28 05 13 – Wire and Cables for Safety and Security..... 4
Section 28 46 00 – Fire Detection and Alarm..... 26
Section 31 10 00 – Site Preparation and Plant Protection..... 10
Section 31 11 00 – Clearing and Grubbing ..... 8
Section 31 23 00 – Excavation and Fill ..... 11
Section 31 23 33 – Utility Trenching and Backfilling..... 10
Section 31 25 00 – Erosion and Sedimentation Control..... 2
Section 31 37 00 – Boulders ..... 6
Section 32 05 23 – Exterior Concrete Paving..... 13
Section 32 11 32 – Aggregate Base Course ..... 3
Section 32 15 40 – Fine Aggregate Paving..... 7
Section 32 33 00 – Site Furnishings..... 3
Section 32 84 10 – Irrigation ..... 19
Section 33 11 66 – Water Distribution System..... 19
Section 33 31 00 – Sanitary Sewer System ..... 9
Section 33 41 00 – Storm Drainage System ..... 11

Appendix:
Appendix A –Flow Test Report..... 5

Plans:
MOUNT DIABLO SP, Mitchell Canyon Education Center
Drawing No. G0.0 though S3-5.6 ..... 139 Sheets

Bid Forms:
Bidder’s Checklist..... 1
Public Works Bid Form (DPR 482B)..... 2
DVBE Notice (DPR 479IP)..... 6
Bidder Declaration (GSPD 05-105)..... 2
DVBE Declarations (DGS PD 843)..... 1
Commercially Useful Function – Bidder Certification (DPR 87)..... 1
Non-Collusion Affidavit (DPR 837)..... 1
Bidder's Bond (DPR 495)..... 1
California Public Contract Code Section 10162 Questionnaire (DPR 20)..... 1
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Fair Chance Employment Act (DPR 282PW)..... 1
Artificial Intelligence (AI) Disclosure Form (DPR 97B)..... 3
California Civil Rights Laws Certification (DGS OLS 04)..... 1

State of California - Natural Resources Agency
DEPARTMENT OF PARKS AND RECREATION

# SMALL BUSINESS PREFERENCE NOTICE

**5% Small Business Preference**

## 5% SMALL BUSINESS PREFERENCE PROGRAM

## What is a California Certified Small Business (SB)?

1) For a business to be considered a Small Business (SB), they must be certified with the State of California - Department of General Services in accordance with California Code of Regulations, Title 2, Section 1896.94.
2) Your business may be eligible if it meets all of the following*:
   a. Must be independently owned and operated.
   b. Cannot be dominant in its field of operation.
   c. Must have its principal office located in California.
   d. Must have its owners (or officers in the case of a corporation) domiciled in California.
   e. Together with its affiliates, be either:
      - A business with 100 or fewer employees, and an average annual gross receipts of $16 million or less over the previous three tax years, **or**
      - A manufacturer with 100 or fewer employees.
   f. Microbusiness: A small business will automatically be designated as a microbusiness if gross annual receipts, together with all affiliates, are less than $5,000,000 or, the small business is a manufacturer with 25 or fewer employees.

   * For additional details visit the Department of General Services (DGS) website.

## What is the Small Business Preference?

**5% Small Business Preference**: State law allows certified small business (SB) and microbusiness (MB) firms to receive a 5% bidding preference on applicable state solicitations. The 5% preference is also available for non-certified businesses who subcontract 25% of contract amount with a certified SB/MB. **In no event shall the SB preference or non-SB subcontracting preference exceed $50,000 in any single bid.**

The effect of the preference is to help SBs/MBs be more competitive in the bid process, thereby enhancing state contract awards directly or indirectly to SB/MB. The preference is only used for computation purposes to determine the winning bidder, the contract is awarded at the actual bid amount.

### 1. How does the 5% Small Business (SB) Preference Work?

a) The following example shows how the 5% preference computation works, and how it is used to determine a successful bidder.

| Bidder | Bid Amount | Bid After 5% Preference | Small Business Status |
|---|---|---|---|
| 1 | $30,750 | $30,750 | Claims small business status, but is not CA certified |
| 2 | $28,975 | $28,975 | Does not claim to be a small business |
| 3 | $29,520 | $29,520 | Claims small business status, but their CA certification has expired |
| 4 | $29,870 | $28,421 | Claims small business and is CA Certified |

b) Computation Method for example 4-a:

1. Five percent is applied to the **lowest (non-certified small business)** responsible bid ([Bidder 2] $28,975 x .05 = $1448.75).
2. The preference amount ($1,448.75) is subtracted from the certified small business (Bidder 4's) bid amount ($29,870 - $1,448.75 = $28,421.25).
3. Bidder 4's computed total is $28,421.25, making them the lowest bidder.
4. The contract is awarded to Bidder 4 for $29,870.

**c) NOTE:** *The 5% SB preference is applied to currently certified and registered small businesses and is used for bid evaluation purposes and* ***does not alter the bid's actual amount****.*

## 2. Documentation

a) Bidders must provide a printout from the State's SB/DVBE vendor system showing your certification and expiration date from the following web site. www.Caleprocure.ca.gov

b) If a non-certified firm is claiming the SB Preference based on subcontracting at least 25% of the contract to a certified SB/MB, you must include a complete GSPD 05-105 with your bid. An evaluated bid under the 25% SB subcontracting qualification cannot displace a certiffied and registered SB.

c) At completion of peformance and when SB participation was included toward SB goals under this contract, then the contractor must complete and submit form DPR 489 to the State's designated representative under this contract and within the time specified within the contracting documents or within 60 days of receipt of final payment, which ever is sooner.

## 3. Verification

Information submitted by the bidders to claim the SB Preference will be verified by the State. If evidence of an alleged violation is found during the verification process, the State shall initiate an investigation, in accordance with the requirements of the PCC §10115, et seq., and MVC §999 et seq., and follow the investigatory procedures required by the 2 CCR §1896.80. Contractors found to be in violation of certain provisions may be subject to loss of certification, penalties and/or contract termination.

## 4. To locate SB/MB contractors:

a) Contact the department's contracting official named in this solicitation for any SB/MB contractors who may have identified themselves as potential subcontractors, and to obtain suggestions for search criteria to possibly identify SB/MB contractors for the solicitation. You may also contact the department's SB/DVBE Advocate for assistance: www.parks.ca.gov/advocate.

b) Access the list of all certified SB/MBs by using the Department of General Services, Procurement Division (DGS-PD) online certified firm database at: www.Caleprocure.ca.gov

c) Search by "Keywords" or United Nations Standard Products and Services Codes (UNSPSC) that apply to the elements of work you want to subcontract to a SB/MB.

d) Check for subcontractor ads that may be placed on the California State Contracts Register (CSCR) for this solicitation prior to the closing date. You may access the CSCR at: www.Caleprocure.ca.gov

## 5. Information

The State of California, Department of General Services, Procurement Division, Office of Small Business and DVBE Services (OSDS) offers many services that assist contractor/business owners with a variety of information designed to streamline the State contracting process. OSDS also certifies SB/MB contractors. For more information, please contact

The State of California
Department of General Services
Office of Small Business and DVBE Services
707 Third Street, First Floor – Room 400
West Sacramento, CA 95605

www.dgs.ca.gov/PD/Contact
Receptionist: (916) 375-4940
24-hour recording: (916) 322-5060
FAX: (916) 375-4950
OSDSHelp@dgs.ca.gov

# Disabled Veteran Business Enterprise (DVBE) Notice

## DVBE Participation Requirement and Incentive for Invitation For Bids (IFB)

**1**. Bidder's attention is directed to the Disabled Veteran Business Enterprise (DVBE) Participation Requirement for bidders, as outlined in the accompanying bid package.

**2.** In order to be responsive and eligible for award of the contract, bidder must attain the prescribed goals for the DVBE participation.

**The DVBE Participation Requirement for this solicitation is 6%.**

**Failure to fulfill the DVBE requirement will render your bid non-responsive.**

**3**. It is essential that you commence the required participation process **immediately**, to allow adequate response time for potential DVBE participants.

**4.** The DVBE participation requirement is mandatory by state law, whether you are conducting business as an individual, partnership or corporation.

## IMMEDIATE ACTION REQUIRED

**5. What is a Disabled Veteran Business Enterprise (DVBE)?**

a) For a business to be considered a Disabled Veteran Business Enterprise (DVBE), they must be certified with the State of California - Department of General Services in accordance with California Code of Regulations, Title 2, Section 1896.94. Please see the following website for more information about DVBE certification benefits and eligibility requirements:

www.dgs.ca.gov/PD/Services/Page-Content/Procurement-Division-Services-List-Folder/Certify-or-Re-apply-as-Small-Business-Disabled-Veteran-Business-Enterprise

b) Only DVBEs who perform a commercially useful function relevant to this solicitation, may be used to satisfy the DVBE participation and/or incentive program requirements.

**6. Commercially Useful Function Definition**

a) California Code of Regulations, Title 2, § 1896.61(l): The term "DVBE contractor, subcontractor or supplier" means any person or entity that satisfies the ownership (or management) and control requirements of §1896.61(f); is certified in accordance with §1896.70; and provides services or goods that contribute to the fulfillment of the contract requirements by performing a commercially useful function.

b) A person or entity must perform a commercially useful function (CUF) as defined under Military and Veterans Code (MVC) §999.

c) A contractor, subcontractor, or supplier will not be considered to perform a commercially useful function if the contractor's, subcontractor's, or supplier's role is limited to that of an extra participant in a transaction, contract, or project through which funds are passed in order to obtain the appearance of disabled veteran business enterprise participation.

**7. What is the DVBE participation requirement?**

a) **Bidders must commit at minimum 6% of their total bid** to currently certified and registered DVBE companies for this solicitation. All bidders must meet the full participation requirement based on the total bid amount in order to be considered a responsive bidder.

b) **Reporting Requirement:** *If, for this agreement and pursuant to Military & Veterans Code (MVC) 999.5 (d), a contractor made a commitment to achieve disabled veteran business enterprise (DVBE) participation, within 60 days of receiving final payment under this agreement (or within such other time period as may be specified elsewhere in this agreement) the contractor must certify in a report to the awarding department:*

1. *the total amount the prime contractor received under the contract*
2. *the name and address of the DVBE(s) that participated in the performance of the contract*
3. *the amount each DVBE received from the prime contractor*
4. *that all payments under the contract have been made to the DVBE(s)*
5. *the actual percentage of DVBE participation that was achieved*

c) *You will be required to report to DPR the actual dollars spent with each DVBE subcontractor on a STD. 817. If awarded the contract you will receive this form at the completion of the contract. A person or entity that knowingly provides false information shall be subject to a civil penalty for each violation. (Military & Veterans Code (M&VC) § 999.5(d))*

**8. What is the DVBE Incentive Program?**

a) The DVBE Incentive Program was established by statute and applies to contracts solely financed by State funds. This program is separate from the DVBE Participation Program. The incentive is designed to encourage bidders to partner with DVBE subcontractors.

b) DVBE incentive will be given to bidders who provide DVBE participation above 6%.

c) The incentive may be combined with other incentives and preferences up to an established cap of $100,000.00. **The incentive is used only for evaluation purposes and does not alter the amounts of the actual bids.**

**9. Who is eligible to receive the incentive?**

a) Any responsive bidder who has attained more than the required amount (6%) of DVBE participation per the solicitation instructions.

**10. Documentation**

a) To be considered a reponsive bidder, bidders must document at least 6% DVBE participation commitment by completing and submitting the following forms:
   1. GSPD 05-105, Bidder Declaration
   2. DGS PD 843, DVBE Declaration

b) GSPD 05-105, Bidder Declaration: The GSPD 05-105 is used to document the proposed prime contractor and subcontractors, including their roles and responsibilities. **The form must be submitted with the bid package.** If there is a discrepancy between the dollar amount and percentage of bid for DVBE participation then the percentage shall prevail.

c) DGS PD 843,DVBE Declaration: All disabled veteran owners and disabled veteran managers of the DVBE must complete the form and submit it with the bid package. A DGS PD 843 needs to be submitted by every DVBE supplier who is part of a bid whether they are the prime contractor or subcontractor .

d) Bids that fail to submit the completed required forms to confirm the level of DVBE participation will not be eligible to receive the DVBE incentive and may be declared unresponsive due to DVBE participation requirements. Clerical and typographical errors on these forms may be corrected at the State's sole discretion.

e) Information submitted by the bidders to claim the DVBE incentive(s) will be verified by the State. If evidence of an alleged violation is found during the verification process, the State shall initiate an investigation, in accordance with the requirements of the PCC §10115, et seq., and MVC §999 et seq., and follow the investigatory procedures required by the 2 CCR §1896.80. Contractors found to be in violation of certain provisions may be subject to loss of certification, penalties and/or contract termination.

## 11. How does the DVBE Incentive Program Work?

a) The DVBE incentive is used only for evaluation purposes to determine the successful bidder and does not alter the amounts of the actual bids. A dollar cap of $100,000.00 is set for all combined incentives and preferences.

b) For contracts to be awarded based on the Low Price Method, the incentive amount is equal to a percentage of the lowest responsive and responsible bid based on the amount of DVBE participation in the bid being evaluated per Table A below. The Computation Method does not include the small business preference; however, the small business preference may be applied and may affect the application of the incentive and the outcome of the ranking.

c) **Table A – Invitation For Bid (IFB)** (aka Low Price Method)

| Confirmed DVBE Participation of | DVBE Incentive Amount for IFB |
|---|---|
| 10% or more | 5% of lowest responsive and responsible bid |
| 9% - 9.99% | 4% of lowest responsive and responsible bid |
| 8% - 8.99% | 3% of lowest responsive and responsible bid |
| 7% - 7.99% | 2% of lowest responsive and responsible bid |
| 6.01% - 6.99% | 1% of lowest responsive and responsible bid |

d) **Computation Method**

Low Price Method

| Bidder Name | A | B | C |
|---|---|---|---|
| Original Bid Price | $98,000.00 | $102,100.00 | $100,000.00 |
| DVBE Participation for certified DVBE Prime or Subcontractors | 4% | 8% | 6% |
| Initial Ranking | Unresponsive | 2 | 1 |
| DVBE Incentive (from Table A) | n/a | 3% | n/a |
| Incentive Amount (% x Lowest Responsive and Responsible Bid Price) | n/a | **$3,000.00** (3% x $100,000) | n/a |
| Evaluated Bid Price (Bidder's Price - Bidder's Incentive Amount) | n/a | **$99,100.00** ($102,100 - $3,000) | n/a |
| **Final Rank:** | **Unresponsive** | **1** | **2** |

## 12. Substitution of Proposed DVBE

a) If awarded the contract, the DVBE subcontractors and/or contractors proposed by bidder must be used unless prior written notice of substitution is provided to the state and the state approves such substitution.

b) The notice must include a minimum of: (1) a written explanation of the reason for the substitution; and (2) an updated GSPD 05-105 must be submitted to the award office of Department of Parks and Recreation. The substitution request must before approved before the substitution can take place.

c) Failure to adhere to at least the DVBE participation proposed by the successful bidder may be cause for contract termination and recovery of damages under the rights and remedies due the state under the default section of the contract.

d) Contractor understands and agrees that should award of this contract be based in part on their commitment to use the Disabled Veteran Business Enterprise (DVBE) subcontractor(s) identified in their bid or offer, per Military and Veterans Code 999.5 (e), a DVBE subcontractor may only be replaced by another DVBE subcontractor and must be approved by the State. Changes to the scope of work that impact the DVBE subcontractor(s) identified in the bid or offer and approved DVBE substitutions will be documented by contract amendment.

e) Failure of Contractor to seek substitution and adhere to the DVBE participation level identified in the bid or offer may be cause for contract termination, recovery of damages under rights and remedies due to the State, and penalties as outlined in M&VC § 999.9; Public Contract Code (PCC) § 10115.10, or PCC § 4110 (applies to public works only).

## 13. To locate DVBE contractors:

a) Contact the department's contracting official named in this solicitation for any DVBE contractors who may have identified themselves as potential subcontractors, and to obtain suggestions for search criteria to possibly identify DVBE contractors for the solicitation. You may also contact the department's SB/DVBE Advocate for assistance:

b) Access the list of all certified DVBEs by using the Department of General Services, Procurement Division (DGS-PD) online certified firm database at:

https://caleprocure.ca.gov/pages/PublicSearch/supplier-search.aspx?psNewWin=true

Search by "Keywords" or United Nations Standard Products and Services Codes (UNSPSC), that apply to the elements of work you want to subcontract to a DVBE.

c) Check for subcontractor ads that may be placed on the California State Contracts Register (CSCR) for this solicitation prior to the closing date. You may access the CSCR at:
www.Caleprocure.ca.gov

d) The State of California, Department of General Services (DGS), Procurement Division, Office of Small Business and DVBE Services (OSDS) offers many services that assist contractor/business owners with a variety of information designed to streamline the State contracting process. OSDS also certifies DVBE contractors. For more information, please

The State of California
Department of General Services
Office of Small Business and DVBE Services
707 Third Street, First Floor – Room 400
West Sacramento, CA 95605

www.dgs.ca.gov/PD
Receptionist: (916) 375-4940
24-hour recording: (916) 322-5060
FAX: (916) 375-4950
OSDSHelp@dgs.ca.gov

## DISABLED VETERAN BUSINESS ENTERPRISE (DVBE)
## DVBE Documentation Checklist

1. The State of California acknowledges the service and sacrifice of its disabled veterans, in part, through the "Disabled Veteran Business Enterprise (DVBE) Participation Program." As mandated by law, state agencies have a goal to award at least 3% of their annual contract dollars to certified DVBE's.

2. When a firm bids on a state DPR contract that contains DVBE participation, the the dollar amount of **the bid must meet the 6% participation requirement** set by DPR.

3. **INCOMPLETE DOCUMENTATION (GSPD 05-105 AND DGS PD 843) MUST RESULT IN DISQUALIFICATION FROM FURTHER PARTICIPATION IN THE SELECTION PROCESS FOR THE CONTRACT.**

4. The following checklist is provided to assist bidders with their DVBE participation documentation:

**a) GSPD 05-105, Bidder Declaration**

- ☐ All DVBE participation is indicated.
- ☐ The names of each participating DVBE company is listed with the dollar value and applied percentage of the bid.
- ☐ A copy of the printout from eProcurement system showing the company's DVBE certification status.
- ☐ The DVBE participation percentage listed agrees with the dollar value claimed.

**b) DGS PD 843, DVBE Declaration**

- ☐ A completed and signed DGS PD 843 is included with the bid for every DVBE (whether prime contractor or subcontractor) included.

State of California - Natural Resources Agency
DEPARTMENT OF PARKS AND RECREATION

**PUBLIC WORKS**
**NOTICE TO CONTRACTORS**

**MOUNT DIABLO STATE PARK (SP)**
Mitchell Canyon Education Center
Contra Costa County, California
Bid Number: C26863001

Bids must be submitted electronically with all necessary fully executed bid submission documents as an attachment in Portable Document Format (PDF) to DPR.PWBIDS@parks.ca.gov no later than **2:00 p.m., Wednesday, September 2, 2026**. Bid submission time will be as of the electronic time stamp associated with when the electronic email submission was received. Submissions with attached PDF documents in excess of 10 Megabytes in size risk being rejected and can be deemed unresponsive. DPR will provide an individual electronic email response confirming receipt of each submission received. If a confirmation receipt is not received within 30-minutes of submission, please contract Merrilee Byrnes at Merrilee.Byrnes@parks.ca.gov to confirm your bid was received. Confirmation receipt is not a representation by DPR that the submitted bid is responsive and complete. Bidders shall ensure that the electronic submission contains the attachment, the documents are fully responsive and lack any deficiency and is directed to the appropriate email address (DPR.PWBIDS@parks.ca.gov) without error. Failure to do so risks the bid being deemed unresponsive. It is recommended that Bidders submit bids at least an hour in advance of the bid submission deadline to allow for confirmation of bid submission. Bid will be opened publicly over conference-call, individuals interested in calling into the conference must send their request into DPR.PWBIDS@parks.ca.gov to receive a conference participation access code. Please ensure a request for conference-call is submitted 24-hours in advance to allow DRP adequate time to accommodate all Bidders. Bids will be submitted for performing the work as follows:

> Furnish all labor, materials, tools and equipment necessary to construct the Mitchell Canyon Education Center at **MOUNT DIABLO SP** in Contra Costa County, California, complete and in accordance with the plans and specifications therefore and such addenda thereto as may be issued prior to bid opening date.

License required: **A and/or B**

Engineer's Estimate: **$3,400,000 to $4,200,000**

Contract Term: **270 Calendar Days from Notice to Proceed**
Work Performance Period**: 635 Calendar Days from Formal Start Work Date**

NOTE: **A job showing will be held at 10:00 a.m., Thursday, August 13, 2026, at MOUNT DIABLO SP, 96 Mitchell Canyon Road, Clayton, CA 94517 in Contra Costa County. Attendance at the job showing is MANDATORY and will be the only opportunity made available for prospective bidders to view the site with park personnel. No Bid will be considered from a Prime Contractor that did not attend the mandatory job showing.**

The bidder agrees to complete all work within **TWO HUNDRED SEVENTY (270)** calendar days from the date of written notice to commence work. This time includes ten (10) calendar days allowed for the contractor to begin work.

**Instructions to Download Bid Package**: Prospective bidders may examine and obtain the bid forms, specifications, plans and addenda (if any) by downloading this bid package from the Department of General Services' (DGS) website at: **https://caleprocure.ca.gov/pages/Events-BS3/event-search.aspx.** At the website go to Quicklinks, Find Bid Opportunities, and enter Bid Number "**C26863001**" in the "Event Name" field. Click on the "Search" button to view the full advertisement and bid documents.

**Questions and Answers**: Any discrepancies, omissions, ambiguities, or conflicts in or among the contract documents or doubts as to meaning shall be brought to the State's attention by including your comments directly to Merrilee.Byrnes@parks.ca.gov **NO LATER THAN 2 p.m., seven (7)** calendar days prior to bid opening date. Answers will be provided by Addendum which will be posted within the Bid Solicitation located on the Cal eProcure website stated above. It is the responsibility of the bidders to download any addenda as needed.

No bid will be considered unless it is made on a standard bid form furnished by the Department of Parks and Recreation, and is made in accordance with the "Instructions to Bidders".

Bids must be submitted for the entire work as described herein. The Department of Parks and Recreation reserves the right to waive any irregularity in a bid or to reject any or all bids.

The apparent low bidder will be required to execute a contractual agreement in the form of a "Standard Agreement - Form 213" which shall be binding upon the State of California only upon approval by the State.

Bond requirements for contracts exceeding $5,000 are stated in the General Conditions, DPR 483, Section 000700.

In accordance with the provisions of Section 1770, 1773 and 1773.1 of the Labor Code, the Department has ascertained that the general prevailing rate of wages in the county in which the work to be done be as listed by the Department of Industrial Relations (415) 703-4780. A copy of this listing is on file at the address listed above or at **www.dir.ca.gov.**

**Participation in Small Business Preference Program:** Preference will be granted to bidder properly approved as "Small Business" in accordance with Section 1896, et seq., Title 2, California Code of Regulations. A small business firm must have an approved certification form (STD. 812) on file at the Department of General Services, Office of Small Business and DVBE Services, 707 Third Street, First Floor – Room 400, West Sacramento, California 95605, by 5:00 p.m. of bid opening date (website address: http://www.pd.dgs.ca.gov/smbus). If bidder requests "Small Business" preference on this project, bidder must sign STD. 811 form (Small Business Preference and

Certification Request) and submit with bid. A printout from the eProcurement website www.caleprocure.ca.gov showing Small Business Certification and expiration date must be submitted with bid.

**Non-Small Business Preference** – refer to **"**Bidder Declaration," GSPD 05-105 form: A five percent (5%) bid preference is available to a non-small business proposing firms claiming twenty-five percent (25%) California certified small business subcontractor participation. If claiming the non-small business subcontractor preference, follow the directions and fill out the "Bidder Declaration" (GSPD 05-105) which is included in the Bid Forms. Proposers claiming the five percent (5%) preference must commit to subcontract at least twenty-five percent (25%) of the net bid price with one or more California certified small businesses. Completed certification applications and required support documents must be submitted to the office of Small Business and DVBE Services (OSDS) no later than 5:00 p.m. on the bid due date, and the OSDS must be able to approve the application as submitted. Questions regarding certification should be directed to the OSDS at (916) 375-4940.

**Participation in Disabled Veteran Business Enterprise Program (DVBE):** The **minimum** DVBE participation percentage goal is **6%**. Failure to fulfill the DVBE requirement will render your bid non-responsive. **DVBE Incentive:** For evaluation purposes only, an incentive will be given to bidders who exceed 6% DVBE participation requirements. Refer to the DVBE forms beginning with DPR 479IP. In determining the lowest responsible bidder, the SB Preference is applied first in the bid evaluation process. If the Low Bidder is claiming the SB Preference or the Non-Certified SB Preference, the 5% or $50,000 max is not calculated for any bidder. However, the DVBE Incentive would be calculated. A Low Bidder claiming the SB Preference can only be displaced by another bidder claiming the SB Preference, if the adjusted bid price with SB Preference and DVBE Incentive is lower. The DVBE program incentives are applied second for bidders attaining more than the required amount of DVBE participation per the solicitation instructions. More information regarding the incentive program(s) and how bids are evaluated is available on the State Administrative Manual Management Memo Number MM08-03 (Management Memo) at http://www.documents.CaleProcure.ca.gov/osp/sam/mmemos/MM08_03.pdf.

**Notice of Requirement for Nondiscrimination Program:** Your attention is called to the "Nondiscrimination Clause" set forth or referred to herein, which is applicable to all nonexempt State construction contracts, and subcontracts, and to the "Standard California Nondiscrimination Construction Contract Specifications" set forth herein. (Refer to General Terms and Conditions (GTC 02/2025) at http://www.CaleProcure.ca.gov/ols/Resources/StandardContractLanguage.aspx).

**Withdrawal of Bid**: As stated in the Instructions to Bidders, any requests to withdraw a bid must be submitted in writing. Submit via email to PWBids@parks.ca.gov. See Instructions to Bidders, section 1.03M for details.

**Public Works Contractor Registration Program – SB 854:** 1) No contractor or subcontractor may be listed on a bid proposal for a public works project (submitted on or after March 1, 2015) unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5 [with limited exceptions from this requirement

for bid purposes only under Labor Code section 1771.1(a)]. 2) No contractor or subcontractor may be awarded a contract for public work on a public works project (awarded on or after April 1, 2015) unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5. 3) This project is subject to compliance monitoring and enforcement by the Department of Industrial Relations. Refer to http://www.dir.ca.gov/Public-Works/SB854.html for more information.

**Executive Order N-6-22 – Russia Sanctions**
On March 4, 2022, Governor Gavin Newsom issued Executive Order N-6-22 (the EO) regarding Economic Sanctions against Russia and Russian entities and individuals. "Economic Sanctions" refers to sanctions imposed by the U.S. government in response to Russia's actions in Ukraine, as well as any sanctions imposed under state law. By submitting a bid or proposal, Contractor represents that it is not a target of Economic Sanctions. Should the State determine Contractor is a target of Economic Sanctions or is conducting prohibited transactions with sanctioned individuals or entities, that shall be grounds for rejection of the Contractor's bid/proposal any time prior to contract execution, or, if determined after contract execution, shall be grounds for termination by the State.

**Gen AI solicitation language**
The State of California seeks to realize the potential benefits of GenAI, through the development and deployment of GenAI tools, while balancing the risks of these new technologies.

Bidder / Offeror must notify the State in writing if it: (1) intends to provide GenAI as a deliverable to the State; or (2), intends to utilize GenAI, including GenAI from third parties, to complete all or a portion of any deliverable that materially impacts: (i) functionality of a State system, (ii) risk to the State, or (iii) Contract performance. For avoidance of doubt, the term "materially impacts" shall have the meaning set forth in State Administrative Manual (SAM) § 4986.2 Definitions for GenAI.

Failure to report GenAI to the State may result in disqualification. The State reserves the right to seek any and all relief to which it may be entitled to as a result of such nondisclosure.

Upon notification by a Bidder / Offeror of GenAI as required, the State reserves the right to incorporate GenAI Special Provisions into the final contract or reject bids/offers that present an unacceptable level of risk to the State.

Government Code 11549.64 defines "Generative Artificial Intelligence (GenAI)" as an artificial intelligence system that can generate derived synthetic content, including text, images, video, and audio that emulates the structure and characteristics of the system's training data.

**DEPARTMENT OF PARKS AND RECREATION**
**Armando Quintero, Director**

# SECTION 00100
# PUBLIC WORKS
# INSTRUCTIONS TO BIDDERS

## PART 1. GENERAL

### 1.01 EXAMINATION OF BID DOCUMENTS AND SITE

A. *Bidder shall carefully examine and thoroughly acquaint himself/herself with the conditions at the site of the work, the plans, the specifications and the provisions contained in the project manual. He/she shall investigate conditions character, quality and quantity of surface, and sub-surface materials of obstacles to be encountered. Failure by the bidder to acquaint himself/herself with site conditions and available information will not relieve him/her from the responsibility for estimating properly the difficulty or cost of successfully performing the work. The submission of a bid will be considered as conclusive evidence that the bidder has made such examination.*

B. Questions pertaining to the Plans and Specifications which may arise during the bidding period shall be directed to the Question and Answer section of the solicitation posted within the advertisement.

### 1.02 DISCREPANCIES

A. Any discrepancies, omissions, ambiguities, or conflicts in or among the contract documents or doubts as to meaning shall be brought to the state's attention not later than seven days prior to bid opening date.

B. All interpretations and clarifications will be in the form of written addenda. All bidders are responsible to inquire as to addenda issued. All addenda become part of the contract documents. Any oral representations issued shall be of no force or effect.

### 1.03 BIDS AND BIDDERS

A. Before submitting bids, all bidders must be licensed in the appropriate classification in accordance with provisions in Chapter 9, Division 3, of the "California Business and Professions Code" as amended.

*No bidder may bid on work of a kind for which he/she is not properly licensed by the Contractors State License Board, and any such bid received will be rejected. Joint venture bidders must possess a joint venture license.*

B. State shall not award a contract to a bidder, nor shall a bidder be eligible to bid for or receive a contract, who has, in the preceding five years, been convicted of violating a state or federal law respecting the employment of undocumented aliens.

C. Bids shall be signed and submitted on the Bid Form provided and shall be filled out in the same name style, manner and license number as bidder is licensed with the Contractors State License Board.

D. Each bid shall have listed therein the name, address, license number and portion of the work of each subcontractor to whom the bidder proposes to subcontract portions of the work in an amount in excess of 1/2 of 1 percent of the total bid in accordance with the "Subletting and Subcontracting Fair Practices Act," commencing with Section 4100 of the Public Contract Code. The contractor agrees that he/she is fully qualified to perform that portion of the work, and that he/she shall perform that portion of the work for which a subcontractor has not been listed.

E. Bids exceeding $5,000 shall have enclosed cash, a cashier's check, certified check, or a bidder's bond, executed as surety by a corporation authorized to issue surety bonds in the State of California, made payable to "Director of Parks and Recreation," in an amount equal to at least 10 percent of amount of bid. No such bid shall be considered unless one of the forms of bidder's security is enclosed therewith. If bidder's security is a bidder's bond, it must be executed on a form approved by the state. Personal checks are not acceptable.

Within 10 days after the contract award the Department of Parks and Recreation will return all bidder's security, other than bidder's bonds, accompanying proposals that are not to be further considered in making the award. Retained bidder's security will be held until the contract has been fully executed, after which all bidder's security, except bidder's bonds, will be returned.

F. Bids shall not be qualified. Any proposal modifying the conditions of the bid will be disregarded, or will be cause for rejection of the bid. Deviations from the Plans and Specifications shall not be considered and shall be cause for rejection of the bid.

G. Bids shall include the cost of all items shown on the Plans, mentioned in the Specifications, or reasonably inferred therefrom as necessary to complete the work within the intent of the contract documents.

H. Bid shall include all applicable federal, state and other taxes, together with the cost of all permits, licenses and the like, which may be required under various laws and regulations.

I. Amounts shall be written in figures.

J. Bids shall be submitted electronically in Portable Document Format (PDF) to DPR.PWBIDS@parks.ca.gov no later than the time and date determined in the Notice to Contractors. If confirmation receipt of your bid submission is not received within 30-minutes, please contract Merrilee Byrnes at Merrilee.Byrnes@parks.ca.gov to confirm your bid has been received. It is recommended Bidders submit their bids at least one (1) hour in advance of the bid submission deadline to allow for confirmation of bid submission; however, it is the responsibility of the bidder to see that his/her bid is received in the proper time. Bids will be opened publicly over conference-call, upon request of Bidder(s). Please ensure a request for conference-call of bid opening is submitted 24-hours in advance to allow DPR adequate time to accommodate all Bidders. Neither confirmation receipt nor announcement of bid implicates responsiveness of Any bid. DPR will determine responsiveness of all bids after completion of bid reviews.

K. No bids will be accepted after the time set for the bid opening.

L. Bids will be opened and read publicly at the time set for the bid opening, or as soon as practicable thereafter.

M. Any bid may be withdrawn prior to the time fixed in the Notice to Contractors for submitting bids, provided a request for withdrawal is submitted in writing, signed by the bidder or his duly authorized representative and filed at, or e-mailed to or faxed to the place shown on the Notice to Contractors. *An oral, telegraphic, or telephonic request to withdraw or alter a bid proposal is not acceptable.*

N. No bid may be withdrawn after the time fixed in the Notice to Contractors for submitting bids.

O. No bids shall be considered unless a sworn statement is executed by the bidder on the form provided by the state titled "NONCOLLUSION AFFIDAVIT TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID FOR PUBLIC WORKS," DPR 837, and submitted with the bid.

P. In the case of a tie bid, the determination of a successful bidder will be made by a coin toss in the presence of all interested bidders, at a time and date set by the state.

## 1.04 CONTRACT

A. **Bids shall remain valid for 120 calendar days after the bid opening date ("120-Day Bid Validity Period"):** The State will endeavor to award a contract within 120 calendar days from the bid opening date. A contract is awarded upon the State providing written notifications to a bidder that it is the lowest responsible bidder and forwarding the contract documents to such bidder for bidder's signature. A contract is executed upon the State agency with approcal authority approving the contract. Bidders shall honor their bids for 120 calendar days after the bid opening date. If after 120 calendar days from the bid opening date a bidder has not received written notification from the State that bidder has been awarded the contract, such bidder may withdraw their bid. If within the 120-Day Bid Validity Period, a bidder receives written notification from the State that such bidder has been awarded the contract, such bidder shall continue to honor its bid and have no claim for any reason to amend its bid pending execution of the contract.

B. If the contract is awarded, it will be awarded to lowest responsible bidder whose bid complies with all prescribed requirements, which may include a “Small Business Vendor” in accordance with California Code of Regulations, Title 2, Section 1896 et seq.

C. The apparent low bidder, in order to qualify as the lowest responsible bidder, will be required to execute and deliver to the State the rquired contract documents.

D. The apparent low bidder shall execute the required number of copies of the contract documents and return them within ten (10) working days, not including Saturdays, Sundays and Legal Holidays, after he/she has received notice that he/she is the apparent low bidder. Signature of the apparent low bidder on the contract documents will complete identification of these documents.

Failure to provide the required executed contract documents within the ten (10) working days, not including Saturdays, Sundays and Legal Holidays may be deemed refusal of an award which may be cause for forfeiture of bidder’s security.

The state may award to the next lowest responsible bidder and avail itself of all legal remedies provided by statute.

E. The contract shall be binding upon the state only after approval by the state. Should work begin in advance of receiving notice that the Contract is approved, that work shall be considered as having been done by a volunteer and Contractor shall go unpaid.

**1.05 CERTIFICATE OF INSURANCE**

The contractor shall furnish a Certificate of Insurance to the state as described in General Conditions, DPR 483, Section 00700.

**1.06 CALIFORNIA PUBLIC CONTRACT CODE SECTION 10162 QUESTIONNAIRE**

Bidder shall be required to submit a DPR 20 (California Public Contract Code Section 10162 Questionnaire). Failure to submit this form with the bid shall not be cause for rejection; however, bidders must furnish the completed form within the time frame prescribed by the Department of Parks and Recreation. Failure to submit the required information within the time frame prescribed by the Department of Parks and Recreation may be deemed refusal of an award which shall be cause for forfeiture of bidder’s security.

Solicitation Number_____

# BIDDER DECLARATION

**1.** Prime bidder information **(Review attached Bidder Declaration Instructions prior to completion of this form)**:

**a.** Identify current California certification(s) **(MB, SB, NVSA, DVBE):** _____ **or None** ☐ (If "None", go to Item #2)

**b.** Will subcontractors be used for this contract? **Yes** ☐ **No** ☐ (If yes, indicate the distinct element of work your firm will perform in this contract e.g., list the proposed products produced by your firm, state if your firm owns the transportation vehicles that will deliver the products to the State, identify which solicited services your firm will perform, etc.). Use additional sheets, as necessary.

SAMPLE

**c.** If you are a California certified DVBE:
(1) Are you a broker or agent? **Yes** ☐ **No** ☐
(2) If the contract includes equipment rental, does your company own at least 51% of the equipment provided in this contract (quantity and value)? **Yes** ☐ **No** ☐ **N/A** ☐

**2.** If no subcontractors will be used, skip to certification below. Otherwise, list all subcontractors for this contract. (Attach additional pages if necessary):

| Subcontractor Name, Contact Person, Phone Number & Fax Number | Subcontractor Address & Email Address | CA Certification (MB, SB, NVSA, DVBE or None) | Work performed or goods provided for this contract | Corresponding % of bid price | Good Standing? | 51% Rental? |
|---|---|---|---|---|---|---|
| | | | | | ☐ | ☐ |
| | | | | | ☐ | ☐ |
| | | | | | ☐ | ☐ |

**CERTIFICATION: By signing the bid response, I certify under penalty of perjury that the information provided is true and correct.**

# BIDDER DECLARATION Instructions

**All prime bidders (the firm submitting the bid) must complete the Bidder Declaration.**

**1.a.** Identify all current certifications issued by the State of California. If the prime bidder has no California certification(s), check the line labeled "None" and proceed to Item #2. If the prime bidder possesses one or more of the following certifications, enter the applicable certification(s) on the line:

- Microbusiness (MB)
- Small Business (SB)
- Nonprofit Veteran Service Agency (NVSA)
- Disabled Veteran Business Enterprise (DVBE)

**1.b.** Mark either "Yes" or "No" to identify whether subcontractors will be used for the contract. If the response is "No", proceed to Item #1.c. If "Yes", enter on the line the distinct element of work contained in the contract to be performed or the goods to be provided by the prime bidder. Do not include goods or services to be provided by subcontractors.

Bidders certified as MB, SB, NVSA, and/or DVBE must provide a commercially useful function as defined in Military and Veterans Code Section 999 for DVBEs and Government Code Section 14837(d)(4)(A) for small/microbusinesses.

Bids must propose that certified bidders provide a commercially useful function for the resulting contract or the bid will be deemed non-responsive and rejected by the State. For questions regarding the solicitation, contact the procurement official identified in the solicitation.

**Note: A subcontractor is any person, firm, corporation, or organization contracting to perform part of the prime's contract.**

**1.c.** This item is only to be completed by businesses certified by California as a DVBE.

(1) Declare whether the prime bidder is a broker or agent by marking either "Yes" or "No". The Military and Veterans Code Section 999.2 (b) defines "broker" or "agent" as a certified DVBE contractor or subcontractor that does not have title, possession, control, and risk of loss of materials, supplies, services, or equipment provided to an awarding department, unless one or more of the disabled veteran owners has at least 51-percent ownership of the quantity and value of the materials, supplies, services, and of each piece of equipment provided under the contract.

(2) If bidding rental equipment, mark either "Yes" or "No" to identify if the prime bidder owns at least 51% of the equipment provided (quantity and value). If **not** bidding rental equipment, mark "N/A" for "not applicable."

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**2.** If no subcontractors are proposed, do not complete the table. Read the certification at the bottom of the form and complete "Page ____ of ____" on the form.

If subcontractors will be used, complete the table listing all subcontractors. If necessary, attach additional pages and complete the "Page ____ of ____" accordingly.

**2.** *(continued)* **Column Labels**

***Subcontractor Name, Contact Person, Phone Number & Fax Number***—List each element for all subcontractors.

***Subcontractor Address & Email Address***—Enter the address and if available, an Email address.

***CA Certification (MB, SB, NVSA, DVBE or None)***—If the subcontractor possesses a current State of California certification(s), verify on this website (www.eprocure.pd.dgs.ca.gov).

***Work performed or goods provided for this contract***—Identify the distinct element of work contained in the contract to be performed or the goods to be provided by each subcontractor. Certified subcontractors must provide a commercially useful function for the contract. (See paragraph 1.b above for code citations regarding the definition of commercially useful function.) If a certified subcontractor is further subcontracting a greater portion of the work or goods provided for the resulting contract than would be expected by normal industry practices, attach a separate sheet of paper explaining the situation.

***Corresponding % of bid price***—Enter the corresponding percentage of the total bid price for the goods and/or services to be provided by each subcontractor. Do not enter a dollar amount.

***Good Standing?***—Provide a response for each subcontractor listed. Enter either "Yes" or "No" to indicate that the prime bidder has verified that the subcontractor(s) is in good standing for all of the following:

- Possesses valid license(s) for any license(s) or permits required by the solicitation or by law
- If a corporation, the company is qualified to do business in California and designated by the State of California Secretary of State to be in good standing
- Possesses valid State of California certification(s) if claiming MB, SB, NVSA, and/or DVBE status

***51% Rental?***—This pertains to the applicability of rental equipment. Based on the following parameters, enter either "N/A" (not applicable), "Yes" or "No" for each subcontractor listed.

Enter "**N/A**" if the:

- Subcontractor is NOT a DVBE (regardless of whether or not rental equipment is provided by the subcontractor) or
- Subcontractor is NOT providing rental equipment (regardless of whether or not subcontractor is a DVBE)

Enter "**Yes**" if the subcontractor is a California certified DVBE providing rental equipment and the subcontractor owns at least 51% of the rental equipment (quantity and value) it will be providing for the contract.

Enter "**No**" if the subcontractor is a California certified DVBE providing rental equipment but the subcontractor does NOT own at least 51% of the rental equipment (quantity and value) it will be providing.

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**Read the certification at the bottom of the page and complete the "Page ____ of ____" accordingly.**

SAMPLE

STATE OF CALIFORNIA – DEPARTMENT OF GENERAL SERVICES PROCUREMENT DIVISION

# DISABLED VETERAN BUSINESS ENTERPRISE DECLARATIONS

DGS PD 843 (Rev. 9/2019)
Formerly STD. 843

**Instructions:** The disabled veteran (DV) owner(s) and DV manager(s) of the Disabled Veteran Business Enterprise (DVBE) must complete this declaration when a DVBE contractor or subcontractor will provide materials, supplies, services or equipment [Military and Veterans Code Section 999.2]. Violations are misdemeanors and punishable by imprisonment or fine and violators are liable for civil penalties. All signatures are made under penalty of perjury.

## SECTION 1

Name of certified DVBE: _____ DVBE Ref. Number: _____

Description (materials/supplies/services/equipment proposed): _____

Solicitation/Contract Number: _____ SCPRS Ref. Number: _____
(FOR STATE USE ONLY)

## SECTION 2

**APPLIES TO ALL DVBEs. Check only one box in Section 2 and provide original signatures.**

☐ I (we) declare that the DVBE is not a broker or agent, as defined in Military and Veterans Code Section 999.2 (b), of materials, supplies, services or equipment listed above. Also, complete Section 3 below if renting equipment.

☐ Pursuant to Military and Veterans Code Section 999.2 (f), I (we) declare that the DVBE is a broker or agent for the principal(s) listed below or on an attached sheet(s). *(Pursuant to Military and Veterans Code 999.2 (e), State funds expended for equipment rented from equipment brokers pursuant to contracts awarded under this section shall not be credited toward the 3-percent DVBE participation goal.)*

SAMPLE

All DV owners and managers of the DVBE **(attach additional pages with sufficient signature blocks for each person to sign)**:

_____ _____ _____
(Printed Name of DV Owner/Manager) (Signature of DV Owner/ Manager) (Date Signed)

_____ _____ _____
(Printed Name of DV Owner/Manager) (Signature of DV Owner/Manager) (Date Signed)

Firm/Principal for whom the DVBE is acting as a broker or agent: _____
(If more than one firm, list on extra sheets.) (Print or Type Name)

Firm/Principal Phone: _____ Address: _____

## SECTION 3

**APPLIES TO ALL DVBEs THAT RENT EQUIPMENT AND DECLARE THE DVBE IS NOT A BROKER.**

☐ Pursuant to Military and Veterans Code Section 999.2 (c), (d) and (g), I am (we are) the DV(s) with at least 51% ownership of the DVBE, or a DV manager(s) of the DVBE. The DVBE maintains certification requirements in accordance with Military and Veterans Code Section 999 et. seq.

☐ The undersigned owner(s) own(s) at least 51% of the quantity and value of each piece of equipment that will be rented for use in the contract identified above. I (we), the DV owners of the equipment, have submitted to the administering agency my (our) personal federal tax return(s) at time of certification and annually thereafter as defined in *Military and Veterans Code 999.2,* subsections (c) and (g). *Failure by the disabled veteran equipment owner(s) to submit their personal federal tax return(s) to the administering agency as defined in Military and Veterans Code 999.2, subsections (c) and (g), will result in the DVBE being deemed an equipment broker.*

Disabled Veteran Owner(s) of the DVBE **(attach additional pages with signature blocks for each person to sign)**:

_____ _____
(Printed Name) (Signature) (Date Signed)

_____ _____ _____
(Address of Owner) (Telephone) (Tax Identification Number of Owner)

Disabled Veteran Manager(s) of the DVBE **(attach additional pages with sufficient signature blocks for each person to sign)**:

_____ _____ _____
(Printed Name of DV Manager) (Signature of DV Manager) (Date Signed)



PRINT CLEAR

State of California – Natural Resources Agency
DEPARTMENT OF PARKS AND RECREATION

# COMMERCIALLY USEFUL FUNCTION – BIDDER CERTIFICATION

All California Certified Small Business (SB), Micro Business (MB), and Disabled Veteran Business Enterprise (DVBE) suppliers contracting and subcontracting must complete this certification form.

| LEGAL BUSINESS NAME (including "Doing Business As" DBA name) | DPR REFERENCE/AGREEMENT NUMBER |
|---|---|
| | |

| CERTIFICATIONS (mark all that apply) | DGS CERTIFICATION NUMBER (OSDS) | EXPIRATION DATE |
|---|---|---|
| ☐ Small Business ☐ Micro Business ☐ DVBE | | |

For this agreement, this business is the: ☐ Prime Contractor ☐ Subcontractor

All Certified Small Business, Micro Business, and/or DVBE prime contractors, subcontractors or suppliers must meet the commercially useful function requirements under Government Code Section 14837(d)(4)(A) for Small and Micro Businesses, and Military and Veterans Code Section 999(b)(5)(B)(i) for DVBEs.

SAMPLE

A. Is the GSPD-05-105, Bidder Declaration attached? ☐ Yes ☐ No

B. Is the DGS PD 843, Disabled Veteran Business Enterprise Declarations form attached if applicable?

☐ Yes ☐ No ☐ N/A

**Please answer the following 5 questions as they apply to your company for the goods and/or services being acquired in this solicitation:**

| | | | |
|---|---|---|---|
| 1 | Will your business be responsible for the execution of a distinct element of the resulting work? | ☐ Yes ☐ No | |
| 2 | Will your business carry out the obligation of the contract by actually performing, managing or supervising the work involved? | ☐ Yes ☐ No | |
| 3 | Will you perform work that is normal for your business, service and functions? | ☐ Yes ☐ No | |
| 4 | Will your business be responsible for products, inventories, materials, suppliers required for the contract, negotiating price, determining quality and quantity, ordering, installing (if applicable) and making payment? (Note: This only applies to GOODS. If this is a service, mark N/A and skip to #5.) | **Goods** ☐ Yes ☐ No | **Services** ☐ N/A |
| 5 | If subcontracting a portion of the work, is it a normal portion as expected by current industry practices? (Also answer Yes if not subcontracting any portion.) | ☐ Yes ☐ No | |

A response of "No" may result in your quote being deemed non-responsive and disqualified.

## BIDDER'S CERTIFICATION

*The signatory of this document must be the certified business owner (or authorized representative in the case of a corporation) and as such, hereby certifies under penalty of perjury under the laws of the State of California that all information provided herein is truthful and accurate.*

| PRINTED NAME AND TITLE OF AUTHORIZED SIGNER | SIGNATURE | DATE |
|---|---|---|
| | | |

## DEPARTMENT OF PARKS AND RECREATION USE

☐ APPROVED ☐ DENIED

| DPR BUYER/EVALUATOR PRINTED NAME | SIGNATURE | DATE |
|---|---|---|
| | | |

**State of California - Natural Resources Agency**
**DEPARTMENT OF PARKS AND RECREATION**

# NON-COLLUSION DECLARATION TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID FOR PUBLIC WORKS

The undersigned declares:

I am the_____ of _____, the party
(Position Title) (Company Name)
making the foregoing bid.

SAMPLE

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 andnot 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 elementof 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, hereby 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 thatthe foregoing is true and correct, and that this declaration is executed on

_____, at _____, _____
(Date) (City) (State/Zip Code)

_____
(Print or Type Name)

_____
(Signature)

**State of California - The Resources Agency**
**DEPARTMENT OF PARKS AND RECREATION**

# BIDDER'S BOND

**KNOW ALL PEOPLE BY THESE PRESENTS:**

That we, _____

_____, as Principal, and as Surety, are held and firmly bound unto the State of California, hereinafter called the State, in the penal sum of ten percent (10%) of the total amount of the bid of the Principal above named, submitted by said Principal to the State of California, Department of Parks and Recreation for the work described below, for the payment of which sum in lawful money of the United States, well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION of this obligation is such that:

WHEREAS, the Principal has submitted the above-mentioned bid to the State of California, Department of Parks and Recreation, for certain construction specifically described as follows, for which bids are to be opened at

_____

*(Insert place where bids will be opened)*

_____ on _____

*(Insert date of bid opening)*

for _____

*(Copy here the exact description of work, including location, as it appears on the proposal)*

_____

SAMPLE

NOW, THEREFORE, If the aforesaid Principal is awarded the contract and, within the time and manner required under the specifications, after the prescribed forms are presented to him or her for signature, enters into a written contract, in the prescribed form, in accordance with the bid, and files the two bonds with the Department, one to guarantee faithful performance and the other to guarantee payment for labor and materials, as required by law, then this obligation shall be null and void; otherwise, it shall be and remain in full force and virtue.

In the event suit is brought upon this bond by the Obligee and judgment is recovered, the Surety shall pay all costs incurred by the Obligee in such suit, including a reasonable attorney's fee to be fixed by the court.

IN WITNESS WHEREOF, We have hereunto set our hands and seals on this _____ day of _____, 20 _____.

_____ (SEAL)

_____ (SEAL)

_____ (SEAL)

*Principal*

_____ (SEAL)

_____ (SEAL)

_____ (SEAL)

*Surety*

NOTE: Signatures of those executing for the Surety must be properly acknowledged.

## CERTIFICATE OF ACKNOWLEDGEMENT

State of California

County of _____ ss

On this _____ day of _____ in the year of 20 _____ before me, a notary public in and for the county and state aforesaid, personally appeared, _____
known to me to be the person whose name is subscribed to the within instrument and known to me to be the attorney-in-fact of _____ and acknowledged to me that he subscribed the name of the said company thereto as surety, and his own name as attorney-in-fact.

(SEAL)

_____

*Notary Public*

**State of California - The Resources Agency**
**DEPARTMENT OF PARKS AND RECREATION**

# CALIFORNIA PUBLIC CONTRACT CODE SECTION 10162
# — Questionnaire —

| PARK UNIT NAME | PROJECT NAME |
|---|---|
| | |

NAME OF BUSINESS

***In accordance with Section 10162 of the California Public Contract Code, bidders shall complete, under penalty of perjury, the question below. Please answer the following:***

HAVE YOU, ANY OFFICER OF YOUR BUSINESS, OR ANY EMPLOYEE OF YOUR BUSINESS WHO HAS PROPRIETARY INTEREST IN YOUR BUSINESS EVER BEEN DISQUALIFIED, REMOVED, OR OTHERWISE PREVENTED FROM BIDDING ON, OR COMPLETING A FEDERAL, STATE, OR LOCAL GOVERNMENT PROJECT BECAUSE OF A VIOLATION OF LAW OR VIOLATION OF SAFETY REGULATIONS?

☐ **Yes** *(Explain circumstances below. Attach additional pages if needed.)* ☐ **No**

SAMPLE

## NOTICE TO BIDDERS

Bidders are cautioned that making false certification may subject the certifier to criminal prosecution.

The Department of Parks and Recreation (DPR) reserves the right under California Public Contract Code Section 10162 to reject any bidder, any officer of such bidder, or any employee of such bidder who has a proprietary interest in such bidder who has been disqualified, removed or otherwise prevented from bidding on, or completing a federal, state or local government project because of a violation of law or violation of safety regulations.

Failure to return this form with the bid shall not be cause for rejection; however, bidders must furnish the completed form within the time frame prescribed by the DPR. Failure to submit this form within the time frame prescribed by the DPR may be deemed refusal of an award which shall be cause for forfeiture of bidder's security.

## CERTIFICATION

*By my signature, I certify under penalty of perjury under the laws of the State of California that the foregoing questionnaire and statements pursuant to California Public Contract Code Section 10162 are true and correct.*

BIDDER SIGNATURE PRINTED NAME DATE

▶

State of California - Natural Resources Agency
DEPARTMENT OF PARKS AND RECREATION

| *FOR DEPARTMENT USE ONLY* |
|---|
| AGREEMENT/PAPO NO. |

# DARFUR CONTRACTING ACT CERTIFICATION

**DO NOT COMPLETE OR RETURN THIS FORM IF:** Within the previous three years, your company **HAS NOT** had any business activities or other operations outside of the United States.

**All other companies, complete Option #1 or Option #2 and return:**

Public Contract Code Sections 10475 -10481 applies to any company that currently or within the previous three years has had business activities or other operations outside of the United States. For such a company to bid on or submit a proposal for a State of California contract, the company must certify that it is either a) not a scrutinized company; or b) a scrutinized company that has been granted permission by the Department of General Services to submit a proposal.

SAMPLE

## OPTION #1 - CERTIFICATION

If your company, within the previous three years, has had business activities or other operations outside of the United States, in order to be eligible to submit a bid or proposal, please insert your company name and Federal ID Number and complete the certification below.

I, the official named below, CERTIFY UNDER PENALTY OF PERJURY that a) the prospective proposer/bidder named below is not a scrutinized company per Public Contract Code 10476; and b) I am duly authorized to legally bind the prospective proposer/bidder named below. This certification is made under the laws of the State of California.

| COMPANY/VENDOR NAME *(Printed)* | FEDERAL ID NUMBER |
|---|---|
| BY *(Authorized Signature)* ► | |
| PRINTED NAME AND TITLE OF PERSON SIGNING | |
| DATE EXECUTED | EXECUTED IN THE COUNTY AND STATE OF |

## OPTION #2 - WRITTEN PERMISSION FROM DGS

Pursuant to Public Contract Code section 10477(b), the Director of the Department of General Services may permit a scrutinized company, on a case-by-case basis, to bid on or submit a proposal for a contract with a state agency for goods or services, if it is in the best interests of the state. If you are a scrutinized company that has obtained written permission from the DGS to submit a bid or proposal, complete the information below.

We are a scrutinized company as defined in Public Contract Code section 10476, but we have received written permission from the Department of General Services to submit a bid or proposal pursuant to Public Contract Code section 10477(b). A copy of the written permission from DGS is included with our bid or proposal.

| COMPANY/VENDOR NAME *(Printed)* | FEDERAL ID NUMBER |
|---|---|
| INITIALS OF SUBMITTER | |
| PRINTED NAME AND TITLE OF PERSON INITIALING | |

DO NOT COMPLETE THIS FORM UNLESS YOUR COMPANY MEETS THE CRITERIA OF OPTION #1 OR OPTION #2.

# FAIR CHANCE EMPLOYMENT ACT

**Public Contract Code 10186:**

(a) This section shall be known, and may be cited, as the "Fair Chance Employment Act."

(b) Any person submitting a bid to the state on a contract involving onsite construction-related services shall certify that the person will not ask an applicant for onsite construction-related employment to disclose orally or in writing information concerning the conviction history of the applicant on or at the time of an initial employment application.

(c) This section shall not apply to a position for which the person or the state is otherwise required by state or federal law to conduct a conviction history background check or to any contract position with a criminal justice agency, as that term is defined in Section 13101 of the Penal Code.

(d) This section shall not apply to a person to the extent that he or she obtains workers from a hiring hall pursuant to a bona fide collective bargaining agreement.

SAMPLE

## CERTIFICATION

*By my signature, I certify under penalty of perjury under the laws of the State of California that I have read, understand and will abide by California Public Contract Code Section 10186.*

| *Contractor/Bidder Firm Name (Printed)* | *Federal ID Number* |
|---|---|
| *By (Authorized Bidders Signature)* | |
| *Printed Name and Title of Person Signing* | |
| *Date Executed* | *Executed in the County of* |

State of California – Natural Resources Agency
DEPARTMENT OF PARKS AND RECREATION

# ARTIFICIAL INTELLIGENCE (AI) DISCLOSURE FORM

Instructions for this form are on Page 3.

## I. BIDDER CONTACT INFORMATION

BUSINESS NAME | SOLICITATION NUMBER

REPRESENTATIVE NAME | BUSINESS TELEPHONE NUMBER

BUSINESS ADDRESS | CITY | STATE | ZIP CODE

SAMPLE

**Description of Services:**

Describe in detail the services being provided. Include names of products and large language model.

## II. DISCLOSURE

Will you and/or your subcontractor(s) be using or offering AI technology, model, service, or system (collectively, "product") for this product in question?

☐ No. (Skip to Section IIII) ☐ Yes. (Answer 1-5 below)

**1. What type of AI is included?**

☐ Traditional AI ☐ Generative AI

**2. Is the AI required for this product?**

☐ No ☐ Yes ☐ Other:

**3. What is the model and version of this product?**

**4. What is the license tier of the AI product, if applicable (free, enterprise, platinum, etc.)?**

SAMPLE

**5. How is the AI solution delivered: IaaS, PaaS, SaaS, or will it be deployed on-premises? (Indicate if this is a thin client, thick client, web extension, plugin, etc.)**

Provide the best contact for information related to questions related to the AI included in the product (if different than the representative listed in Section I.)

| NAME | E-MAIL | PHONE NUMBER |
|---|---|---|

## III. SIGNATURE

By signing this document, I have identified and reported any AI use in the performance of this product in question.

| Signature | Date |
|---|---|

## ARTIFICIAL INTELLIGENCE (AI) DISCLOSURE FORM (Instructions)

**Instructions:**

The Department of Parks and Recreation (DPR) is required to track and complete risk assessments for any Generative Artificial Intelligence (GenAI) purchases. This document is intended to help DPR identify GenAI and assess the risk related to any GenAI purchases.

**Section I:**

Bidders shall fill in their contact information.

The DPR staff shall fill out the Description of Services in detail and/or reference the applicable Statement of Work or attachment(s). Include the services to be provided related to AI and include the names of products and large language model. It is important to include as much detail as possible related to any AI aspect of the potential purchase.

SAMPLE

**Section II:**

Bidders shall disclose any aspect of AI related to the purchase.

If “no” is selected, no further information is required in this section.

If “yes” is selected, the Bidder shall fill out answers to questions 1-5. Bidders should provide as much detail as possible related to the AI technology, model, service or system as it relates to what the DPR is soliciting for.

**If GenAI is selected and the DPR staff intends to pursue the product, the DPR staff must complete the** SIMM 5305-F GenAI Intelligence Risk Assessment, Data Classification section and the Risk Assessment Questionnaire questions a-j; and submit it to ISPO@parks.ca.gov with a cc: to both PMO@parks.ca.gov and DPR-IT.Procurement@parks.ca.gov. Contact ISPO@parks.ca.gov for assistance with completing this assessment.

Upon review, ISPO will contact the DPR staff for more information, if needed, prior to submitting the finalized document to the California Department of Technology.

Procurement efforts will be placed on temporary hold pending CDT approval.

**Definitions:**

- IaaS – Infrastructure as a Service is a cloud computing model that provides on-demand access to virtualized computing resources like servers, storage, and networking.
- PaaS – Platform as a Service is a cloud computing model that provides a complete platform for developing, running, and managing applications.
- SaaS – Software as a Service a cloud-based software delivery model where users access and use applications over the internet via a subscription rather than purchasing and installing software locally.

**Section III:**

Bidder signatures are required to certify all provided information on this document is true and accurate to the best of their knowledge.

STATE OF CALIFORNIA
**CALIFORNIA CIVIL RIGHTS LAWS ATTACHMENT**
DGS OLS 04 (Rev. 01/17)

DEPARTMENT OF GENERAL SERVICES
OFFICE OF LEGAL SERVICES

Pursuant to Public Contract Code section 2010, a person that submits a bid or proposal to, or otherwise proposes to enter into or renew a contract with, a state agency with respect to any contract in the amount of $100,000 or above shall certify, under penalty of perjury, at the time the bid or proposal is submitted or the contract is renewed, all of the following:

1. CALIFORNIA CIVIL RIGHTS LAWS: For contracts executed or renewed after January 1, 2017, the contractor certifies compliance with the Unruh Civil Rights Act (Section 51 of the Civil Code) and the Fair Employment and Housing Act (Section 12960 of the Government Code); and

2. EMPLOYMENT DISCRIMINATORY POLICIES: For contracts executed or renewed after January 1, 2017, if a Contractor has an internal policy against a sovereign nation or people recognized by the United States government, the Contractor certifies that such policies are not used in violation of the Unruh Civil Rights Act (Section 51 of the Civil Code) or the Fair Employment and Housing Act (Section 12960 of the Government Code).

SAMPLE

## CERTIFICATION

I, the official named below, certify under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

| Proposer/Bidder Firm Name (Printed) | Federal ID Number |
|---|---|
| | |

By (Authorized Signature)

Printed Name and Title of Person Signing

| Executed in the County of | Executed in the State of |
|---|---|
| | |

Date Executed

**SCO ID:** 3790-C2XXXXXXX

STATE OF CALIFORNIA - DEPARTMENT OF GENERAL SERVICES

**STANDARD AGREEMENT**

STD 213 (Rev. 04/2020)

| AGREEMENT NUMBER | PURCHASING AUTHORITY NUMBER (If Applicable) |
|---|---|
| C2XXXXXXX | |

1. This Agreement is entered into between the Contracting Agency and the Contractor named below:

CONTRACTING AGENCY NAME

Department of Parks and Recreation

CONTRACTOR NAME

2. The term of this Agreement is:

START DATE

Notice to Proceed (NTP)

THROUGH END DATE

Two (2) Years From NTP

3. The maximum amount of this Agreement is:

$

Dollars and Zero Cents

SAMPLE

4. The parties agree to comply with the terms and conditions of the following exhibits, which are by this reference made a part of the Agreement.

| Exhibits | Title | Pages |
|---|---|---|
| Exhibit A | Scope of Work | 1 |
| Exhibit B | Budget Detail and Payment Provisions | 2 |
| Exhibit B | Attachment I, Public Works Bid Forms | 2 |
| Exhibit B | Attachment II, Bidder Declaration (GSPD 05-105) | 1 |
| Exhibit C * | General Terms and Conditions (GTC) | 04/2017 |
| Exhibit D | Special Terms and Conditions | 1 |
| Exhibit D | Attachment I, Project Manual | XX |

*Items shown with an asterisk (*), are hereby incorporated by reference and made part of this agreement as if attached hereto.*
*These documents can be viewed at https://www.dgs.ca.gov/OLS/Resources*

*IN WITNESS WHEREOF, THIS AGREEMENT HAS BEEN EXECUTED BY THE PARTIES HERETO.*

**CONTRACTOR**

CONTRACTOR NAME (if other than an individual, state whether a corporation, partnership, etc.)

| CONTRACTOR BUSINESS ADDRESS | CITY | STATE | ZIP |
|---|---|---|---|
| | | | |

| PRINTED NAME OF PERSON SIGNING | TITLE |
|---|---|
| | |

| CONTRACTOR AUTHORIZED SIGNATURE | DATE SIGNED |
|---|---|
| | |

**SCO ID:** 3790-C2XXXXXXX

STATE OF CALIFORNIA - DEPARTMENT OF GENERAL SERVICES
**STANDARD AGREEMENT**
STD 213 (Rev. 04/2020)

| AGREEMENT NUMBER | PURCHASING AUTHORITY NUMBER (If Applicable) |
|---|---|
| C2XXXXXXX | |

**STATE OF CALIFORNIA**

| CONTRACTING AGENCY NAME | | | |
|---|---|---|---|
| Department of Parks and Recreation | | | |
| **CONTRACTING AGENCY ADDRESS** | **CITY** | **STATE** | **ZIP** |
| 2241 Harvard Street, Suite 200 | Sacramento | CA | 95815 |
| **PRINTED NAME OF PERSON SIGNING** | **TITLE** | | |
| Brian Dewey | Assistant Deputy Director,Facilities & Development | | |
| **CONTRACTING AGENCY AUTHORIZED SIGNATURE** | **DATE SIGNED** | | |
| | | | |
| **CALIFORNIA DEPARTMENT OF GENERAL SERVICES APPROVAL** | **EXEMPTION (If Applicable)** | | |
| | DGS APPROVAL NOT REQUIRED<br>Exempt per PCC § 10106(a)(3)<br>Exempt per PCC § 10107 | | |

SAMPLE

# EXHIBIT A — Public Works
# (Standard Agreement)

**SCOPE OF WORK**

1. Contractor agrees to furnish all labor, tools, materials and equipment necessary to:

SAMPLE

2. The work shall be performed at:

3. The work shall be provided during:

4. The project representatives during the term of this agreement will be:

| | | | |
|---|---|---|---|
| State Agency: | | Contractor: | |
| Section/Unit: | | Section/Unit: | |
| Attention: | | Attention: | |
| Address: | | Address: | |
| City/State/Zip Code: | | City/State/Zip Code: | |
| Phone: | | Phone: | |
| Fax: | | Fax: | |
| E-mail: | | E-mail: | |

# EXHIBIT B — PUBLIC WORKS
# (Standard Agreement)

SAMPLE

## BUDGET DETAIL AND PAYMENT PROVISIONS

### 1. Invoicing and Payment

A. For services satisfactorily rendered, and upon receipt and approval of the invoices, the State agrees to compensate the Contractor for actual expenditures incurred in accordance with the rates specified in the Bid Form, marked Exhibit B, Attachment 1, which is attached hereto and made a part of this Agreement.

B. Invoices shall include the Agreement Number and shall be submitted in triplicate not more frequently than monthly in arrears to:

### 2. Budget Contingency Clause

A. It is mutually agreed that if the Budget Act of the current year and/or any subsequent years covered under this Agreement does not appropriate sufficient funds for the program, this Agreement shall be of no further force and effect. In this event, the State shall have no liability to pay any funds whatsoever to Contractor or to furnish any other considerations under this Agreement and Contractor shall not be obligated to perform any provisions of this Agreement.

B. If funding for any fiscal year is reduced or deleted by the Budget Act for purposes of this program, the State shall have the option to either cancel this Agreement with no liability occurring to the State, or offer an agreement amendment to Contractor to reflect the reduced amount.

### 3. Prompt Payment Clause

Payment will be made in accordance with, and within the time specified in, Government Code Chapter 4.5, commencing with Section 927.

### 4. Compensation

Contractor shall submit to the State an itemized request for payment, in triplicate, no more than once each 30 day period. All invoices or requests for payment, not on Contractor's preprinted stationery, shall be signed by the Contractor or his authorized representative and submitted to the State's Representative as indicated in paragraph 1B above.

Five percent (5%) shall be retained from each progress payment and held by the State as partial security for the fulfillment of the contract by the Contractor. The State shall pay the Contractor the value of such work, as estimated therein, after deducting therefrom all previous payments, and all amounts to be retained under the provisions of this Agreement. No progress payments will be made by the State for project terms less than thirty (30) days. The one and only payment will be the final payment made by the State upon satisfactory completion of all work required under the contract documents.

# EXHIBIT B — PUBLIC WORKS
# (Standard Agreement)

## BUDGET DETAIL AND PAYMENT PROVISIONS

### 5. Disabled Veterans Participation Goals

A. Upon completion of an award contract in which a commitment to achieve a DVBE goal was made, the prime contractor that entered into a subcontract with a DVBE is required to complete and submit form STD. 817 within 60 days to certify payment information to the awarding department, in accordance with Military and Veterans Code (M&VC) Section 999.5.

SAMPLE

B. For contracts awarded on or after January 1, 2021, pursuant to M&VC Section 999.7, the State shall withhold ten thousand dollars ($10,000) from the final payment, or the full final payment if less than ten thousand dollars ($10,000), until the prime contractor complies with the certification requirements of M&VC Section 999.5. Prime contractors that fail to comply with the certification requirements shall be given notice and allowed to cure the defect. If after 15 calendar days but not more than 30 calendar days from the date of the notice, the prime contractor fails to comply with the certification requirements, the State shall permanently deduct ten thousand ($10,000) from the final payment, or the full payment if less than ten thousand dollar ($10,000). The withholding applies to all contracts with a DVBE subcontractor.

C. Notwithstanding any other law, an awarding department shall not withhold more than the amount specified on the final payment of any disabled veteran business enterprise contract for the purposes of ensuring compliance with the certification requirements of M&VC 999.5.

State of California - Natural Resources Agency
DEPARTMENT OF PARKS AND RECREATION

# Exhibit B, Attachment 1
# PUBLIC WORKS BID FORM

| BID TIME | BID DATE |
|---|---|
| 2:00 P.M. | September 2, 2026 |
| PROJECT LOCATION | |
| **MOUNT DIABLO SP** | |
| PROJECT NAME | |
| C26863001 Mitchell Canyon Education Center | |

**Nondiscrimination Compliance Statement:** The prospective contractor's signature affixed hereon and dated shall constitute a certification under penalty of perjury under the laws of the State of California that the bidder has, unless exempted, complied with the nondiscrimination program requirements of Government Code Section 12990 and Title 2, California Code of Regulations, Section 8103.

**Verification:** By signing this Bid Form, the bidder assures the state that it has not been convicted of violating a state or federal law regarding the employment of undocumented aliens, in the preceding five years.

The prospective contractor's signature affixed hereon and dated shall constitute a certification that the representations made by the prospective contract in the bid are made under penalty of perjury under the laws of the State of California.

***Important:*** *Pursuant to Title 2, California Code of Regulations, Section 8103 and Business and Professions Code Section 7028.15, no bid will be considered unless it contains the certifications and license information requested on this form. The State reserves the right to waive any irregularity in any bid or to reject any or all bids.*

**CERTIFICATION**

***I, the official named below, CERTIFY UNDER PENALTY OF PERJURY that I am duly authorized to legally bind the prospective Contractor to the clause(s) listed above. This certification is made under the laws of the State of California. I understand that failure to submit the Public Works Bid Form with the appropriate bidder signature will result in rejection of the bid.***

SAMPLE

BY *(Authorized Signature)* DATE

►

PRINTED NAME AND TITLE OF PERSON SIGNING

| CONTRACTOR/BIDDER FIRM NAME *(Printed) - AS IT APPEARS ON LICENSE* | | PHONE NO. | FAX NO. |
|---|---|---|---|
| MAILING ADDRESS | | CITY/STATE/ZIP CODE | EMAIL |
| LICENSE CLASSIFICATION | LICENSE NO. | LICENSE EXPIRATION DATE. | DIR REGISTRATION NO. |

STATUS OF BUSINESS *(Check appropriate box.)*

☐ Individual.

☐ Corporation. State in which incorporated: _____

☐ Partnership. Full names of partners: _____

**Listed hereinafter are the names, addresses and contractor's license numbers of all subcontractors who will perform work or labor or render services in an amount in excess of one-half of one percent of the general contractor's total bid if this bid is accepted and the portion of the work that each will perform. Material vendors are not included.**

| KIND OF WORK | NAME AND ADDRESS | LICENSE NO. |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

The bidder hereby proposes to furnish all labor, materials, tools and equipment necessary to construct the Mitchell Canyon Education Center at **MOUNT DIABLO SB** in Contra Costa County, California, complete and ready for use in accordance with the contract documents therefore, for the following lump sum which shall include all applicable taxes and other expenses:

**Base Bid Lump Sum Total:** **$_____**

**Base Bid Lump Sum Total Written Out:**

_____

SAMPLE

| Item | Quantity | Description | Item Total |
|---|---|---|---|
| Deductive Alternate: | | | |
| 1. | Lump Sum | Base Bid: Includes all contract bid documents. Construction drawings A0-0.1 through S3-5.6<br><br>Deductive Alternate No 01: Construction of concrete trailhead path and relocate sign kiosk, post footings in concrete. Fiber rolls around future trailhead path. Provide truncated domes where trail meets vehicular surface, typ. Custom sliding fiber cement barn door shutters, barn door guide blocks, lockable Hose Bibb and gravel drainage area.<br>Refer to sheets A0-1.2, A0-1.3, A1-2.2, A1-3.1, A1-3.3, A1-8.1, A1-8.2, A1-9.4, C1.1, C1.2, C2.0, C4.0, L1.0, L1.1, L1.2, L3.0, L4.0, A0-1.0, A0-1.2, A0-1.3, | $_____ |

The bidder agrees to complete all work within **TWO HUNDRED SEVENTY (270)** calendar days from the date of written notice to commence work. This time includes ten (10) calendar days allowed for the contractor to begin work.

The State desires to complete the maximum amount of work that can be accomplished within available funds. The award of contract, if made, will be to the lowest responsible bidder who submits the lowest Base Bid amount.

Should the lowest qualified bid for the Base Bid be greater than the available funds, the Project will be reduced by taking into consideration the Deductive Alternate which decreases the bid in listed numerical sequence of precedence shown above (i.e., Deductive Alternate #1). Therefore, the award of contract, if made, will be to the lowest responsible bidder for the Base bid minus Deductive Alternate #1. (i.e., **$100,000 - $10,000 = $90,000**)

After award of the Contract, the State, at its discretion, reserves the right to add, via amendment, to the Contract Work, any deductive work that was eliminated during the bid process. Immediately following award of the Contract the State will notify each party involved, in writing of the status of each alternate. The State will indicate if alternates have been accepted, rejected, or deferred for later consideration.

SAMPLE

# EXHIBIT D — PUBLIC WORKS
## (Standard Agreement)

**SPECIAL TERMS AND CONDITIONS**

1. **Project Manual**

The Project Manual, marked Exhibit D, Attachment I, containing general conditions, plans and specifications, and other pertinent bid documents related to this project, as enumerated in the Project Manual's Table of Contents, is hereby attached and incorporated into this agreement.

SAMPLE

2. **Public Works - Rules/Regulations**

Contractor shall observe and comply with all federal, state, city, and county laws, rules or regulations affecting the work. Any work done that does not comply with any laws, rules, or regulations will be remedied at the Contractor's expense.

3. **Executive Order N-6-22 – Russia Sanctions**

On March 4, 2022, Governor Gavin Newsom issued Executive Order N-6-22 (the EO) regarding Economic Sanctions against Russia and Russian entities and individuals. "Economic Sanctions" refers to sanctions imposed by the U.S. government in response to Russia's actions in Ukraine, as well as any sanctions imposed under state law. The EO directs state agencies to terminate contracts with, and to refrain from entering any new contracts with, individuals or entities that are determined to be a target of Economic Sanctions. Accordingly, should the State determine Contractor is a target of Economic Sanctions or is conducting prohibited transactions with sanctioned individuals or entities, that shall be grounds for termination of this agreement. The State shall provide Contractor advance written notice of such termination, allowing Contractor at least 30 calendar days to provide a written response. Termination shall be at the sole discretion of the State.

# PAYMENT BOND TO ACCOMPANY CONSTRUCTION CONTRACT

(Public Contract Code Sections 7103 and 10221)

BOND NO._____

The premium on this bond is _____ for the term of _____

## Know All Men By These Presents:

That the State of California, acting by and through the_____, has awarded to _____whose address for service is _____, as Principal, a contract for the work described as follows:

Project Title: _____

Project Location: _____

WHEREAS, the provisions of Public Contract Code Sections 7103 and 10221 require that the Principal file a bond in connection with said contract and this bond is executed and tendered in accordance therewith.

NOW THEREFORE, Principal and _____, a Surety Corporation organized under the laws of _____, and authorized to transact a general surety business is in the State of California, as Surety, are held and firmly bound to the People of the State of California in the penal sum of_____, for which payment we bind ourselves, our heirs, executors, administrators, successors and assigns jointly and severally, firmly by these presents.

SAMPLE

## THE CONDITION OF THIS OBLIGATION IS SUCH,

1. That if said Principal or its subcontractors shall fail to pay any of the persons named in Civil Code Section 9100, or amounts due under the Unemployment Insurance Code with respect to work or labor performed under the contract, or for any amounts required to be deducted, withheld, and paid over to the Employment Development Department from the wages of employees of the Principal and subcontractors pursuant to Section 13020 of the Unemployment Insurance Code, with respect to such work and labor, that the surety herein will pay for the same, otherwise this obligation is to be void. In case suit is brought upon this bond, the Surety will pay a reasonable attorney's fee to be fixed by the court.
2. This bond shall inure to the benefit of any persons named in Civil Code Section 9100 as to give a right of action to such persons or their assigned in any suit brought upon this bond.
3. The aggregate liability of the Surety hereunder, including costs and attorney fees, on all claims whatsoever shall not exceed the penal sum of the bond in accordance with the provisions of Section 996.470(a) of the Code of Civil Procedure.
4. This bond is executed by the Surety, to comply with the provisions of Public Contract Code Sections 7103, 10221 and 10222, of Chapter 5, Title 3, Part 6, Division 4 of the Civil Code and of Chapter 2, Title 14, Part 2 of the Code of Civil Procedure and said bond shall be subject to all of the terms and provisions thereof.
5. This bond may be cancelled by the Surety in accordance with the provisions of Section 996.310 et seq. of the Code of Civil Procedure.
6. This bond to become effective _____

_____ (NAME OF SURETY)

_____ (ADDRESS FOR SERVICE)

I certify (or declare) under penalty of perjury under the laws of the State of California that I have executed the foregoing bond under an unrevoked power of attorney.

Executed in _____ (CITY AND STATE) on _____ (DATE)

_X_____
(SIGNATURE OF ATTORNEY IN FACT)

_____
(PRINTED OR TYPED NAME OR ATTORNEY IN FACT)

# PERFORMANCE BOND TO ACCOMPANY CONTRACT

**KNOW ALL MEN BY THESE PRESENTS:**

**THAT WHEREAS**, The State of California, acting by and through the Department of Parks and Recreation, has awarded to **CONTRACTOR** a corporation existing under and by virtue of the laws of the State of California as principal, hereinafter designated as the "Contractor", a contract for the work described as follows:

**PARK NAME, Project Name**

**AND WHEREAS**, Said Contractor is required to furnish a bond in connection with said contract, guaranteeing the faithful performance thereof;

**NOW, THEREFORE**, We the undersigned Contractor and surety are held and firmly bound unto the State of California, in the sum of **Contract Amount ($00.00)** to be paid to the State 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.

SAMPLE

**THE CONDITION OF THIS OBLIGATION IS SUCH**,

That if the above bound Contractor, his or its heirs, executors, administrators, successors, or assigns, shall in all things stand to and abide by, and well and truly keep and perform the covenants, conditions and agreements in the foregoing contract and any alteration thereof made as therein provided, on his or their part to be kept and performed at the time and in the manner therein specified, and in all respects according to their true intent and meaning, and shall indemnify and save harmless the State of California, its officers and agents, as therein stipulated, then this obligation shall become and be null and void; otherwise, it shall be and remain in full force and virtue.

IN WITNESS WHEREOF, We have hereunto set our hands and seals on this _____ day of _____, 20___.

_____

By _____
Contractor

_____ (Seal)
Name of Surety

By_____
Attorney-in-Fact

NOTE: Signatures of those executing for the surety must be properly acknowledged, and a Power of Attorney attached.

CERTIFICATE OF ACKNOWLEDGEMENT

State of California
County of _____ ss

On this _____ day of _____ in the year 20_____ before me, a notary public in and for

The county and state aforesaid, personally appeared _____
(Attorney-in-Fact)
Known to me to be the person whose name is subscribed to the within instrument and known to me to be the Attorney-in-Fact of

_____ and acknowledged to me that he subscribed the name of the said company thereto as surety, and his own name as Attorney-in-Fact.

(SEAL)

_____
NOTARY PUBLIC

Print Form | Reset Form

STATE OF CALIFORNIA – DEPARTMENT OF FINANCE

# PAYEE DATA RECORD

(Required when receiving payment from the State of California in lieu of IRS W-9 or W-7)

STD 204 (Rev. 03/2021)

## Section 1 – Payee Information

**NAME** (This is required. Do not leave this line blank. Must match the payee's federal tax return)

**BUSINESS NAME, DBA NAME or DISREGARDED SINGLE MEMBER LLC NAME** (If different from above)

**MAILING ADDRESS** (number, street, apt. or suite no.) (See instructions on Page 2)

| CITY, STATE, ZIP CODE | E-MAIL ADDRESS |
|---|---|
| | |

## Section 2 – Entity Type

**Check one (1) box only that matches the entity type of the Payee listed in Section 1 above.** (See instructions on page 2)

- ☐ **SOLE PROPRIETOR / INDIVIDUAL**
- ☐ **SINGLE MEMBER LLC** *Disregarded Entity owned by an individual*
- ☐ **PARTNERSHIP**
- ☐ **ESTATE OR TRUST**

**CORPORATION** (see instructions on page 2)

- ☐ **MEDICAL** *(e.g., dentistry, chiropractic, etc.)*
- ☐ **LEGAL** *(e.g., attorney services)*
- ☐ **EXEMPT** *(e.g., nonprofit)*
- ☐ **ALL OTHERS**

SAMPLE

## Section 3 – Tax Identification Number

Enter your Tax Identification Number (TIN) in the appropriate box. The TIN must **match** the name given in Section 1 of this form. Do not provide more than one (1) TIN. The TIN is a 9-digit number. **Note:** Payment will not be processed without a TIN.

- For **Individuals**, enter SSN.
- If you are a **Resident Alien**, and you do not have and are not eligible to get an SSN, enter your ITIN.
- Grantor Trusts (such as a Revocable Living Trust while the grantors are alive) may not have a separate FEIN. Those trusts must enter the individual grantor's SSN.
- For **Sole Proprietor or Single Member LLC (disregarded entity), in which the sole member is an individual**, enter SSN (ITIN if applicable) or FEIN (FTB prefers SSN).
- For **Single Member LLC (disregarded entity), in which the sole member is a business entity**, enter the owner entity's FEIN. Do not use the disregarded entity's FEIN.
- For all other entities including LLC that is taxed as a corporation or partnership, estates/trusts (with FEINs), enter the entity's FEIN.

**Social Security Number (SSN) or Individual Tax Identification Number (ITIN)**

___ ___ ___ -___ ___ - ___ ___ ___ ___

**OR**

**Federal Employer Identification Number (FEIN)**

___ ___ - ___ ___ ___ ___ ___ ___ ___

## Section 4 – Payee Residency Status (See instructions)

☐ **CALIFORNIA RESIDENT** – Qualified to do business in California or maintains a permanent place of business in California.

☐ **CALIFORNIA NONRESIDENT** – Payments to nonresidents for services may be subject to state income tax withholding.

☐ No services performed in California

☐ Copy of Franchise Tax Board waiver of state withholding is attached.

## Section 5 – Certification

***I hereby certify under penalty of perjury that the information provided on this document is true and correct. Should my residency status change, I will promptly notify the state agency below.***

| NAME OF AUTHORIZED PAYEE REPRESENTATIVE | TITLE | E-MAIL ADDRESS |
|---|---|---|
| | | |

| SIGNATURE | DATE | TELEPHONE *(include area code)* |
|---|---|---|
| | | |

## Section 6 – Paying State Agency

**Please return completed form to:**

| STATE AGENCY/DEPARTMENT OFFICE | UNIT/SECTION |
|---|---|
| Department of Parks and Recreation | Park Operations Adminstrative Services Division |
| **MAILING ADDRESS** | **FAX** |
| 2241 Harvard Street, Suite 200 | |

| CITY | STATE | ZIP CODE | E-MAIL ADDRESS |
|---|---|---|---|
| Sacramento | CA | 95815 | merrilee.byrnes@parks.ca.gov |

STATE OF CALIFORNIA – DEPARTMENT OF FINANCE

# PAYEE DATA RECORD

(Required when receiving payment from the State of California in lieu of IRS W-9 or W-7)

STD 204 (Rev. 03/2021)

**GENERAL INSTRUCTIONS**

Type or print the information on the Payee Data Record, STD 204 form. Sign, date, and return to the state agency/department office address shown in Section 6. Prompt return of this fully completed form will prevent delays when processing payments.

Information provided in this form will be used by California state agencies/departments to prepare Information Returns (Form1099).
**NOTE:** Completion of this form is optional for Government entities, i.e. federal, state, local, and special districts.

A completed Payee Data Record, STD 204 form, is required for all payees (non-governmental entities or individuals) entering into a transaction that may lead to a payment from the state. Each state agency requires a completed, signed, and dated STD 204 on file; therefore, it is possible for you to receive this form from multiple state agencies with which you do business.

Payees who do not wish to complete the STD 204 may elect not to do business with the state. If the payee does not complete the STD 204 and the required payee data is not otherwise provided, payment may be reduced for federal and state backup withholding. Amounts reported on Information Returns (Form 1099) are in accordance with the Internal Revenue Code (IRC) and the California Revenue and Taxation Code (R&TC).

## Section 1 – Payee Information

**Name** – Enter the name that appears on the payee's federal tax return. The name provided shall be the tax liable party and is subject to IRS TIN matching (when applicable).

- Sole Proprietor/Individual/Revocable Trusts – enter the name shown on your federal tax return.
- Single Member Limited Liability Companies (LLCs) that is disregarded as an entity separate from its owner for federal tax purposes - enter the name of the individual or business entity that is tax liable for the business in section 1. Enter the DBA, LLC name, trade, or fictitious name under Business Name.
- Note: for the State of California tax purposes, a Single Member LLC is not disregarded from its owner, even if they may be disregarded at the Federal level.
- Partnerships, Estates/Trusts, or Corporations – enter the entity name as shown on the entity's federal tax return. The name provided in Section 1 must match to the TIN provided in section 3. Enter any DBA, trade, or fictitious business names under Business Name.

**Business Name** – Enter the business name, DBA name, trade or fictitious name, or disregarded LLC name.
**Mailing Address** – The mailing address is the address where the payee will receive information returns. Use form STD 205, Payee Data Record Supplement to provide a remittance address if different from the mailing address for information returns, or make subsequent changes to the remittance address.

SAMPLE

## Section 2 – Entity Type

| If the Payee in Section 1 is a(n)… | THEN Select the Box for… |
|---|---|
| Individual ● Sole Proprietorship ● Grantor (Revocable Living) Trust disregarded for federal tax purposes | Sole Proprietor/Individual |
| Limited Liability Company (LLC) owned by an individual and is disregarded for federal tax purposes | Single Member LLC-owned by an individual |
| Partnerships ● Limited Liability Partnerships (LLP) ● and, LLC treated as a Partnership | Partnerships |
| Estate ● Trust (other than disregarded Grantor Trust) | Estate or Trust |
| Corporation that is medical in nature (e.g., medical and healthcare services, physician care, nursery care, dentistry, etc. ● LLC that is to be taxed like a Corporation and is medical in nature | Corporation-Medical |
| Corporation that is legal in nature (e.g., services of attorneys, arbitrators, notary publics involving legal or law related matters, etc.) ● LLC that is to be taxed like a Corporation and is legal in nature | Corporation-Legal |
| Corporation that qualifies for an Exempt status, including 501(c) 3 and domestic non-profit corporations. | Corporation-Exempt |
| Corporation that does not meet the qualifications of any of the other corporation types listed above ● LLC that is to be taxed as a Corporation and does not meet any of the other corporation types listed above | Corporation-All Other |

## Section 3 – Tax Identification Number

The State of California requires that all parties entering into business transactions that may lead to payment(s) from the state provide their Taxpayer Identification Number (TIN). The TIN is required by R&TC sections 18646 and 18661 to facilitate tax compliance enforcement activities and preparation of Form 1099 and other information returns as required by the IRC section 6109(a) and R&TC section 18662 and its regulations.

## Section 4 – Payee Residency Status

**Are you a California resident or nonresident?**

- A corporation will be defined as a "resident" if it has a permanent place of business in California or is qualified through the Secretary of State to do business in California.
- A partnership is considered a resident partnership if it has a permanent place of business in California.
- An estate is a resident if the decedent was a California resident at time of death.
- A trust is a resident if at least one trustee is a California resident.
  - For individuals and sole proprietors, the term "resident" includes every individual who is in California for other than a temporary or transitory purpose and any individual domiciled in California who is absent for a temporary or transitory purpose. Generally, an individual who comes to California for a purpose that will extend over a long or indefinite period will be considered a resident. However, an individual who comes to perform a particular contract of short duration will be considered a nonresident.

For information on Nonresident Withholding, contact the Franchise Tax Board at the numbers listed below:

Withholding Services and Compliance Section: 1-888-792-4900 E-mail address: wscs.gen@ftb.ca.gov
For hearing impaired with TDD, call: 1-800-822-6268 Website: www.ftb.ca.gov

## Section 5 – Certification

Provide the name, title, email address, signature, and telephone number of individual completing this form and date completed. In the event that a SSN or ITIN is provided, the individual identified as the tax liable party must certify the form. Note: the signee may differ from the tax liable party in this situation if the signee can provide a power of attorney documented for the individual.

## Section 6 – Paying State Agency

This section must be completed by the state agency/department requesting the STD 204.

## Privacy Statement

Section 7(b) of the Privacy Act of 1974 (Public Law 93-579) requires that any federal, state, or local governmental agency, which requests an individual to disclose their social security account number, shall inform that individual whether that disclosure is mandatory or voluntary, by which statutory or other authority such number is solicited, and what uses will be made of it. It is mandatory to furnish the information requested. Federal law requires that payment for which the requested information is not provided is subject to federal backup withholding and state law imposes noncompliance penalties of up to $20,000. You have the right to access records containing your personal information, such as your SSN. To exercise that right, please contact the business services unit or the accounts payable unit of the state agency(ies) with which you transact that business.

All questions should be referred to the requesting state agency listed on the bottom front of this form.

Print Form Reset Form

STATE OF CALIFORNIA – STATE CONTROLLERS OFFICE

**PAYEE DATA RECORD SUPPLEMENT**

(This form is optional. Form is used to provide remittance address information if different than the mailing address on the STD 204 – Payee Data Record. Use this form to provide additional remittance addresses and additional Authorized Representatives of the Payee not identified on the STD 204.)

STD 205 (New 03/2021)

## Payee Information (must match the STD 204)

**NAME** (*Required. Do not leave blank.*)

**TAX ID NUMBER** (*Required*)
SSN, ITIN, or FEIN that matches Tax ID number provided on STD 204

**BUSINESS NAME, DBA NAME or DISREGARDED SINGLE MEMBER LLC NAME**
(*If different from above*)

## Additional Remittance Address Information

- Use the fields below to provide remittance addresses for payee if different from the mailing address on the STD 204.
- ***The addresses provided below are for remittance purposes only. 1099 information returns will be sent to the mailing address specified on the STD 204.***

SAMPLE

| | | | |
|---|---|---|---|
| 1 | **REMITTANCE ADDRESS** (number, street, apt or suite no.) | | |
| | **CITY** | **STATE** | **ZIP CODE** |
| 2 | **REMITTANCE ADDRESS** | | |
| | **CITY** | **STATE** | **ZIP CODE** |
| 3 | **REMITTANCE ADDRESS** | | |
| | **CITY** | **STATE** | **ZIP CODE** |
| 4 | **REMITTANCE ADDRESS** | | |
| | **CITY** | **STATE** | **ZIP CODE** |
| 5 | **REMITTANCE ADDRESS** | | |
| | **CITY** | **STATE** | **ZIP CODE** |

## Additional Contact Information

Use the fields below to provide additional Authorized Representatives for the Payee if applicable.

| | | |
|---|---|---|
| 1 | **CONTACT NAME** | |
| | **TELEPHONE** *(Include area code)* | **EMAIL** |
| 2 | **CONTACT NAME** | |
| | **TELEPHONE** | **EMAIL** |
| 3 | **CONTACT NAME** | |
| | **TELEPHONE** | **EMAIL** |

## Certification

***I hereby certify under penalty of perjury that the information provided on this supplemental document is true and correct.***

***By signing this document, I authorize the State of California to remit payment to the addresses specified on this supplemental form (STD 205) and certify that all persons identified on this form are authorized representatives of this payee. Payments remitted to any of the listed addresses may be reported on 1099 information returns to the tax liable entity identified on the accompanying Payee Data Record - STD 204.***

| **NAME OF AUTHORIZED PAYEE REPRESENTATIVE** (Print or Type name) | **TITLE** | **E-MAIL ADDRESS** |
|---|---|---|
| **SIGNATURE**<br>X_____ | **DATE** | **TELEPHONE** *(Include area code)* |

STATE OF CALIFORNIA – STATE CONTROLLERS OFFICE

**PAYEE DATA RECORD SUPPLEMENT**

(This form is optional. Form is used to provide remittance address information if different than the mailing address on the STD 204 – Payee Data Record. Use this form to provide additional remittance addresses and additional Authorized Representatives of the Payee not identified on the STD 204.)

STD 205 (New 03/2021)

**GENERAL INSTRUCTIONS**

Type or print the information on the Payee Data Record Supplement, STD 205. Sign, date, and return to the state agency/department with a completed STD 204. Prompt return of the fully completed forms will prevent delays when processing payments.

**Purpose** – Completion of this form (STD 205) is optional. Payees may use this form to provide remittance addresses or contact information in addition to the 1099 information return mailing address provided on the STD 204. This form shall only be used in conjunction with the STD 204, and will not be accepted without a STD 204.

***Please note***: The State of California Government will issue 1099 information returns to the mailing address provided on the most recently dated form STD 204 validated by the Payee. Addresses provided on this form (STD 205) will be used for remittance purposes only. If the payee would like to update the address for receiving 1099 information returns, please complete the STD 204.

**Payee Information:** The Payee's Tax ID number (TIN) and Name (including any Business, DBA, or Disregarded LLC names) are required. This information is subject to TIN matching via the IRS database for validation. Payee Information provided in this section must clearly match the STD 204. Any discrepancies may result in delays of payment, up to and including denial of the request.

SAMPLE

**Name** – Enter the name of the Payee. The name provided shall be the tax liable party and is subject to IRS TIN matching (when applicable).

**Business Name** – Enter the business name, DBA name, trade or fictitious name, or disregarded LLC name.

**Tax ID Number**-The State of California requires that all parties entering into business transactions that may lead to payment(s) from the state provide their Taxpayer Identification Number (TIN). The TIN is required by R&TC sections 18646 and 18661 to facilitate tax compliance enforcement activities and preparation of Form 1099 and other information returns as required by the IRC section 6109(a) and R&TC section 18662 and its regulations.

**Additional Remittance Address Information** - Enter the Payee's additional remittance address(s) that are not listed on STD 204. Up to five (5) addresses may be provided on this form. The Payee may provide additional remittance addresses on a second STD 205 form if needed.

**Additional Contact Information** - Enter the Payee's additional or updated contact information. Up to three contacts may be identified on this form. Payee may provide additional contacts on a second STD 205 if needed.

**PRIVACY STATEMENT**

Section 7(b) of the Privacy Act of 1974 (Public Law 93-579) requires that any federal, state, or local governmental agency, which requests an individual to disclose their social security account number, shall inform that individual whether that disclosure is mandatory or voluntary, by which statutory or other authority such number is solicited, and what uses will be made of it.

It is mandatory to furnish the information requested. Federal law requires that payment for which the requested information is not provided is subject to federal backup withholding and state law imposes noncompliance penalties of up to $20,000.

You have the right to access records containing your personal information, such as your SSN. To exercise that right, please contact the business services unit or the accounts payable unit of the state agency(ies) with which you transact that business.

All questions should be referred to the requesting state agency listed on the bottom front of the STD 204 form.

# Contractor Certification Clauses

CCC 04/2017

CERTIFICATION

I, the official named below, CERTIFY UNDER PENALTY OF PERJURY that I am duly authorized to legally bind the prospective Contractor to the clause(s) listed below. This certification is made under the laws of the State of California.

| Contractor/Bidder Firm Name (Printed) | Federal ID Number |
|---|---|
| By (Authorized Signature) | |
| Printed Name and Title of Person Signing | |
| Date Executed | Executed in the County of |

SAMPLE

**CONTRACTOR CERTIFICATION CLAUSES**

1. STATEMENT OF COMPLIANCE: Contractor has, unless exempted, complied with the nondiscrimination program requirements. (Gov. Code §12990 (a-f) and CCR, Title 2, Section 11102) (Not applicable to public entities.)

2. DRUG-FREE WORKPLACE REQUIREMENTS: Contractor will comply with the requirements of the Drug-Free Workplace Act of 1990 and will provide a drug-free workplace by taking the following actions:

a. Publish a statement notifying employees that unlawful manufacture, distribution, dispensation, possession or use of a controlled substance is prohibited and specifying actions to be taken against employees for violations.

b. Establish a Drug-Free Awareness Program to inform employees about:

1) the dangers of drug abuse in the workplace;

2) the person's or organization's policy of maintaining a drug-free workplace;

3) any available counseling, rehabilitation and employee assistance programs; and,

4) penalties that may be imposed upon employees for drug abuse violations.

c. Every employee who works on the proposed Agreement will:

1) receive a copy of the company's drug-free workplace policy statement; and,

2) agree to abide by the terms of the company's statement as a condition of employment on the Agreement.

Failure to comply with these requirements may result in suspension of payments under the Agreement or termination of the Agreement or both and Contractor may be ineligible for award of any future State agreements if the department determines that any of the following has occurred: the Contractor has made false certification, or violated the certification by failing to carry out the requirements as noted above. (Gov. Code §8350 et seq.)

3. NATIONAL LABOR RELATIONS BOARD CERTIFICATION: Contractor certifies that no more than one (1) final unappealable finding of contempt of court by a Federal court has been issued against Contractor within the immediately preceding two-year period because of Contractor's failure to comply with an order of a Federal court, which orders Contractor to comply with an order of the National Labor Relations Board. (Pub. Contract Code §10296) (Not applicable to public entities.)

SAMPLE

4. CONTRACTS FOR LEGAL SERVICES $50,000 OR MORE- PRO BONO REQUIREMENT: Contractor hereby certifies that Contractor will comply with the requirements of Section 6072 of the Business and Professions Code, effective January 1, 2003.

Contractor agrees to make a good faith effort to provide a minimum number of hours of pro bono legal services during each year of the contract equal to the lessor of 30 multiplied by the number of full time attorneys in the firm's offices in the State, with the number of hours prorated on an actual day basis for any contract period of less than a full year or 10% of its contract with the State.

Failure to make a good faith effort may be cause for non-renewal of a state contract for legal services, and may be taken into account when determining the award of future contracts with the State for legal services.

5. EXPATRIATE CORPORATIONS: Contractor hereby declares that it is not an expatriate corporation or subsidiary of an expatriate corporation within the meaning of Public Contract Code Section 10286 and 10286.1, and is eligible to contract with the State of California.

6. SWEATFREE CODE OF CONDUCT:

a. All Contractors contracting for the procurement or laundering of apparel, garments or corresponding accessories, or the procurement of equipment, materials, or supplies, other than procurement related to a public works contract, declare under penalty of perjury that no apparel, garments or corresponding accessories, equipment, materials, or supplies furnished to the state pursuant to the contract have been laundered or produced in whole or in part by sweatshop labor, forced labor, convict labor, indentured labor under penal sanction, abusive forms of child labor or exploitation of children in sweatshop labor, or with the benefit of sweatshop labor, forced labor, convict labor, indentured labor under penal sanction, abusive forms of child labor or exploitation of children in sweatshop labor. The contractor further declares under penalty of perjury that they adhere to the Sweatfree Code of Conduct as set forth on the California Department of Industrial Relations website located at www.dir.ca.gov, and Public Contract Code Section 6108.

b. The contractor agrees to cooperate fully in providing reasonable access to the contractor's records, documents, agents or employees, or premises if reasonably

required by authorized officials of the contracting agency, the Department of Industrial Relations, or the Department of Justice to determine the contractor's compliance with the requirements under paragraph (a).

7. DOMESTIC PARTNERS: For contracts of $100,000 or more, Contractor certifies that Contractor is in compliance with Public Contract Code section 10295.3.

8. GENDER IDENTITY: For contracts of $100,000 or more, Contractor certifies that Contractor is in compliance with Public Contract Code section 10295.35.

## DOING BUSINESS WITH THE STATE OF CALIFORNIA

SAMPLE

The following laws apply to persons or entities doing business with the State of California.

1. CONFLICT OF INTEREST: Contractor needs to be aware of the following provisions regarding current or former state employees. If Contractor has any questions on the status of any person rendering services or involved with the Agreement, the awarding agency must be contacted immediately for clarification.

Current State Employees (Pub. Contract Code §10410):

1). No officer or employee shall engage in any employment, activity or enterprise from which the officer or employee receives compensation or has a financial interest and which is sponsored or funded by any state agency, unless the employment, activity or enterprise is required as a condition of regular state employment.

2). No officer or employee shall contract on his or her own behalf as an independent contractor with any state agency to provide goods or services.

Former State Employees (Pub. Contract Code §10411):

1). For the two-year period from the date he or she left state employment, no former state officer or employee may enter into a contract in which he or she engaged in any of the negotiations, transactions, planning, arrangements or any part of the decision-making process relevant to the contract while employed in any capacity by any state agency.

2). For the twelve-month period from the date he or she left state employment, no former state officer or employee may enter into a contract with any state agency if he or she was employed by that state agency in a policy-making position in the same general subject area as the proposed contract within the 12-month period prior to his or her leaving state service.

If Contractor violates any provisions of above paragraphs, such action by Contractor shall render this Agreement void. (Pub. Contract Code §10420)

Members of boards and commissions are exempt from this section if they do not receive payment other than payment of each meeting of the board or commission, payment for preparatory time and payment for per diem. (Pub. Contract Code §10430 (e))

2. LABOR CODE/WORKERS' COMPENSATION: Contractor needs to be aware of the provisions which require every employer to be insured against liability for Worker's Compensation or to undertake self-insurance in accordance with the provisions, and

Contractor affirms to comply with such provisions before commencing the performance of the work of this Agreement. (Labor Code Section 3700)

3. AMERICANS WITH DISABILITIES ACT: Contractor assures the State that it complies with the Americans with Disabilities Act (ADA) of 1990, which prohibits discrimination on the basis of disability, as well as all applicable regulations and guidelines issued pursuant to the ADA. (42 U.S.C. 12101 et seq.)

4. CONTRACTOR NAME CHANGE: An amendment is required to change the Contractor's name as listed on this Agreement. Upon receipt of legal documentation of the name change the State will process the amendment. Payment of invoices presented with a new name cannot be paid prior to approval of said amendment.

5. CORPORATE QUALIFICATIONS TO DO BUSINESS IN CALIFORNIA:

SAMPLE

a. When agreements are to be performed in the state by corporations, the contracting agencies will be verifying that the contractor is currently qualified to do business in California in order to ensure that all obligations due to the state are fulfilled.

b. "Doing business" is defined in R&TC Section 23101 as actively engaging in any transaction for the purpose of financial or pecuniary gain or profit. Although there are some statutory exceptions to taxation, rarely will a corporate contractor performing within the state not be subject to the franchise tax.

c. Both domestic and foreign corporations (those incorporated outside of California) must be in good standing in order to be qualified to do business in California. Agencies will determine whether a corporation is in good standing by calling the Office of the Secretary of State.

6. RESOLUTION: A county, city, district, or other local public body must provide the State with a copy of a resolution, order, motion, or ordinance of the local governing body which by law has authority to enter into an agreement, authorizing execution of the agreement.

7. AIR OR WATER POLLUTION VIOLATION: Under the State laws, the Contractor shall not be: (1) in violation of any order or resolution not subject to review promulgated by the State Air Resources Board or an air pollution control district; (2) subject to cease and desist order not subject to review issued pursuant to Section 13301 of the Water Code for violation of waste discharge requirements or discharge prohibitions; or (3) finally determined to be in violation of provisions of federal law relating to air or water pollution.

8. PAYEE DATA RECORD FORM STD. 204: This form must be completed by all contractors that are not another state agency or other governmental entity.

# SECTION 000700
# GENERAL CONDITIONS

## 1.01 DEFINITIONS

**A. Acceptance (or Final Completion) –** Acceptance occurs when all the provisions and requirements of the Contract are complete and is so certified by State's Representative.

**B. Bulletin –** A Bulletin is a written order directed to Contractor and issued by State's Representative, directing a minor change or making a clarification in the Work, or requesting information from Contractor about the Work. A Bulletin is to be used for minor changes or clarifications which State's Representative believes will have no impact on the Contract Sum or Contract Time.

**C. Calendar Day (or Day) –** A Calendar Day is a day of twenty-four (24) hours measured from one midnight to the next midnight, Pacific Time. Unless otherwise indicated, a "day" shall mean a Calendar Day.

**D. Change Order (or Amendment) –** A Change Order is a written modification of the Contract Documents made in accordance with the provisions of Section 1.08 of these General Conditions and which has been signed by State and Contractor.

**E. Contract (or Contract Documents) –** The Contract shall consist of the Notice to Contractors; Instructions to Bidders; Bid Form; Bidders Bond; Standard Agreement – STD. 213; General Conditions; STD. 807, Payment Bond; Performance Bond; Special Provisions; Specifications; Plans; STD. 811, Small Business Preference and Certification; Certificate of Insurance; Addenda; Amendments; Non Collusion Affidavit; Disabled Veteran Business Enterprise Compliance Certification and Documentation; and any other provisions made a part thereto by reference.

**F. Contract Time –** The Contract Time shall be the number of Calendar Days specified in which the Work is to be completed including any adjustments and/or time extensions that may be granted by State in accordance with the terms of the Contract.

**G. Contract Sum –** The Contract Sum is the total amount of money stated in the Contract as payable to Contractor for the performance of the Work under the Contract, including authorized adjustments thereto.

**H. Contractor –** The Contractor is the person, firm, individual, partnership, company, corporation, association, joint venture, or any combination thereof, who has entered into the Contract with State.

**I. Event of Default –** An Event of Default is an action that permits termination of the Contract as described herein.

**J. Field Order –** A Field Order is a written order directed to Contractor and signed by State's Representative directing a change or making a clarification in the Work, or requesting information from Contractor about the Work. A Field Order signed by Contractor indicates receipt of the Field Order. A Field Order shall be followed by a Change Order.

**K. Legal Holidays –** Legal Holidays are every Sunday; January 1; 3rd Monday in January; February 12; 3rd Monday in February; March 31; the last Monday in May; July 4; 1st Monday in September; 2nd Monday in October; November 11; Thanksgiving Day and the following Friday; December 25; and every day so declared by the President of the United States or the Governor of California. If January 1, February 12, March 31, July 4, November 11, or December 25 falls on a Sunday, the following Monday is a holiday. If November 11 falls on a Saturday, the preceding Friday is a holiday.

**L. Milestone Date –** A Milestone Date is a significant point in the development of the Work that is illustrated on Contractor's Project Work Schedule.

**M. Not-in-Contract (NIC) –** Not -in-Contract means work not included in the Contract.

**N. Project –** The Project means the erection, construction, alteration, repair, or improvement to be accomplished under the Contract.

**O. Project Work Schedule –** The Project Work Schedule is the schedule furnished by Contractor to State in accordance with Section 1.06A(2) of these General Conditions displaying the anticipated schedule for completing the Work.

**P. Punch List –** The Punch List is the list prepared as a result of a final inspection conducted by State at the completion of the Work indicating items to be completed, corrected, and/or replaced with regard to the Work as specified in the Contract Documents.

**Q.** **Regular Work Hours –** Eight hours labor constitutes a legal day's work and this Work period shall occur between the hours of 8:00 a.m. and 5:00 p.m. on Working Days unless otherwise agreed by State's Representative.

**R.** **Schedule of Values –** The Schedule of Values is the statement furnished by Contractor to State in accordance with Section 1.09A of these General Conditions displaying the portions of the Contract Sum allotted for the various parts of the Work and the projected schedule of payment.

**S.** **State –** The State means the State of California, Department of Parks and Recreation (DPR) and the Director of DPR.

**T.** **State's Representative –** The State's Representative is the person designated by State to oversee and manage the Contract and completion of the Work on behalf of State and who is the authorized representative of State for this Project. The term State's Representative may be used interchangeably with Project Manager. CONTRACTOR SHALL ONLY TAKE DIRECTION FROM STATE'S REPRESENTATIVE FOR THE CONTRACT AND MAY NOT RELY ON THE COMMUNICATIONS, REPRESENTATIONS OR OTHER INSTRUCTIONS OF OTHER EMPLOYEES, OFFICERS, MANAGERS, CONTRACTORS, OR AGENTS OR REPRESENTATIVES OF STATE UNLESS CONFIRMED BY STATE'S REPRESENTATIVE IN WRITING OR AS OTHERWISE, FROM TIME TO TIME, MAY BE PERMITTED BY THE PROVISIONS OF THE CONTRACT.

**U.** **Subcontractor –** A Subcontractor is anyone having a direct contract with Contractor or another Subcontractor and includes one who furnishes material worked to a special design according to the Plans and/or Specifications, but does not include one who merely furnishes material not so worked.

**V.** **Substantial Completion –** Substantial Completion is the point at which, in the discretion of State, in accordance with Section 1.09D of these General Conditions, the Project may be used for the purpose for which it is being constructed exclusive of Punch List items which do not interfere with such use and may be completed notwithstanding use of the Project.

**W.** **Supplier –** A Supplier is anyone who contracts with Contractor or a Subcontractor to furnish materials or equipment for the Project.

**X.** **Work –** The Work is everything required to complete the Project, including, but not limited to, all labor, suppliers, material, equipment, and tools.

**Y.** **Working Day –** A Working Day is every day except Saturdays, Sundays, and Legal Holidays and those days not charged as Working Days pursuant to the Contract Documents.

**1.02 CORRELATION AND INTENT OF CONTRACT DOCUMENTS**

**A.** The General Conditions are incorporated into the Contract Documents in their entirety and may not be revised or modified in any way, except by the Supplemental Conditions.

**B.** What is required by one document shall be as binding as if required by all. In the event of conflicts among the Contract Documents, such conflicts shall be resolved by giving the documents the following order of priority: (1) The Contract between State and Contractor, as the same may be amended (Amendments and revisions of later date take precedence over those of earlier date); (2) Special Conditions; (3) General Conditions; and (4) Drawings and Specifications. Drawings govern Specifications for quantity and location, and Specifications govern Drawings for quality and performance. In the event of ambiguity in quantity or quality, the greater quantity and the higher quality shall govern. Dimensions shall be figured rather than determined by scale or rule. Full-size or large-scale details or Drawings shall govern small-scale details or Drawings.

**C.** Where conflict exists between the Contract Documents or between the Contract Documents and applicable standards under codes or ordinances promulgated by governmental bodies having jurisdiction over the Project, **CONTRACTOR SHALL BE DEEMED TO HAVE AGREED TO PERFORM THE MOST STRINGENT OR HIGHEST QUALITY WAY OF PERFORMING THE WORK.**

**D.** Should Contractor discover conflicts, omissions, or errors in the Contract Documents or have any question concerning interpretation or clarification of the Contract Documents, or if it appears to Contractor that the Work to be done or any matters relative thereto are not sufficiently detailed or explained in the Contract Documents, then, before proceeding with the Work affected, Contractor shall immediately notify State's Representative in writing, using an approved Request For Information (RFI) form, and request interpretation, clarification, or furnishing of additional detailed instructions concerning the Work. Such questions shall be resolved and instructions to Contractor issued within fourteen (14) Calendar Days by State, whose decision shall be final and conclusive. Should Contractor proceed with the Work affected before resolution, Contractor shall be responsible for any resultant damage or added cost, and Contractor shall remove, replace, or adjust the Work not in accordance with State's Representative subsequent instructions.

**E.** All costs and time incurred by Contractor to prepare, review, respond to, estimate, or otherwise process RFI's, Bulletins, Field Orders, Amendments, Schedules, Correspondence, or any other paperwork shall be part of Contractor's base contract overhead and no additional compensation will be allowed therefore.

**1.03 CONTRACT BONDS**

**A.** When the Contract Sum exceeds five thousand dollars ($5,000), Contractor shall furnish, in duplicate, a Payment Bond, to accompany the Contract, in an amount equal to one hundred percent (100%) of the Contract Sum securing payment for laborers, mechanics, and material suppliers used on the Work under the Contract. Payment Bonds shall be prepared on a Payment Bond to Accompany Construction Contract (STD. 807) as furnished by State.

**B.** When the Contract Sum exceeds five thousand dollars ($5,000), Contractor shall furnish, in duplicate, a Performance Bond, to accompany the Contract, in the amount equal to at least one hundred percent (100%) of the Contract Sum guaranteeing faithful performance of the Work. Performance Bonds may be prepared on standard bonding company forms.

**C.** Payment and Performance Bonds shall be issued by a corporate surety authorized to transact a general surety business in the State of California. Contractor shall deliver its required bonds before the date of execution of the Contract.

**D.** The bonds must remain in full force and effect for the entire length of time Contractor is involved with the Contract and shall include any warranty periods.

**1.04 INSURANCE**

**A. Insurance Requirements**

**(1)** General Liability Insurance: Contractor shall procure commercial general liability insurance covering liability arising out of premises operations, products/completed operations, independent contractors, personal/advertising injury and liability assumed under an insured contract with limits not less than $1,000,000 each occurrence, $2,000,000 general aggregate and $2,000,000 products/completed operations aggregate. Said policy shall apply separately to each insured against whom any claim is made or suit is brought subject to Contractor's limits of liability.

**(2)** Builder's Risk/Installation Floater: During the term of this Contract, Contractor shall maintain in force, at its own expense, Builder's Risk/Installation Floater for an amount equal to the full amount of the Contract improvements, upon the project and all materials or items which is or will become the property of State pursuant to the Contract Documents, including, but not limited to, materials and other items at the work site or stored off-site with the consent of State. A copy of any applicable Builder's Risk/Installation Floater will be provided to State, and it shall be the responsibility of Contractor and each Subcontractor to satisfy itself as to the terms of such coverage, and to determine whether or not at its own cost, to carry any supplemental policy of insurance.

**(3)** Motor Vehicle Liability Insurance: Contractor shall maintain motor vehicle liability insurance with limits not less than $1,000,000 combined single limit each accident. Such insurance shall cover liability arising out of an accident involving a motor vehicle in use by Contractor, including, but not limited to, Contractor owned, hired, and non-owned motor vehicles.

**(4)** Workers' Compensation and Employer's Liability Insurance: Contractor shall maintain statutory worker's compensation and employer's liability insurance for all of Contractor's employees who will be engaged in the performance of work on the property, including special coverage extensions where applicable.

**B. Insurance Policies –** Each policy of insurance shall: (1) Be in a form acceptable by State; (2) be written by an insurer acceptable to State; (3) be maintained at Contractor's sole expense; (4) require a minimum of ten(10) days written notice to State prior to any cancellation, non-renewal, or modification of insurance coverage; (5) contain an endorsement naming the State of California, its officers, agents, employees, and servants as additionally insured, but only with respect to Work performed for the State of California under this Contract or permit, at no cost to State; the endorsements are to be provided for the general liability and motor vehicle liability policies; (6) be in full force for the complete term of the Contract including any warranty periods; and (7) be primary, and not in excess, to any insurance carried by State.

Waiver of Subrogation: When work is performed on State-owned or controlled property, the Workers' Compensation and Employers' Liability policy shall be endorsed with a waiver of subrogation endorsement in favor of the State. This endorsement shall also be provided.

**C. Insurance Companies**

**(1)** Insurance companies issuing any of the policies required by these provisions shall have a rating classification of "A-" or better and a financial size category rating of "vii" or better according to the latest edition of the A.M. Best Key Rating Guide. Any other rating classification requires State approval.

**(2)** All insurance companies issuing any of the policies required by these provisions shall be licensed to do business in the State of California.

**D. Certificate of Insurance**

**(1)** Concurrent with the execution of the Agreement, Contractor shall provide to State evidence that the insurance required to be

carried by these provisions, including any endorsement affecting the additional insured status, is in full force and effect and that premiums therefore have been paid. Such evidence shall be furnished on the insurance industry's standard ACORD Form (Certificate of Insurance) or a certified copy of the original policy, including all requirements set forth in this section.

**(2)** Contractor shall notify the State within 10 days of receipt of a notice of cancellation, expiration, or any reduction in coverage, or if the insurer commences proceedings or has proceedings commenced against it, indicating the insurer is insolvent. Contractor shall provide to State evidence of replacement policy at least ten (10) Working Days prior to the effective date of such cancellation, expiration, or reduction in coverage.

**E. Contractor's Additional Responsibilities**

**(1)** Contractor is responsible for any deductible or self-insured retention contained within the insurance program.

**(2)** Contractor shall ensure that all Subcontractors procure insurance meeting the requirements of these provisions.

**F. State's Remedies –** Should Contractor fail to keep the insurance required to be carried by these provisions in full force and effect at all times, State may, in addition to any other remedies State has, terminate this Contract immediately, and all payments due or that become due will be withheld, until notice is received by State that such insurance has been restored or replaced in full force and effect and that the premiums, therefore, have been paid to cover a period of time satisfactory to State.

**1.05 STATE'S RIGHTS TO STOP PERFORMANCE AND/OR CARRY OUT WORK**

**A. State's Right to Stop the Work –** If Contractor fails to correct the Work which is not in accordance with the requirements of the Contract Documents or fails to carry out the Work in accordance with the Contract Documents; or fails or refuses to provide a sufficient amount of properly supervised and coordinated labor, materials, or equipment so as to be able to complete the Work within the Contract Time; or disregards the instructions of State's Representative when based on the requirements of the Contract Documents; State may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; provided, however, the right of State to stop the Work shall not give rise to a duty on the part of State to exercise this right for the benefit of Contractor or any other person or entity and any delay resulting from such Work stoppage shall not extend any Milestone Date identified in the Contract or the required dates of Substantial or Final Completion.

**B. State's Right to Carry Out the Work –** If Contractor fails to carry out the Work in accordance with the Contract Documents and fails within a five (5) day period after written notice from State to eliminate (or commence to eliminate and thereafter work diligently to eliminate) such failure, State may, regardless of whether an Event of Default has occurred, and without prejudice to other remedies State may have, correct such deficiencies. In such case an offset may be made deducting from payments then or thereafter due Contractor the cost of correcting such deficiencies, including compensation for State's and State Representative's additional services and expenses made necessary by such default, neglect, or failure. If payments then or thereafter due Contractor are not sufficient to cover such amounts, Contractor shall promptly pay the difference to State on demand. The correction of such deficiencies by State or by others shall not relieve Contractor of any obligation or liability for the Work and shall not operate to waive any right or claim of State.

**1.06 CONTRACTOR**

**A. Contractor's Construction Schedules**

**(1)** Contractor agrees to complete the Work within the number of calendar days stated on the Bid Form from the date of written notice to commence Work. This time includes ten (10) Calendar Days allowed for Contractor to begin Work and ten (10) Calendar Days for issuance and completion of the Punch List. Upon written notice to proceed, Contractor shall begin Work and shall diligently prosecute the Work, with adequate forces, to completion within the Contract Time.

**(2)** Within ten (10) Calendar Days of the Notice to Proceed, Contractor shall furnish to State one (1) electronic copy and three (3) paper copies of a Critical Path Method (CPM) Project Work Schedule, in form and content satisfactory to State Representative and utilizing Microsoft Project software, presenting an orderly and realistic plan for completing the Work. The schedule shall include all scheduled Working Days, relevant work activities by trade and critical path dates. No activity on the schedule shall have a duration longer than 15 calendar days, with the exception of fabrication and procurement, unless otherwise approved. Within five (5) Working Days from the date the Project Work Schedule is furnished to State's Representative, State's Representative shall review and comment on the Project Work Schedule and approve or disapprove it, giving reasons for any disapproval. If disapproved, Contractor shall modify the Project Work Schedule and resubmit it for approval following the above stated timeframes. Additionally, Contractor shall submit one (1) electronic copy and three (3) paper copies of the updated

Critical Path Method (CPM) Project Work Schedule with each monthly Request for Payment. The Project Work Schedule shall be maintained at the work site and all revisions, along with the reasons therefore, as well as any affect on the critical path of the Work and the completion date, shall be furnished to State as soon as possible after the date of the revision, but in no event later than five (5) days after its revision.

**(3)** If the progress of the Work is behind the Project Work Schedule to such an extent that State reasonably determines that Contractor will be unable to meet any of the critical path dates set forth in the Project Work Schedule, including without limitation any Milestone Date, or Contractor fails to take prompt and adequate corrective action to State's satisfaction to bring the progress of the Work in compliance with the Project Work Schedule, State may, in addition to any other right or remedy provided herein, proceed as provided in Sections 1.05, 1.07, and/or 1.11 of these General Conditions.

**(4)** Liquidated Damages:

**a.** Failure of Contractor to complete the Work within the Contract Time will result in damages being sustained by State. It is and will be extremely difficult and impracticable to determine the actual damage which State will sustain by reason of such delay. Therefore, Contractor shall pay to State, as liquidated damages, the sum of ONE THOUSAND DOLLARS ($1,000.00) for each and every Calendar Day's delay in finishing the Work under this Contract beyond the stipulated number of days, or any adjustments thereof. State may deduct liquidated damages from funds due or that become due Contractor. Execution of the Contract shall constitute acknowledgment by Contractor that Contractor has ascertained and agrees that State will suffer damages in the amount fixed herein.

**b.** Contractor shall not be assessed liquidated damages when the delay is caused by the failure of State or the owner of any utility to provide for removal or relocation of an existing utility, facility, or to perform work as indicated in the Contract Documents.

**B. Shop Drawings, Product Data, and Samples**

**(1)** Reference in the Contract Documents to any equipment, material, article, or process by specific brand, trade name, make, or catalog number, followed by the term "or approved equal", shall be regarded as establishing a standard of quality. In such cases Contractor may, subject to State's Representative's review and approval, substitute any other brand of equal quality, utility, and availability. State's Representative shall be the sole judge of equality and suitability of substitute materials. Contractor shall bear all costs and expenses, including, but not limited to, costs and expenses related to demonstrating equality or suitability of such substitute equipment, material, article or process, and any costs or expenses of changes or adjustments necessitated by such substitutions, including, but not limited to, those related to other parts of the Work or the Work of other contractors. State's Representative's approval of any substitution shall not relieve Contractor from compliance with all requirements of the Contract Documents. Where the Contract Documents do not specifically permit the use of "approved equals" for any equipment, material, article, or process referred to by specific brand, trade name, make or catalog number, no substitutions shall be permitted except by means of the Change Order procedures as set forth in Section 1.08 of these General Conditions.

**(2)** Contractor shall not be relieved of responsibility for any deviations from requirements of the Contract Documents or allowed any additional compensation by reason of State's Representative approval of Shop Drawings, Product Data, Samples or similar submittals unless Contractor has specifically informed State's Representative in writing of such deviation at the time of submittal and fully complied with Section 1.08 of these General Conditions, and State's Representative has given written approval to the specific deviation. If Shop Drawings provide detail not shown in Contract Documents, Contractor shall be deemed to have primary design-build responsibility for such items. Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals by State's approval thereof.

**C. Safety and Clean-Up –** Contractor acknowledges that State will continue to occupy and must maintain continuous operations in the Parks in which the Work is located. It is critical that these operations shall not suffer any significant interference, including, without limitation, any interruption in utilities or unreasonable noise, dust, odor, or vibration. Contractor shall perform the Work and limit its use of the Project site in such a manner as to minimize any interference with occupancies and operations in such Parks and in accordance with applicable Park rules and regulations. Contractor shall be liable for all costs for all claims related to dust, mud, noise, odor, vibration, or windblown materials attributed to the Work hereunder.

**D. Potential Subcontractors**

Nothing contained in this agreement or otherwise, shall create any contractual relation between State and any subcontractors, and no subcontract shall relieve Contractor of its responsibilities and obligations hereunder. Contractor agrees to be as fully responsible to State for the acts and omissions of its subcontractors and of persons either directly or indirectly employed by any of them as it is for the acts and omissions of persons directly employed by Contractor. Contractor's obligation to pay its subcontractors is an

independent obligation from State's obligation to make payments to Contractor. As a result, State shall have no obligation to pay or to enforce the payment of any moneys to any subcontractor.

**E. Force Majeure**

Except for defaults of subcontractors, neither party shall be responsible for delays or failures in performance resulting from acts beyond the control of the offending party. Such acts shall include but shall not be limited to acts of God, fire, flood, earthquake, other natural disaster, nuclear accident, strike, lockout, riot, freight embargo, public regulated utility, or governmental statutes or regulations superimposed after the fact. If a delay or failure in performance by Contractor arises out of a default of its subcontractor, and if such default of its subcontractor, arises out of causes beyond the control of both Contractor and subcontractor, and without the fault or negligence of either of them, Contractor shall not be liable for damages of such delay or failure, unless the supplies or services to be furnished by subcontractor were obtainable from other sources in sufficient time to permit Contractor to meet the required performance schedule.

## 1.07 ADMINISTRATION OF THE CONTRACT

**A. Claims and Disputes**

**(1)** Time Limits on Contractor Claims: Except where a shorter time period is provided herein, claims by Contractor arising during the course of construction, including claims for additional costs, must be made within five (5) days after occurrence of the event giving rise to such claim or within five (5) days after Contractor first recognizes or reasonably should have recognized the condition giving rise to the claim. Claims must be made by written notice to State within five (5) days following such event.

**(2)** Continuing Contract Performance: Contractor, in the event of any claim or dispute with State over any matter whatsoever, shall not cause any delay or cessation in Contractor's Work and shall proceed with all Work called for in the Contract Documents and/or required to complete the Project.

**(3)** Claims for Additional Cost: If Contractor wishes to make a claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Said notice shall itemize all claims, shall differentiate between extra work and base contract work, and shall contain sufficient detail and substantiating data to permit evaluation of same by State's Representative. Any change in the Contract Sum resulting from such approved claim shall only be authorized by a Change Order.

**(4)** Claims for Additional Time: If Contractor wishes to make claim for an increase in the Contract Time, written notice as provided herein shall be given. Contractor's claim shall include an estimate of cost and the probable effect of delay on progress of the Work and shall document any adverse effect on the Project Work Schedule. In the case of a continuing delay, only one claim is necessary.

**(5)** Claim Certification: Any claim for additional cost or time must include the following certification, signed by the Contractor's legal representative: "I certify under penalty of perjury, according to the Laws of the State of California, that this claim is made in good faith, that the supporting documentation is accurate and complete, and that the amount requested accurately reflects the contract adjustments for which the Department is responsible."

**(6)** Delays in and Extensions of Time:

**a.** If (a) Work on the critical path as shown on the Project Work Schedule is delayed at any time by (i) an act or neglect of State, any employee of State, or any separate contractor employed by State, (ii) changes ordered in the Work in accordance with the provisions of Article 7, (iii) unusually severe and/or abnormal weather conditions which preclude the safe performance of the Work, (iv) national conflicts or priorities arising therefrom, (v) fires beyond the reasonable control of Contractor, (vi) floods beyond the reasonable control of Contractor, (vii) earthquakes, (viii) off-site or area-wide labor disputes which are beyond the reasonable control of Contractor, (ix) civil disturbances and for no other cause or causes; (b) Contractor would otherwise have been able timely to perform its obligations under the Contract Documents but for such delay; (c) Contractor has taken reasonable precautions to foresee, prevent and to mitigate the effects of delays to Work on the critical path due to such causes; and (d) Contractor has given written notice as required by Section 1.08 of these General Conditions; then subject to the provisions of Section 1.07 of these General Conditions, the Contract Time shall be appropriately extended by Change Order by the number of Working Days of delay on the critical path of the Work actually and directly caused by such occurrence. Such extension of Contract Time shall be net of any delays caused by or due to the fault or negligence of Contractor or which are otherwise the responsibility of Contractor or its agents or Subcontractors, and shall also be net of any contingency or "float" time allowance included in the Project Work Schedule. State may, at its option, authorize extra Work in order to accelerate the Project Work Schedule and minimize or eliminate the impact of the delay. No extension shall be made or allowed nor shall such extra Work be authorized unless a written request therefor by Contractor is made within five (5) Calendar Days after the first occurrence of the delay. Any claims of Contractor relating

to time shall be made promptly in accordance with the applicable provisions of Section 1.08 of these General Conditions, or shall be deemed waived.

**b.** If adverse weather conditions are the basis for a claim for additional Contract 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 a direct and adverse effect on scheduled critical path activities.

**c.** Adjustments in compensation for delays or time extensions will be allowed only for the causes specified in (i) and (ii) of paragraph 1.07A(6)a above, which extend the overall project duration.

**(7)** Disputes Resolution: A claim or dispute arising out of or relating to the Contract Documents which is not disposed of by agreement between Contractor and State shall be decided by State's Representative promptly, but not longer than ten (10) Working Days from the date Contractor notifies State's Representative in writing that agreement on a dispute cannot be reached and a written decision from State's Representative is required. The decision of State's Representative shall be final and conclusive on Contractor unless, within fifteen (15) days from the receipt of such decision, Contractor submits to State's Representative a written request for review of the decision made by State's Representative. The Director, or a designee other than State's Representative, shall review all decisions and render a decision in writing on or before thirty (30) days from the date of receipt of written position statements by Contractor and State's Representative as provided for herein. Contractor and State's Representative shall be afforded an opportunity to be heard by way of written submissions and to offer relevant information with respect to the matter in question.

**(8)** Decision of Director is Final: The decision of the Director or her or his designee shall be final and conclusive on Contractor, unless, within fifteen (15) Working Days from receipt of such decision, Contractor submits to State's Representative a written notice of Contractor's election to reserve its rights to file a claim with the State Board of Control and seek further adjudication of such claim should such claim be rejected by the State Board of Control.

**(9)** Arbitration: Claims (demands for monetary compensation of damages) arising out of related to the Contract Documents shall be resolved by arbitration unless State and Contractor agree in writing, after the claim has arisen, to waive arbitration and to have the claim litigated in a court of competent jurisdiction. Arbitration shall be pursuant to California Public Contract Code, Section 10240 et seq., and applicable regulations, Title 1, California Code of Regulations, Section 301 et seq. The arbitration decision shall be decided under and in accordance with the laws of the State of California, supported by substantial evidence and, in writing, contain the basis for the decision, findings of fact, and conclusions of law. Arbitration shall be initiated by a Demand for Arbitration made in compliance with the requirements of above referenced regulations. A Demand for Arbitration by Contractor shall be made not later than 180 days after date of service in person or by mail on Contractor of the final written decision by State on the claim. (This Section only applies to Contracts that exceed $117,000.00.)

**(10)** Exhaust All Administrative Remedies: Contractor must exhaust all remedies and comply with all disputes resolution procedures set forth in the proceeding section prior to filing any legal action which names the Department of Parks and Recreation, State of California, or any officer, employee, agent or affiliate of any of them. In no event, may Contractor bring any claims or pursue legal action for damages or other remedies for issues or matters not raised and presented in written notifications as provided for in the Contract Documents and as set forth in all written requests for review by State's Representative.

## 1.08 CHANGES IN THE WORK

**A. Change Orders (Amendments) –** When adjustments in the Contract Sum and Contract Time are determined, such determination shall be effective immediately and shall be recorded by preparation and execution of an appropriate Change Order. A Change Order signed by Contractor indicates Contractor's final and binding agreement therewith, including the adjustment in the Contract Sum or the Contract Time. No Change Order shall authorize an adjustment in the Contract Sum or Contract Time unless such Change Order specifies such adjustment. If no adjustment in either or both the Contract Sum and the Contract Time is specified, Contractor's execution of the Change Order shall constitute Contractor's agreement that no such adjustment shall be made. Contractor agrees that in no event shall it make any subsequent claim relating to the items covered by an executed Change Order, whether direct, indirect, or consequential in nature. All Change Orders are subject to the approval by the Department of General Services, if required.

**B. Bulletins and Field Orders**

**(1)** A Bulletin or Field Order shall not be recognized as having any impact upon the Contract Sum or the Contract Time. Contractor shall have no Claim therefor unless, within five (5) days from the date such direction or order was given, Contractor submits a written Change Order Request to the State's Representative with estimates of any adjustment in the Contract Sum or Contract Time to which Contractor believes it is entitled as a result of the change in the Work described in the Bulletin or Field Order, including sufficient detail to allow evaluation by the State's Representative.

**(2)** Upon receipt of a Bulletin or Field Order, Contractor shall promptly proceed with the Work involved, or as otherwise directed by the Bulletin or Field Order.

**C. Pricing Changes**

**(1)** When submitting its change proposal, Contractor shall include and set forth in clear and precise detail, breakdowns of labor, materials and allowable costs for all trades involved and the estimated impact on the Project Work Schedule. If requested by State, Contractor shall furnish spread sheets from which the breakdowns were prepared, plus spread sheets, if requested, of any Subcontractors. Allowable costs to be included in Contractor's change proposal shall be strictly limited to those set forth in Section 1.08C(2) of these General Conditions.

**(2)** In the event that (a) State approves a Change Order to be priced on a time and material basis, (b) State issues a Field Order to proceed with a change in the Work, Contractor timely notifies State of Contractor's belief that it is entitled to an adjustment in the Contract Sum or the Contract Time as a result of such change, and State and Contractor cannot agree on the amount of such adjustment, (c) Contractor is entitled to compensation as the result of a concealed condition, or (d) the Contract Sum includes allowances, then the amount of Contractor's allowable costs shall be governed by this Subsection. Allowable costs include and shall be strictly limited to the following:

**a.** The actual and reasonable cost of additional materials required as a result of such change, purchased by Contractor (or any Subcontractor) and used in the Work, including sales taxes, freight and delivery charges.

**b.** Construction equipment costs shall be substantiated by vendor's invoices. In no event shall the cost of such items exceed (1) the average current wholesale prices at which the items are locally available in the quantities required, delivered to the site, less applicable cash or trade discounts or (2) the equipment rental rates in the Labor Surcharge and Equipment Rental Rates published by Caltrans; whichever is less. The allowable rate constitutes full compensation to the Contractor including cost of fuel, oil, lubrication, supplies, necessary attachments, repairs, maintenance, depreciation, storage, insurance, labor except for construction equipment operators, and incidentals. No costs will be allowed for time while construction equipment is inoperative, idle or on standby, unless approved by the State.

**c.** Labor costs including welfare and fringe benefits shall be the actual labor cost, required as a result of such change in the Work, including no more than one (1) working foreman, but not including any supervisory or administrative personnel. Labor costs shall not exceed the local prevailing wage, which includes the Straight-Time Total Hourly Rate plus Burden. Burden shall be limited to the actual FICA-OASDI, FUTA, SUI, and Workers' Compensation payment percentages multiplied by the sum of the Basic Hourly Rate and Vacation/Holiday payments. Labor costs shall be substantiated by daily time cards (signed by Contractor's Superintendent) and labor summaries.

**d.** The cost of Work performed by Subcontractors or sub-Subcontractors is based on the actual direct costs of material, labor, and construction equipment and is determined pursuant to the provisions of this Subsection.

**e.** For deleted Work otherwise required to be performed hereunder, the Contract Sum shall be reduced by an amount equal to the net savings to Contractor and all Subcontractors and sub-Subcontractors on account of the deleted work for material, labor, and construction equipment.

**(3)** Failure of Contractor and State to agree on an adjustment of the Contract Sum or extension of Contract Time for performance under the Contract Documents shall not excuse Contractor from proceeding with the prosecution and performance of the Work as changed. State shall have the right within its sole discretion to require Contractor to commence performance of changes to the Work. If Contractor and State cannot agree on an appropriate stipulated sum for any change, the adjustment to the Contract Sum, if any, shall, subject to the provisions of Section 1.08 of these General Conditions, be determined by State on the basis of the allowable costs incurred as a result of such change as set forth in Section 1.08C(2) plus a fee as set forth in Section 1.08C(4).

**(4)** In addition to the allowable costs incurred for a change, Contractor (and any Subcontractors) is entitled to a fee. Such fee shall be included in any agreed upon stipulated sum for the Change Order and shall be added to the allowable costs for Change Orders priced on a time and material basis or as to which no agreement is reached. The additional fee shall be Contractor's (and Subcontractor's) sole reimbursement for overhead, profit and any other cost (including insurance required in the Contract Documents) not specifically reimbursable under the Contract for Construction. No such fee shall be applied to gross receipts or use tax amounts or bond premiums paid by Contractor. The following fees shall apply to Contractor and all Subcontractors and represent the maximum fees chargeable on each Contract tier, who shall receive mark-ups for all categories on a percentage basis equal to Contractor's Fee stated in the Contract:

**a.** For Work to be performed by Subcontractors, such Subcontractors, cumulative of all tiers, shall be permitted an additional fee of fifteen percent (15%) of the allowable costs incurred by such Subcontractors;

**b.** For Work to be performed by Contractor's own forces, Contractor shall be permitted an additional fee in the amount of fifteen percent (15%) of the allowable costs incurred directly by Contractor;

**c.** For Work to be performed by Subcontractors, Contractor shall be permitted an additional fee in the amount of five percent (5%) of the sum of the allowable costs incurred by Subcontractors plus the allowance for Subcontractors' fee provided in Subsection 4(a) above.

**1.09 PAYMENTS AND COMPLETION**

**A. Schedule of Values –** The apparent low bidder, within ten (10) days, not including Saturdays, Sundays, and Legal Holidays, after receiving notice that he/she is the apparent low bidder, shall submit along with the contract documents a complete itemized Schedule of Values that includes, but is not necessarily limited to, the cost of each line item equal to or greater than one and one-half percent of the contractor's total bid and every work item (activity) shown on the Contract Critical Path Method (CPM) Project Work Schedule. The sum of the cost of all activities in the Schedule of Values shall equal the Contract Amount. Contractor's mobilization, profit, fees, taxes, overhead and General Conditions must be itemized separately and not be prorated across other categories. The Schedule of Values, when approved by State's Representative, shall be used to monitor the progress of the Work and as a basis for payment requests. Each item shall show its total Scheduled Value, value of previous applications, value of the application, percentage completed, total value completed and value yet to be completed. All blanks and columns must be filled in, including every percentage complete figure. Contractor is to add approved Change Orders (Amendments) to the Schedule of Values on a monthly basis.

**B. Request for Payment –** Contractor shall submit to State an itemized request for payment no more than once each 30 day period for operations completed in accordance with the Schedule of Values. Such request shall be supported by such data substantiating Contractor's right to payment as State's Representative may require, such as copies of requisitions from Subcontractors and material suppliers, and reflect retainage. Any allowance included in the request for payment shall be separately itemized with supporting data attached. Progress payments for mobilization shall not exceed that authorized in Section 10264 of the Public Contract Code. Contractor shall furnish with each request for payment:

**(1)** Cost data to support the application, including without limitation, copies of Subcontractor's pay requests accurately reflecting current percentage of completion on a line-item basis.

**(2)** One (1) certified copy of all payroll records for the month.

**(3)** One (1) electronic copy and three (3) paper copies of the updated Project Work Schedule reflecting the current status of the project.

**(4)** One (1) originally signed Unconditional Waiver and Release Upon Progress Payment for all Subcontractor work paid to date.

**C. Retention**

**(1)** Five percent (5%) shall be retained from each progress payment and held by State. After the Punch List has been issued, retainage remains at five percent (5%) of all amounts billed or two (2) times the value of the Punch List Work, whichever is more, until Final Completion of the Work.

**(2)** Contractor may elect, upon prior notice to State, to retain additional sums, over the five percent (5%) required, from a Subcontractor. If, however, such additional retainage is made, then an equal amount shall be retained by State from Contractor.

**(3)** Section 10263 of the Public Contract Code pertaining to security deposits in lieu of retentions is incorporated, herein, in full by this reference. Pursuant to that Section, Contractor may, for contracts subject to the State Contract Act, request substitution of eligible securities for such retentions prior to issuance of original contract documents. Contractor hereby agrees to execute said securities using a State-furnished standard escrow agreement.

**D. Substantial Completion**

**(1)** Substantial Completion is the stage in the progress of the Work when, exclusive of Punch List items, the Work or designated portion thereof (which State agrees to accept and occupy and utilize separately) is sufficiently complete in accordance with the Contract Documents so State can legally and practically occupy and utilize the Work for its intended use, except for Work outside the scope of the Contract Documents.

**(2)** Objections to Certificate of Substantial Completion (DPR 248)/Notice of Completion (DPR 249): Contractor shall have seven (7) Working Days after receipt of the Certificate of Substantial Completion (DPR 248) during which Contractor may make written objection to State as to provisions of the Certificate of Substantial Completion and Punch List. If, after considering such objection, State concludes that the Project is not substantially complete, State shall, within seven (7) days after submission of the objection notify the Contractor thereof in writing stating the reasons. Upon Contractor's completion of the items listed on the Punch List and upon satisfaction of the terms and conditions of the Certificate of Substantial Completion, State shall issue a final

Notice of Completion (DPR 249), which shall fix a date as may be necessary or appropriate. State's determination of the Date of Substantial Completion and other items under this paragraph shall be final and conclusive on Contractor.

**E. Partial Occupancy or Beneficial Use**

**(1)** State and its lessees and separate Contractors may occupy or use any completed or partially completed portion of the Work at any stage of construction regardless of whether the Contract Time has expired (hereinafter sometimes referred to as "Partial Occupancy"). Such Partial Occupancy may commence whether or not the applicable portion of Work is substantially complete.

**(2)** It shall be understood, however, that Partial Occupancy shall not: (a) constitute final acceptance of any Work; (b) relieve Contractor for responsibility for loss or damage because of or arising out of defects in, or malfunctioning of, any Work, material, or equipment, or from any other unfulfilled obligations or responsibilities under the Contract Documents; or (c) commence any warranty period under the Contract Documents, provided that Contractor shall not be liable for ordinary wear and tear resulting from such Partial Occupancy.

**F. Testing, Inspection, Final Inspection, and Acceptance**

**(1)** Testing, inspection, and approval of portions of the Work required by the Contract Documents shall be made by an independent Testing Laboratory arranged and paid for by the Contractor and approved by the State. Contractor shall promptly furnish two certified copies of test results and inspection records to the State Representative. Material and equipment shall not be incorporated into the project until test results indicate conformance to the Contract Documents.

**(2)** Authorized employees of State shall have access to the Work at all times. Contractor shall give State's Representative forty-eight (48) hours advance notice of what Work and when the Work will be ready for inspection. Contractor shall provide proper facilities for such access and inspection. Inspection of the Work shall not relieve Contractor of any obligations to fulfill the Contract as prescribed. Any Work covered or concealed by Contractor before approval by State's Representative, shall, if required to be uncovered for examination and recovered, be at Contractor's sole expense.

**(3)** When the Work is completed, Contractor shall notify State's Representative and shall request final inspection. Within five (5) Calendar Days, State's Representative shall make final inspection. Contractor shall be notified in writing of any deficiencies (Punch List). Contractor shall remedy these deficiencies to complete satisfaction of State. After all the Work under this Contract has been completed and is so certified by State's Representative, formal acceptance will be made in writing by State by filing a Notice of Completion (DPR 249) for recording in the county in which the Work was performed.

**1.10 UNCOVERING AND CORRECTION OF WORK**

**Correction of Work –** If, within one (1) year after the date of Final Completion of the entire Work, or within such longer period of time as may be prescribed by laws or in equity or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be defective or otherwise not in accordance with the requirements of the Contract Documents, Contractor shall correct it promptly after receipt of written notice from State to do so unless State has previously given Contractor a written acceptance of such condition. Corrective Work shall be warranted to be free from defects for a period equal to the longer of six (6) months after the completion of the corrective Work or one (1) year after the Date of Final Completion or such longer period of time as may be prescribed by law or in equity, or expiration of the term of any applicable special warranty required by the Contract Documents whichever is longer. Any defect in such Work shall be corrected again by Contractor promptly upon written notice of the defect from State. The obligations under Section 1.10 of these General Conditions shall survive acceptance of the Work under the Contract for Construction and termination of the Contract for Construction. If Contractor fails to correct such Work, State may proceed to have the work corrected at Contractor's expense and Contractor shall pay the cost thereof on demand.

**1.11 TERMINATION OR SUSPENSION OF THE CONTRACT**

**A. Termination by Contractor**

**(1)** Contractor may terminate in writing, the Contract in the manner provided in Section 1.11 of these General Conditions if the Work is entirely stopped for a continuous period of thirty (30) days through no act or fault of Contractor or a Subcontractor, sub-Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with Contractor, for any of the following reasons:

**a.** Issuance of an order of a court or other public authority having jurisdiction.

**b.** An act of government, such as a declaration of national emergency, making material unavailable.

**(2)** If one of the above reasons exists, Contractor may, upon fourteen (14) days written notice to State's Representative, terminate the Contract, unless this reason is cured prior to the expiration of the notice period, and recover from State payment for Work properly executed in accordance with the Contract Documents, excluding any anticipated profits from uncompleted Work, and payment for costs directly related to Work thereafter performed by Contractor in terminating such Work, including reasonable demobilization charges, provided said Work is authorized in advance by State's Representative and State.

**B. Termination by State**

**(1)** State may terminate the Contract if State deems any of the following conditions to exist:

**a.** Contractor refuses or fails to supply enough properly skilled workers or proper materials or equipment.

**b.** Contractor fails to make prompt payment to Subcontractors for materials or equipment or labor in accordance with the respective agreements between Contractor and Subcontractors.

**c.** Contractor disregards laws, ordinances, or rules, regulations, or orders of a public authority having jurisdiction, including, without limitation, environmental rules and regulations and health and safety codes.

**d.** Contractor disregards the instructions of State's Representative (when such instructions are based on the requirements of the Contract Documents).

**e.** In accordance with applicable law, and if permitted by such law, Contractor is the subject of a voluntary or involuntary petition in bankruptcy, or makes a general assignment for the benefit of Contractor's creditors, or a trustee or receiver is appointed for Contractor or for any of its property, or files a petition to take advantage of any debtor's act, or to reorganize under bankruptcy or similar laws.

**f.** Contractor has all or substantially all of its assets, equipment, or materials in any way connected with the work, executed upon or judicially seized, when such attachment or seizure remains undismissed for seven (7) days after levy thereof.

**g.** Contractor has imposed against it a federal or state tax lien.

**h.** Contractor fails to diligently prosecute the Work and/or correct deficiencies.

**i.** Contractor fails to maintain the proper license to perform the Work prescribed by this Contract.

**(2)** When any of the above reasons exist, State may, without prejudice to any other rights or remedies of State and after giving Contractor and Contractor's surety, if any, seven (7) days prior written notice (except in cases of emergency, as reasonably determined by State), terminate the Contract and may:

**a.** Take possession of the site and Project and of all materials, equipment, tools, and construction equipment and machinery thereon owned, rented, or leased by Contractor; and

**b.** Finish the Work by whatever method State may deem expedient.

**c.** Tender completion of the Work to Contractor's surety, if any, in accordance with terms of the Performance Bond.

**(3)** When State terminates the Contract for one of the reasons stated in Subsection 1.11B(1) of these General Conditions, Contractor shall not be entitled to receive further payment until the Work is finished and a final accounting is completed as to the proper sums due Contractor under the terms of the Contract.

**(4)** To the extent the costs of completing Work, including compensation for additional professional services and expenses, exceed those costs which would have been payable to Contractor to complete the Work except for Contractor's default, Contractor will pay the difference to State. This obligation for payment shall survive termination of the Contract. Such costs incurred by State shall be determined by State.

**C. Suspension by State for Convenience –** State may, at any time, at will and without cause, suspend, delay, or interrupt any part of the Work or all the Work for any reason whatsoever for such period of time as State may determine by giving seven (7) days' prior written notice to Contractor specifying the part of the Work to be suspended, delayed, or interrupted and the effective date of such suspension, delay, or interruption, as the case may be. Contractor shall continue to perform the part of the Work not suspended, delayed, or interrupted and shall properly protect and secure the part of the Work so suspended, delayed, or interrupted, so far as is necessary in State's reasonable opinion. Notwithstanding Subsection 1.11B of these General Conditions, if any part of the Work is so suspended, delayed, or interrupted, Contractor shall be entitled to payment of reasonable standby fees (or at State's option, payment

for demobilization) and costs directly associated with protecting and securing the affected Work, provided said costs are authorized in advance by State's Representative. No payment shall be made by State, however, to the extent that such Work is, was, or could have been suspended, delayed, or interrupted under the Contract Documents or an equitable adjustment is made or denied under another provision of the Contract for Construction. In case of such suspension, delay, or interruption, State will issue a Change Order making any required adjustment to the Contract Time and/or the Contract Sum. For the remainder of the Work, the Contract Documents shall remain in full force and effect.

### 1.12 EMPLOYEES

For each phase and type of Work, Contractor shall employ journey level people skilled in their respective trades and skilled in the use of methods, tools, and appliances developed in order to obtain the highest quality of workmanship throughout the Project. Any person State may deem incompetent or disorderly must be promptly removed by Contractor and not re-employed on the Project.

### 1.13 PREVAILING WAGE

**A.** The Notice to Contractors stipulates the prevailing wage rates applicable to the classes of labor to be used on this Project.

**B.** Contractor shall abide by the laws and regulations set forth pursuant to California Labor Code, Sections 1720 et seq., and Title 8, California Code of Regulations, Section 16000 et seq.

### 1.14 TRAVEL AND SUBSISTENCE PAYMENTS

Contractor shall make travel and subsistence payments to each worker needed to execute the Work, as such travel and subsistence payments are defined in the applicable collective bargaining agreements filed in accordance with Labor Code Section 1773.8.

### 1.15 APPRENTICES

Special attention is directed to California Labor Code, Sections 1777.5, 1777.6, and 1777.7, and Title 8, California Code of Regulations, Section 200 et seq. Each Contractor and Subcontractor must, prior to commencement of the Public Works Contract, contact the Division of Apprenticeship Standards, 455 Golden Gate Avenue, San Francisco, California, 94102, or one of its branch offices to ensure compliance and complete understanding of the law regarding apprentices and specifically the required ratio thereunder. Responsibility for compliance with this section lies with the prime Contractor. For further information, the website for the Division of Apprenticeship Standards can be accessed at: www.dir.ca.gov .

### 1.16 SANITARY FACILITIES

Contractor shall provide potable drinking water, and sanitary toilet facilities for Contractor's workers unless the use of existing facilities is authorized by State's Representative. Contractor shall locate temporary facilities as directed by State's Representative and maintain such facilities in good repair and in a sanitary condition. Contractor shall remove such facilities completely at the conclusion of the Work.

### 1.17 OBSERVANCE OF PARK RULES AND REGULATIONS

The Work to be done is within the jurisdiction of the State Park System. All persons entering the premises for whatever reason are subject to the "Rules and Regulations" for the State Park System, as set forth in Title 14, California Code of Regulations, Division 3, Chapters 1 and 2. Any person who fails to observe these "Rules and Regulations" may be barred from further work in the State Park System.

### 1.18 RESPONSIBILITY FOR INJURY AND DAMAGE

**A.** Contractor shall be responsible for damage to or loss of property regardless of cause, or for injury or loss of life to persons employed on this Project and to the general public, which arise from operations under this Contract.

**B.** From the formal Start Work Date until formal acceptance of the Work, Contractor is responsible to save from injury and damage by whatever cause all of the Work under this Contract, except as provided in Section 7105 of the Public Contract Code. Contractor shall rebuild, restore, and/or repair any such injury or damage, at Contractor's sole expense, before formal acceptance.

**C.** State is hereby relieved at all times from an indebtedness or claim other than the Contract Sum.

### 1.19 COOPERATION BETWEEN CONTRACTOR AND STATE

**A.** When the Contract is approved, Contractor will be notified in writing by State of the formal Start Work Date, the Contract completion date, and the name and location of State's Representative responsible for inspection of the Work. Contractor shall start Work within ten (10) Calendar Days of the formal Start Work Date and diligently pursue the Work to completion.

**B.** If Work is suspended for more than three (3) Calendar Days "due to Contractor's actions" or "due to no fault of State," Contractor shall immediately inform State's Representative in writing as to the rescheduling of the Work.

**C.** Contractor shall be responsible for notifying the surety or sureties, furnishing bonds for the Contract, of all changes to the Contract.

**D.** No Work shall be done except on Working Days and during Regular Work Hours unless Contractor has submitted a written request to State's Representative not less then five (5) Calendar Days in advance of each occurrence and State has given written approval. State may reject, without further reason, any work done in violation of this Subsection.

### 1.20 PERMITS, LAWS, AND REGULATIONS

**A.** State shall obtain and pay for the permits as indicated in the Project Manual. Contractor is responsible for all other permits. Notwithstanding that State obtains any permits required for the Work, Contractor shall not be relieved of any responsibility for compliance with laws and codes, including without limitation, building codes, pertaining to the Work. Contractor shall pay all public utility usage charges, for utilities consumed during the Work, including any applicable connection charges, which apply to the Work.

**B.** No building permits from city or county governments are necessary for Work on State projects.

**C.** Contractor shall comply with the current edition of Title 24, California Code of Regulations, and the various safety orders and codes of the State of California where applicable.

**D.** All records of Contractor, subcontractors, and suppliers that pertain to the performance of the work or are necessary to determine or verify compensation, including, but not limited to, all documents used to prepare the bid shall be retained for a period of three years after final payment for examination or audit by the State. The State may examine and copy all records including, but not limited to, paper, electronic, and photographic documents.

### 1.21 STORAGE OF EQUIPMENT AND MATERIALS

**A.** State's Representative shall inform Contractor of the availability of suitable areas for the storage of Contractor's equipment and materials. Contractor shall maintain the storage of equipment and materials within the confines of the area designated by State's Representative.

**B.** Contractor shall store materials intended for use on this Project in such a manner that their quality and fitness for the Work will be preserved. When considered necessary by State, materials shall be stored so as to facilitate inspection. It shall be Contractor's responsibility to protect those stored items. All stored materials remain the property of the Contractor until such time as they are installed in their final position as intended in the Contract Documents.

**C.** Routes of hauling and parking vehicles and equipment beyond the limits of the existing roads shall be only as directed by State's Representative.

### 1.22 SITE CONDITIONS

**A.** State may furnish reports, surveys, or other information describing physical characteristics, legal limitations and utility locations for the Project site, and a legal description of the site. The furnishing of this information is for the convenience of Contractor only and shall not relieve Contractor from its duties under the Contract Documents in general. In performance of the Work, Contractor shall undertake such further investigations and studies as may be necessary or useful to determine subsurface characteristics and patent and concealed conditions. In connection with the foregoing, Contractor shall be solely responsible for locating (and shall locate prior to performing any Work) all utility lines, telephone company lines and cables, sewer lines, water pipes, gas lines, electrical lines, including, without limitation, all buried pipelines and buried telephone cables and shall perform the Work in such a manner so as to avoid damaging any such lines, cables, pipes, and pipelines. Utility points of connection and other site relationships referenced in the contract documents are diagrammatic in nature. The exact location and routing requirements are the responsibility of the Contractor and are subject to the approval of the State's Representative.

**B.** The Contractor shall visit the Project site and verify all existing conditions prior to preparing its bid, in accordance with Parts 1.01 and 1.02 of Section 00100 Public Works, Instructions to Bidders. No additional compensation will be allowed for any conditions described in the Contract Documents or reasonably anticipated from pre-bid examination and observation of the Project site.

**C. Differing Site Conditions**

**(1)** During the progress of the Work, if subsurface or latent physical conditions are encountered at the site differing materially from those indicated in the Contract or if unknown physical conditions of an unusual nature, are encountered at the site, Contractor shall promptly notify State in writing of the specific differing conditions before they are disturbed and before the affected Work is performed.

**(2)** Upon written notification, State's Representative will investigate the conditions, and if State's Representative determines that the conditions materially differ and cause change in the cost or time required for the performance of any Work under the Contract, an adjustment, excluding loss of anticipated profits, will be made and the Contract modified in writing accordingly. State's Representative will notify Contractor of its determination whether or not an adjustment of the Contract is warranted.

**D.** The construction area must be confined to the minimum space needed and be compatible with the ongoing Park Unit operations. The construction area, including all staging and laydown areas, must be approved by the State's Representative.

### 1.23 WARRANTIES

ALL WARRANTIES SHALL INCLUDE LABOR AND MATERIALS AND SHALL BE SIGNED BY THE MANUFACTURER OR SUBCONTRACTOR AS THE CASE MAY BE AND COUNTERSIGNED BY CONTRACTOR. ALL WARRANTIES SHALL BE ADDRESSED TO STATE AND DELIVERED TO STATE'S REPRESENTATIVE UPON COMPLETION OF THE WORK AND BEFORE OR WITH THE SUBMISSION OF REQUEST FOR FINAL PAYMENT.

### 1.24 AS-BUILT PLANS

Prior to acceptance, Contractor shall furnish to State's Representative a set of Contract plans in CAD (computer-aided drafting) format unless otherwise directed by State's Representative, clearly and legibly marked showing the location, as constructed, of all elements, features, components, and utilities. The as-built plans shall provide detailed information and reference dimensions locating all concealed elements, features, components, and utilities. Each sheet must be stamped "AS-BUILT", signed and dated by the Contractor.

### 1.25 PROTECTION OF PERSONS AND PROPERTY

**A.** Contractor shall comply with all air pollution control rules, regulations, ordinances, and statutes, which apply to any Work performed pursuant to the Contract, including, but not limited to, any air pollution control rules, regulations, ordinances, and statutes, specified in California Government Code, Section 11017.

**B.** Contractor shall give notices and comply with applicable laws, ordinances, rules, regulations, and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss. Contractor shall provide all facilities and shall follow all procedures required by the Occupational Safety and Health Act (OSHA) including, but not limited to, providing and posting all required posters and notices and shall otherwise be responsible for all other mandatory safety laws.

**C.** Contractor shall not impose or permit loading upon any part of the Work, construction, site or upon or adjacent to the Work site, in excess of safe limits, or permit loading that will result in stress or damage to the structural, architectural, mechanical, electrical, or other components of the Work.

**D. Hazardous Materials**

**(1)** Contractor shall not cause or permit any "Hazardous Materials" [as defined in Section 1.27D(2) of these General Conditions] to be brought upon, kept or used in or about the Project site except to the extent such Hazardous Materials: (a) are necessary for the prosecution of the Work; and (b) are required pursuant to the Contract Documents; and (c) have been approved in writing by State. Any Hazardous Materials allowed to be used on the Project site shall be used, stored, and disposed of in compliance with all applicable laws relating to such Hazardous Materials.

**(2)** As used herein, the term "Hazardous Materials" means any hazardous or toxic substances, materials or wastes listed in the United States Department of Transportation Hazardous Materials Table, or listed by the Environmental Protection Agency as a hazardous substance, or as defined in the California Health and Safety Code, Section 25316, or any substances, materials or wastes that are or become regulated, identified, defined or listed under federal, state or local law, and all products containing such Hazardous Materials.

**E. Spread of Exotic Biological Organisms –** Before entering the park unit and at the conclusion of the Contract, all Contractors shall remove soil and organic materials from all motorized equipment used to transport or process soil or organic matter. Contractors shall clean the hull, motor, pumps, and accessories on all watercraft before entering the park unit and at the conclusion of the Contract.

# SECTION 000802

# SUPPLEMENTAL CONDITIONS

PART 1 - GENERAL

1.1 SUMMARY

A. The following requirements either amend or supplement the following sections

1. Section 00700 – General Conditions (DPR 483)

B. ADD the following paragraph to Section 00700 – General Conditions (DPR 483)

1.04 Insurance, A. Insurance Requirements, (2) Builder's Risk/Installation Floater:

Builders Risk Insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, windstorm, false work, testing and startup, temporary buildings, and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for the State's and Contractor's services and expenses required as a result of such insured loss.

ADD the following paragraph to Section 00700 – General Conditions (DPR 483), 1.04 Insurance, <u>(5) POLLUTION LIABILITY:</u>

Contractor shall maintain in force, at its own expense, Pollution Liability / Environmental Liability Insurance (covers areas of: asbestos / lead abatement, demolition, electrical, excavation / grading, plumbing, masonry, painting, roofing, DOD & DOE, transformer / PCBs, general contracting, environmental remediation, drilling, emergency response, industrial cleaning / maintenance, lab packing, mechanical, paving, Superfund, storage tank and utility, mold remediation and incidental fungus), with limits not less than one million dollars ($1,000,000) depending on exposure.

D. PRODUCTS (not used)

PART 2 - EXECUTION (not used)

END OF SECTION 000802

# SECTION 000803

# MINED PRODUCTS AND MATERIALS

## PART 1 - GENERAL

### 1.1 DESCRIPTION

A. The following requirements supplement the General Conditions

B. Related Sections:
   1. Section 033000: Cast-In-Place Concrete
   2. Section 311100: Clearing and Grubbing

## PART 2 - PRODUCTS

### 2.1 MINED PRODUCTS AND MATERIALS

A. In accordance with provisions of Section 10295.5 of the Public Contract Code, no sand, gravel, aggregates, or other minerals produced from a surface mining operation subject to the Surface Mining and Reclamation Act of 1975 (Public Resources Code Section 2710, et. seq.), shall be purchased or utilized in the Work of this Contract, unless the operation is identified in the list published quarterly in the California Regulatory Notice Register pursuant to subdivision (b) of Section 2717 of the Public Resources Code. The list is also available through the State of California, Department of Conservation, Office of Mine Reclamation website at www.consrv.ca.gov/omr (AB 3098 List).

## PART 3 - EXECUTION

### 3.1 CERIFICATE OF COMPLIANCE

A. Submit Signed Certificate Indicating:
   1. No sand, gravel, aggregates, or other minerals produced from a surface mining operation subject to the Surface Mining and Reclamation Act of 1975 have been purchased or utilized in the Work of this Contract which have come from sites not currently identified in the list published quarterly in the California Regulatory Notice Register pursuant to subdivision (b) of Section 2717 of the Public Resources Code.

   2. Indicate the California Mine Identification Number of each site from which products or materials have been purchased.

END OF SECTION 000803

# SECTION 000804

# DISPOSAL OF REFUSE

## PART 1 - GENERAL

### 1.1 DESCRIPTION

A. Dispose of waste, debris, and rubbish resulting from the construction of the project.

B. If excess excavation spoils cannot be suitably disposed of on State property, as directed by the State's Representative, it shall be hauled away at the Contractor's expense.

## PART 2 - PRODUCTS (not used)

## PART 3 - EXECUTION

### 3.1 REQUIREMENTS

A. Remove waste materials, debris, and rubbish from site and legally dispose of at public or private dumping areas off State property.

B. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.

1. Do not burn or bury rubbish and waste materials on project site.
2. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
3. Do not dispose of wastes into streams or waterways

END OF SECTION 000804

# SECTION 000810

# CONSTRAINTS AND MITIGATIONS

## PART 1 - GENERAL

### 1.1 DESCRIPTION

A. The following requirements supplement the General Conditions, Section 00700.

### 1.2 RELATED REQUIREMENTS

A. Section 015000 Temporary Facilities and Controls

B. Section 015639 Temporary Tree and Plant Protection

C. Section 311000 Site Clearing

D. Section 311235 Storm Water Pollution Prevention Plan (SWPPP)

E. Section 329300 Plants

### 1.3 DEFINITIONS (Not used).

### 1.4 SUBMITTALS

A. Prior to the start of construction, Contractor shall prepare a Storm Water Soil Loss Prevention Plan for DPR approval that identifies the Best Management Practices for use in all construction areas to reduce or eliminate the discharge of soil and surface water runoff from soil-disturbing construction activities and spills from vehicles and equipment (See Section 311231).

## PART 2 – PRODUCTS (Not used).

## PART 3 – EXECUTION

### 3.1 GENERAL CONSTRAINTS

A. In compliance with the environmental review documents, the Contractor’s operations are subject to the constraints and environmental protection measures that follow, as well as compliance with any and all constraints or environmental protection measures included in other sections of the Project Manual.

B. Contractor shall contact State’s Representative a minimum of fourteen (14) days prior to the start of construction, as well as prior to demolition, vegetation removal, or any ground-disturbing work, and/or work during dates outlined in 3.3 NATURAL RESOURCE CONSTRAINTS below to

schedule cultural and/or natural resource monitoring/surveys by Cultural/Natural Resource Specialists. Any ensuing directives from the Cultural/Natural Resource Specialist in relation to need for interruption of specific Contractor work will be made through the State's Representative.

C. Contractor shall notify State's Representative about any proposed project changes, including but not limited to construction sites, staging and storage locations for vehicles, equipment, materials, and vehicle access routes, for review and approval by Cultural/Natural Resource Specialists a minimum of 5 days in advance of implementation.

D. Contractor shall ensure that State Resource Specialists have access to the site when the specialist(s) determine it necessary to monitor work and/or resources.

E. Contractor shall stage/store equipment and materials only on paved surfaces or previously hardened surfaces to minimize soil compaction of native habitat. These areas shall be reviewed (in consultation with natural and cultural resource specialists) and approved by the State's Representative prior to use by the Contractor.

F. Work shall be restricted to daylight hours.

G. No pets or firearms shall be permitted on-site.

H. All vehicles and equipment shall be in good working condition and free of leaks

3.2 CULTURAL RESOURCE CONSTRAINTS

A. Monitoring is required at the discretion of the Cultural Resource Specialist.

B. In the event that previously unknown cultural resources (including but not limited to concentrations of dark soil, shell, bone, flaked stone, groundstone, or deposits of historic materials ([50+ years old] trash, foundations, etc.) are encountered during project construction by anyone:

1. Work shall cease immediately at the location.
2. Contractor shall immediately notify the State's Representative.
3. Contractor shall not work in this area until receipt of written approval from the State's Representative to resume activity in the area of the discovery.
4. Contractor shall be redirected to work in other project locations.

C. In the event that human remains are discovered:

1. Work shall cease immediately in the area of the find and the Contractor shall immediately notify the State's Representative.
2. Work will not resume in the area of the find until proper disposition is complete in accordance with §5097.98 of the California Public Resources Code.
3. Contractor shall be redirected to work in other project locations until Contractor receives written approval from the State's Representative to resume activity in the area of the discovery.

3.3 NATURAL RESOURCE CONSTRAINTS

A. An education program on Alameda striped-racer in the area shall be presented to all project employees by a Permitted Biologist, prior to the start of construction, and before new employees begin work on-site. Materials discussed in the program will, at a minimum, include the following topics:
    1. The appropriate access route in and out of the construction area and review project boundaries;
    2. What the Contractor is obligated to do if one is encountered;
    3. Species description, general behavior, and ecology;
    4. Distribution and occurrence near the project site;
    5. Species' sensitivity to human activities;
    6. Legal protection;
    7. Penalties for violation of State or Federal laws;
    8. Reporting requirements; and
    9. Project conservation measures.

B. Raptors / Migratory Birds: For activities that involve disturbance to structures, the ground, or vegetation and/or noise levels greater than ambient the following restrictions apply.
    1. A preconstruction survey for nesting birds shall be completed by the Natural Resource Specialist no more than seven (7) days prior to the start of any project-related disturbance.
    2. Should work be suspended or delayed for a period of greater than seven (7) days, then the Natural Resource Specialist, at his/her discretion, shall complete a bird survey to ensure that no additional nesting has occurred at the project site.
    3. If an active nest site is found within/near a construction area, then
        a. The Contractor shall be directed to work in other locations by the State's Representative.

b. The Contractor shall implement protection measures as directed by the State's Representative to minimize harm/harassment to the birds. These may include, but are not limited to, staking/flagging near the nest, establishing a minimum "no work" buffer, and/or installation of temporary fencing.

c. The Contractor shall not start or resume work in this area until receipt of written approval from the State's Representative.

C. Contractor shall use the following Best Management Practices (BMPs) to limit transmission of Sudden Oak Death (SOD) outside of the work area.

1. Unauthorized movement of plant material is prohibited.
2. Utilize paved and graveled roads to the extent possible.
3. Before entering or leaving the project area, remove or wash-off accumulations of plant debris, soil, and mud from shoes, boots, vehicles, and heavy equipment, etc.

D. Contractor shall cover areas of excavation (e.g., pits, trenches, holes) overnight or during periods of inactivity. Routes of escape from excavated pits and trenches shall also be installed for wildlife that could potentially become entrapped.

1. These locations will be regularly inspected by the Contractor, throughout construction and immediately prior to filling.
2. Should any wildlife be discovered within an excavated area, the Contractor shall promptly contact the State's Representative and temporarily suspend all work at the excavation site until the entrapped animal can be safely relocated by the Natural Resource Specialist or Permitted Biologist.

E. Contractor shall implement the following measures to reduce the introduction and spread of non-native, invasive species:

1. All landscaping, planting, and seeding will use native species, from local stock, approved by State parks;
2. Any landscaping or replanting required for the project shall not use species listed as noxious by the California Department of Food and Agriculture (CDFA).
3. Contractor shall landscape/revegetate all bare and disturbed soil with CDFA recommended seed mix or plantings from local species to preclude the invasion of noxious weeds in the project site.
4. Construction equipment shall be cleaned of mud or other debris that may contain invasive plants and/or seeds and inspected to reduce the potential of spreading noxious weeds, before mobilizing to arrive at the construction site and before leaving the construction site.

5. Contractor shall remove all non-native, invasive plant species from disturbed areas prior to replanting.

F. Contractor shall keep the project area clear of trash to avoid attracting scavengers/predators. All food and garbage shall be placed in sealed containers and regularly removed from the site.

3.4 NOISE

A. Contractor shall minimize noise during construction through the use of best available techniques.

B. Contractor shall ensure that all internal combustion engines are equipped with a muffler of a type recommended by the manufacturer and that all equipment and trucks use noise attenuation devices, such as engine enclosures, acoustically attenuating shields or shrouds, intake silencers, ducts, etc.

C. Contractor shall locate stationary noise sources (e.g. generators) and staging areas as far away as possible from sensitive receptors (e.g., visitors, staff, wildlife, and/or neighbors). If stationary noise sources must be located near sensitive receptors, Contractor shall muffle construction-related noise sources to the extent feasible and/or where practicable.

3.5 AIR QUALITY

A. Contractor shall maintain all equipment engines in good condition, in proper tune (according to manufacturer's specifications), and in compliance with all State and Federal requirements.

B. All trucks hauling soil, sand, or other loose materials on public roads shall be covered or required to maintain at least two feet of freeboard.

C. Contractor shall apply water (e.g., using water truck) twice daily at sufficient quantities to prevent airborne dust from leaving the Project area. Watering shall be conducted in a manner that prevents any runoff.

D. Contractor shall apply chemical soil stabilizers on inactive construction areas (disturbed lands within construction projects that are unused for at least 4 consecutive days).

E. Grading activities shall be prohibited during periods of high wind (over 25 mph).

F. Contractor shall cover all inactive storage piles.

G. Contractor shall sweep streets if visible soil material is carried out from the construction site.

3.6 EROSION CONTROL

A. BMPs to address erosion and excess sedimentation shall be incorporated into the project [See Section 311231].

B. Should any areas require hydroseeding for temporary erosion control, then only local, native plant species, approved by the State's Representative, in

coordination with the Natural Resource Specialist, shall be used. No invasive, exotics shall be included in any proposed seed palette. Species identified on Lists A & B of the California Invasive Plant Council's List of Exotic Pest Plants of Greatest Ecological Concern in California, as of October 1999, shall be prohibited.

## 3.7 FIRE PREVENTION

A. Contractor shall require that all heavy equipment be equipped with spark arrestors or turbo-charging (eliminates sparks in exhaust) and fire extinguishers. At the end of each workday, Contractor shall park all equipment within approved staging areas.

B. Contractor shall require that construction crews park vehicles and heavy equipment away from flammable material, such as dry grass or brush.

## 3.8 WORK LIMITS

A. No construction activities may occur outside of defined work limits unless approved in writing by the State's Representative, in consultation with the Cultural and Natural Resource Specialists.

## 3.9 SITE CONDITIONS

A. If unforeseen cultural and/or natural resources are uncovered during execution of the work, the State's Representative will put activities on hold at that specific location, and Contractor(s) shall be redirected to work in other project locations. The State Resource Specialist will record and evaluate the find and implement avoidance, preservation, or recovery measures as appropriate in compliance with environmental law and State Parks' resource directives prior to State's Representative directing resumption of work at that specific location.

B. Contractor shall include in the project schedule, consideration of up to 5 calendar days down time for unforeseen conditions uncovered during execution of work that may require further resource analysis. Down time days must be approved by the State's Representative.

## 3.10 PROTECTION OF EXISTING RESOURCES

A. Contractor shall provide required protection, in areas identified on drawings or as directed by State's Representative to maintain integrity of the existing resources to be protected during the course of the project.

END OF SECTION 000810

# SECTION 011000

# SUMMARY

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Specification and Drawing conventions.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of State's facilities.

2. 011400SF - WORK RESTRICTIONS

### 1.2 PROJECT INFORMATION

A. Project Identification: Mitchell Canyon Education Center

1. Project Location: Mount Diablo State Park

   96 Mitchell Canyon Rd.

   Clayton, CA 94517

### 1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. 1,460 SF Education Center, pedestrian paths, ADA-accessible entrance and drop-off plaza, ADA-accessible parking spaces, emergency vehicle access to parking lot, repairs to an existing restroom and other Work indicated in the Contract Documents.

B. Type of Contract:

1. Project will be constructed under a single prime contract.

1.4 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

**SECTION 011400**
**WORK RESTRICTIONS**

PART 1 - GENERAL

1.1 CONTRACTOR'S USE OF SITE AND PREMISES

A. Restricted Use of Site: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

B. Limits on Use of Site: Limit use of Project site to Work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits on Use of Site: Confine construction operations to work areas coordinated with the State.
2. Driveways, Walkways, and Entrances: Keep driveways, loading areas, and entrances serving premises clear and available to State, State's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.

1.2 COORDINATION WITH OCCUPANTS

A. Partial State Occupancy: State will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with State during construction operations to minimize conflicts and facilitate State usage. Perform the Work so as not to interfere with State's operations. Maintain existing exits unless otherwise indicated.

1.3 WORK RESTRICTIONS

A. Site Access and Vehicular Restrictions

1. Primary Access: Access to the project site for all construction personnel, deliveries, and equipment shall be limited strictly via Mitchell Canyon Road.
2. Restricted Routes and Bridge Structures: The use of the unmarked, non-traffic-rated road and its associated bridge bypass is strictly prohibited for all construction-related vehicular traffic.
3. Prohibited vehicles on the unrated road and bridge bypass include, but are not limited to: construction trucks, cranes, concrete transport trucks, and all other forms of heavy equipment.

4. The Contractor shall be solely responsible for ensuring that all subcontractors, material suppliers, and delivery drivers comply with these access restrictions.
5. Compliance: Any damage resulting from unauthorized use of restricted routes or non-traffic-rated structures shall be repaired immediately at the Contractor's sole expense, to the satisfaction of the State Representative.

B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by State or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Notify State's Representative not less than two days in advance of proposed utility interruptions.
2. Obtain State's written permission before proceeding with utility interruptions.

C. Noise, Vibration, Dust, and Odors: Coordinate operations that may result in high levels of noise and vibration, dust, odors, or other disruption to State occupancy with State.

1. Notify State's Representative not less than two days in advance of proposed disruptive operations.
2. Obtain State's written permission before proceeding with disruptive operations.

D. Smoking and Controlled Substance Restrictions: Use of tobacco products alcoholic beverages, and other controlled substances within the existing State's property is not permitted.

E. The DPR District Personnel will perform the following work prior to the issuance of the Notice to Proceed:
1. Demolition and removal of the existing metal building.
2. Demolition and removal of the existing visitor center trailer, including the associated access ramp.
3. Demolition and removal of the existing trailhead path.
    a. The above items are Not In Contract (N.I.C.). The Contractor shall field-verify that the State has completed the designated demolition and cleared the site footprint prior to commencing adjacent or overlapping Contract work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011400

# SECTION 012300

# ALTERNATES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

### 1.2 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the State decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

### 1.3 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Execute accepted alternates under the same conditions as other work of the Contract.

C. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF DEDUCTIONS

A. Alternate No. 01 Trail Head Grading

1. Base Bid: Includes all contract bid documents. Construction drawings A0-0.1 through S3-5.6
2. Deductive Alternate No 01: Construction of concrete trailhead path and relocate sign kiosk, post footings in concrete. Fiber rolls around future trailhead path. Provide truncated domes where trail meets vehicular surface, typ. Custom sliding fiber cement barn door shutters, barn door guide blocks, lockable Hose Bibb and gravel drainage area.
   a. Refer to sheets A0-1.2, A0-1.3, A1-2.2, A1-3.1, A1-3.3, A1-8.1, A1-8.2, A1-9.4, C1.1, C1.2, C2.0, C4.0, L1.0, L1.1, L1.2, L3.0, L4.0, A0-1.0, A0-1.2, A0-1.3,
   b.

END OF SECTION 012300

# SECTION 012500

# SUBSTITUTION PROCEDURES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:
   1. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

### 1.2 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

   1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.

### 1.3 ACTION SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

   1. Substitution Request Form: Use form acceptable to State's Representative.
   2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

      a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
      b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by State and separate contractors that will be necessary to accommodate proposed substitution.
      c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include

attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.

d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of State's Representatives and States.
h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project.
j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. State's Action: State's Representative will notify Contractor of acceptance or rejection of proposed substitution within 14 days of receipt of request.

a. Forms of Acceptance: Change Order, Construction Change Directive, or State's Supplemental Instructions for minor changes in the Work.
b. Use product specified if State's Representative does not issue a decision on use of a proposed substitution within time allocated.

## 1.4 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.5 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.6 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change:

1. Conditions: State’s Representative will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, State’s Representative will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Substitution request is fully documented and properly submitted.
c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution has received necessary approvals of authorities having jurisdiction.
e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.

B. Substitutions for Convenience: Not Allowed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

# SECTION 012600

# CONTRACT MODIFICATION PROCEDURES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications. The terms “Change Order”, “Contract Modification”, and “Amendment” are synonymous.

### 1.2 MINOR CHANGES IN THE WORK

A. State Representative will issue Bulletins, defined as supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.

### 1.3 PROPOSED CHANGE ORDER (PCO)

A. State-Initiated Requests: State Representative will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. PCOs issued by State Representative are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
2. Within 15 days after receipt of a PCO, submit a change proposal indicating all cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    c. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity durations, start and finish times, and activity relationships. Use available total float before requesting an extension of the Contract Time.

B. Contractor - Change Order Request (COR) - : Contractor may propose changes by submitting a Change Order Request (COR).

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

1.4 ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, base each Change Order proposal on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

1. Include installation costs in purchase amount only where indicated as part of the allowance.
2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
3. Submit substantiation of a change in scope of work, if any, claimed in Change Order proposals related to unit-cost allowances.
4. State reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

B. Submit requests for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the Purchase Order amount or Contractor's handling, labor, installation, overhead, and profit. Submit request within 10 days of receipt of the Contract Field Order (CFO) authorizing work to proceed on the allowance. The State has the option to reject requests submitted later than 10 days after such authorization.

1. Do not include Contractor's or subcontractor's indirect expense in the Change Order proposal cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

1.5 CONTRACT FIELD ORDER (CFO)

A. Contract Field Order: The State may issue a Contract Field Order (CFO). A CFO instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Contract Amendment.

1. A CFO contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

1.6 CHANGE ORDER (CONTRACT AMENDMENT)

A. Submit a letter of authority indicating the Contractor's authorized representative for negotiation of cost and time adjustments, and the limits of their authority. On State's approval of a Contractor's Change Proposal, State will issue a Contract Amendment for signatures of State and Contractor.

PART 2 - PART2 – PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

# SECTION 012900

# PAYMENT PROCEDURES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

### 1.2 SCHEDULE OF VALUES

A. General: Submit Schedule of Values in accordance with GENERAL CONDITIONS.

B. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.

1. Correlate line items in the Schedule of Values with the project CPM Schedule.
2. Subschedules: Where the Work is separated into phases requiring separately phased payments, provide sub-schedules showing values correlated with each phase of payment.

C. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.

1. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
2. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
3. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
4. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
5. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
6. Each item in the Schedule of Values and Applications for Payment shall be complete..

a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.

7. Provide separate line items for profit, fees, taxes, overhead, and General Conditions.

8. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Contract Field Orders result in a change in the Contract Sum.

1.3 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be sequentially numbered and consistent with previous applications and payments as certified by the State Representative and paid for by the State.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Transmittal: Submit three (3) signed original copies of each Application for Payment to the State.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

C. Administrative Items: Administrative actions, submittals , and update submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of Values.
3. Contractor's Construction Schedule (preliminary if not final).
4. Submittals Schedule (preliminary if not final).
5. List of Contractor's staff assignments.
6. Copies of required permits.
7. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.

D. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

2. This application shall reflect Certificates of Partial Substantial Completion issued previously for State occupancy of designated portions of the Work.

E. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. Project Record Documents (As-Builts).
5. Operation and Maintenance (O & M) Manuals.
6. Warranties.
7. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when the State took possession of and assumed responsibility for corresponding elements of the Work.

END OF SECTION 012900

# SECTION 013100

# PROJECT MANAGEMENT AND COORDINATION

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General coordination procedures.
2. Coordination drawings.
3. RFIs.
4. Digital project management procedures.
5. Project meetings.

B. Related Requirements:

1. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

### 1.2 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

### 1.3 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

## 1.4 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

    a. Indicate functional and spatial relationships of components of Architectural, structural, civil, mechanical, and electrical systems.
    b. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to State’s Representative indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show Architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate subframing for support of ceiling, raised access floor, and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Review: State's Representative will review coordination drawings to confirm that, in general, the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If State's Representative determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, State's Representative will so inform Contractor, who shall make suitable modifications and resubmit.

C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:

1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.

## 1.5 REQUEST FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. State's Representative will return without response those RFIs submitted to State's Representative by other entities controlled by Contractor.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. State name.
2. State's Project number.
3. Name of State's Representative
4. State's Project number.
5. Date.
6. Name of Contractor.
7. RFI number, numbered sequentially.
8. RFI subject.
9. Specification Section number and title and related paragraphs, as appropriate.
10. Drawing number and detail references, as appropriate.
11. Field dimensions and conditions, as appropriate.
12. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
13. Contractor's signature.
14. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

C. State's Action: State's Representative will review each RFI, determine action required, and respond. Allow 15 days for State's response for each RFI. RFIs received by State's Representative after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of State's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.

2. State's action may include a request for additional information, in which case State's time for response will date from time of receipt by State's Representative of additional information.
3. State's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify State's Representative in writing within five days of receipt of the RFI response.

D. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number.

1. Project name.
2. Name and address of Contractor.
3. Name and address of State's Representative.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date State's response was received.

E. On receipt of State's action, update the RFI log and immediately distribute the RFI response to affected parties.

1.6 PROJECT MEETINGS

A. General: State's Representative will schedule and conduct meetings and conferences at Project site unless otherwise indicated.

B. Preconstruction Conference: State's Representative will schedule and conduct a preconstruction conference before starting construction, at a time convenient to State and State's Representative.

1. Attendees: Authorized representatives of State, State's Representative, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:

a. Responsibilities and personnel assignments.
b. Tentative construction schedule.
c. Phasing.
d. Critical work sequencing and long lead items.
e. Designation of key personnel and their duties.
f. Lines of communications.
g. Procedures for processing field decisions and Change Orders.
h. Procedures for RFIs.
i. Procedures for testing and inspecting.
j. Procedures for processing Applications for Payment.
k. Distribution of the Contract Documents.
l. Submittal procedures.
m. Preparation of Record Documents.
n. Use of the premises
o. Work restrictions.
p. Working hours.

q. State's occupancy requirements.
r. Responsibility for temporary facilities and controls.
s. Procedures for moisture and mold control.
t. Procedures for disruptions and shutdowns.
u. Construction waste management and recycling.
v. Parking availability.
w. Office, work, and storage areas.
x. Equipment deliveries and priorities.
y. First aid.
z. Security.
aa. Progress cleaning.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other sections and when required for coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise State's Representative of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

a. Contract Documents.
b. Options.
c. Related RFIs.
d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals
h. Retain first subparagraph below for projects with sustainable design documentation requirements.
i. Review of mockups.
j. Possible conflicts.
k. Compatibility requirements.
l. Time schedules.
m. Weather limitations.
n. Manufacturer's written instructions.
o. Warranty requirements.
p. Compatibility of materials.
q. Acceptability of substrates.
r. Temporary facilities and controls.

s. Space and access limitations.
t. Regulations of authorities having jurisdiction.
u. Testing and inspecting requirements.
v. Installation procedures.
w. Coordination with other work.
x. Required performance results.
y. Protection of adjacent work.
z. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: State's Representative will conduct progress meetings at biweekly intervals.

1. Attendees: In addition to representatives of State and State's Representative, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. 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.

1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.

2) Sequence of operations.
3) Retain first subparagraph below if Project uses BIM in construction stage.

4) Status of submittals.
5) Deliveries.
6) Off-site fabrication.
7) Access.
8) Site use.
9) Temporary facilities and controls.
10) Progress cleaning.
11) Quality and work standards.
12) Status of correction of deficient items.
13) Field observations.
14) Status of RFIs.
15) Status of Proposal Requests.
16) Pending changes.
17) Status of Change Orders.
18) Pending claims and disputes.
19) Documentation of information for payment requests.

3. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

    a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

# SECTION 013200

# CONSTRUCTION PROGRESS DOCUMENTATION

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Contractor's Construction Schedule.
2. Construction schedule updating reports.
3. Daily construction reports.
4. Site condition reports.

### 1.2 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

E. Float: The measure of leeway in starting and completing an activity.

1.3 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. Working electronic copy of schedule file.
2. PDF file.
3. Three paper copies, of sufficient size to display entire period or schedule, as required.

B. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working digital copy of schedule, using software indicated, and labeled to comply with requirements for submittals.

D. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for each activity, sorted in ascending order by activity number and then by early start date, or actual start date if known.
3. Total Float Report: List of activities sorted in ascending order of total float.

E. Construction Schedule Updating Reports: Submit with Applications for Payment.

F. Daily Construction Reports: Submit at weekly intervals.

G. Site Condition Reports: Submit at time of discovery of differing conditions.

1.4 COORDINATION

A. Coordinate Contractor's Construction Schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

1.5 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

B. Time Frame: Extend schedule from date established for [the Notice to Proceed to date of final completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

C. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 15 days, unless specifically allowed by State's Representative.
2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.

3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
4. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for State's administrative procedures necessary for certification of Substantial Completion.
5. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.

D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. State-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
3. Work Restrictions: Show the effect of the following items on the schedule:

a. Coordination with existing construction.
b. Limitations of continued occupancies.
c. Uninterruptible services.

d. Partial occupancy before Substantial Completion.
e. Use-of-premises restrictions.
f. Provisions for future construction.
g. Seasonal variations.
h. Environmental control.

E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.

F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the Work and the Contract Time.

G. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

H. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.

I. Distribution: Distribute copies of approved schedule to State’s Representative and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules 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 performance of construction activities.

1.6 GANTT-CHART SCHEDULE REQUIREMENTS

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's Construction Schedule within 10 days of date established for the Notice to Proceed.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1.7 CPM SCHEDULE REQUIREMENTS

A. Prepare network diagrams using AON (activity-on-node) format.

B. CPM Schedule: Prepare Contractor's Construction Schedule using a time-scaled CPM network analysis diagram for the Work.
   1. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
   2. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule to coordinate with the Contract Time.

C. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.

   1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

      a. Preparation and processing of submittals.
      b. Mobilization and demobilization.
      c. Purchase of materials.
      d. Delivery.
      e. Fabrication.
      f. Utility interruptions.
      g. Installation.
      h. Work by State that may affect or be affected by Contractor's activities.
      i. Testing and inspection.
      j. Commissioning.
      k. Punch list and final completion.
      l. Activities occurring following final completion.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

D. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall Project schedule.

E. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Main events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.
10. Dollar value of activity (coordinated with the schedule of values).

F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

1.8 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.

3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Testing and inspection.
8. Accidents.
9. Meetings and significant decisions.
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Substantial Completions authorized.

B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013200

# SECTION 013300

# SUBMITTAL PROCEDURES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.

B. Absolutely no construction activity shall commence on submittal items or affected assemblies prior to the State's approval of contractors submittals.

C. Contractor shall upload and submit all electronic submittals through Procore project management software. State’s Rep will provide Procore tutorial for instruction on how to upload submittals to Procore.

### 1.2 DEFINITIONS

A. Action Submittals: Written and graphic information that requires the Designer's responsive action.

B. Informational Submittals: Written information that does not require the Designer's approval. Submittals may be rejected for not complying with requirements.

### 1.3 SUBMITTAL PROCEDURES

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. The State Representative reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

B. Submittals Schedule: Electronic copies of each submittal must be uploaded to Procore Project Management software and transmitted to the State Representative within 15 days of Notice To Proceed.

C. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on the Designer's receipt of submittal.

1. Initial Review: Allow 20 working days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. The State will advise Contractor when a submittal being processed must be delayed for coordination.
2. If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Allow 15 working days for processing each resubmittal.
4. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.

D. Identification: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space on label or beside title block to record Contractor's review and approval markings and action taken by the State.
3. Include the following information on label for processing and recording action taken:

    a. Project name.
    b. Date.
    c. Name and address of Contractor.
    d. Name and address of subcontractor.
    e. Name and address of supplier.
    f. Name of manufacturer.
    g. Unique sequential identifier, including revision number.
    h. Number and title of appropriate Specification Section.
    i. Drawing number and detail references, as appropriate.
    j. Other necessary identification.

E. Deviations: Highlight, encircle, or otherwise identify in a manner acceptable to the State any deviations from the Contract Documents on submittals.

F. Additional Copies: Unless additional copies are required for final submittal, and unless the Designer observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.

1. Additional copies submitted for maintenance manuals will not be marked with action taken and will be returned.

G. Transmittal: Package each physical sample submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form uploaded to Procore. Number each submittal sequentially and

date each submittal. The State Representative will return submittals, without review, from sources other than Contractor.

1. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.
2. Transmittal Form: Use form approved by the State Representative.

H. Use for Construction: Use only final submittals with mark indicating action taken by the State in connection with construction.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit in Procore all Action Submittals required by individual Specification Sections.

1. Number of Copies: Submit 1 electronic copy of each submittal. If physical samples are indicated, contractor will submit a coversheet in Procore for response. The State Representative will return physical samples. Mark up and retain one physical sample as a Project Record.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's written recommendations.
    b. Manufacturer's product specifications.
    c. Manufacturer's installation instructions.
    d. Manufacturer's catalog cuts.
    e. Wiring diagrams showing factory-installed wiring.
    f. Printed performance curves.
    g. Operational range diagrams.
    h. Compliance with recognized trade association standards.
    i. Compliance with recognized testing agency standards.

C. Shop Drawings: Submit Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Include the following information, as applicable:

a. Dimensions.
b. Identification of products.
c. Fabrication and installation drawings.
d. Roughing-in and setting diagrams.
e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
f. Shopwork manufacturing instructions.
g. Templates and patterns.
h. Schedules.
i. Notation of coordination requirements.
j. Notation of dimensions established by field measurement.

2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
3. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 40 inches.

D. Samples: Submit physical units of materials or products, including the following:
1. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

a. Submit three full set[**s**] of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. The State Representative will return submittal with options selected.

2. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from the same material to be used for the Work, cured and finished in manner specified, and physically identical with the product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

a. Submit three (3) sets of Samples. The State will retain **two** Sample sets; remainder will be returned. A submittal coversheet for each physical sample to be submitted through Procore for response.

3. Preparation: Mount, display, or package Samples in manner specified to facilitate review of qualities indicated. Submit Samples to match the State's sample where so indicated. Attach label on unexposed side.

4. Submit Samples for review of kind, color, pattern, and texture for a final check of these characteristics with other elements and for a comparison of these characteristics between final submittal and actual component as delivered and installed.
5. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

E. Product Schedule or List: Submit a written summary indicating types of products required for the Work and their intended location.

F. Application for Payment: Comply with requirements in Division 1 Section 01290 "Payment Procedures."

G. Schedule of Values: Comply with requirements in Section 00700 General Conditions.

2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.

1. Number of Copies: Submit one (1) electronic copy of each submittal, unless otherwise indicated.
2. Certificates and Certifications: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

B. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements.

C. Environmental Product Declarations (EPD):

1. Per the Buy Clean California Act, Environmental Product Declarations (EPD) shall be submitted for the following items:
    - Concrete Reinforcing Steel: ASTM A615/A615M standard specification for carbon steel bars. ASTM A706/A706M standard specification for low-alloy steel bars. ASTM A767/A767M standard specification for zinc-coated steel bars. ASTM A775/A775M standard specification for epoxy-coated steel bars

    - Structural Steel: Hot-rolled sections consisting of wide flange beams (W-shape and HP-shape used in structural applications), standard beams (S-shape), misc. beams (M-shape), channels, an-

gles, and tees. Hollow structural sections with round, square, or rectangular cross-section. Plate material**.**

- Flat Glass: Float or rolled glass that is clear or tinted.

- Mineral Wool Board Insulation: Board insulation made of rock or slag in light- and heavy-density types. Light-density**:** 2.5 lbs/ft$^3$ – 4.3 lbs/ft$^3$ Heavy-density**:** 4.4 lbs/ft$^3$ – 8 lbs/ft$^3$ lbs/ft$^3$ is pounds per cubic foot

2. An EPD is an independently verified and registered document that reports a product's environmental impact over its life cycle.

3. An EPD must be:
   - A facility-specific manufacturer declaration
   - Independently verified in accordance with ISO 14025 (Type III environmental declarations – Principles and procedures)
   - Developed according to the guidelines of the applicable Product Category Rule (PCR) as identified by the State

4. Global Warning Potential (GWP) Limits for Eligible Material

**Table 1: GWP limits for eligible materials**

| **Eligible material** | **Maximum acceptable GWP limit (unfabricated)*** |
|---|---|
| Hot-rolled structural steel sections | 1.01 MT $CO_2$ eq./MT |
| Hollow structural sections | 1.71 MT $CO_2$ eq./MT |
| Steel plate | 1.49 MT $CO_2$ eq./MT |
| Concrete reinforcing steel | 0.89 MT $CO_2$ eq./MT |
| Flat glass | 1.43 MT $CO_2$ eq./MT |
| Light-density mineral wool board insulation | 3.33 kg $CO_2$ eq./1 m$^2$ |
| Heavy-density mineral wool board insulation | 8.16 kg $CO_2$ eq./1 m$^2$ |

D. Welding Certificates: Submit written certification that welding procedures and personnel comply with requirements. Submit record of Welding Procedure

Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

E. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements and, where required, is authorized for this specific Project.

F. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.

G. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements.

H. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.

I. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

J. Field Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements.

K. Product Test Reports: Submit written reports indicating current product produced by manufacturer complies with requirements. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

L. Research/Evaluation Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.

M. Maintenance Data: Submit written and graphic instructions and procedures for operation and normal maintenance of products and equipment.

N. Design Data: Submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

O. Manufacturer's Instructions: Submit written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer.

P. Manufacturer's Field Reports: Submit written information documenting factory-authorized service representative's tests and inspections.

## PART 3 - EXECUTION

### 3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to the State.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

### 3.2 DESIGNER'S ACTION

A. General: The Designer will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: The Designer will review each submittal, make marks to indicate corrections or modifications required, and return it. The Designer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken:

C. Informational Submittals: The Designer will review each submittal and will return it, or will reject and return it if it does not comply with requirements. The State Representative will forward each submittal to appropriate party.

END OF SECTION 013300

# SECTION 014000

# QUALITY REQUIREMENTS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspection services are required by the Contractor to verify compliance with requirements specified or indicated.

1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
2. Requirements for Contractor to provide quality-assurance and quality-control services required by State’s Representative, or authorities having jurisdiction are not limited by provisions of this Section.

### 1.2 DEFINITIONS

A. Experienced: When used with an entity or individual, "experienced" unless otherwise further described means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.

1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).

D. Mockups: Full-size physical assemblies that are constructed on-site either as freestanding temporary built elements or as part of permanent construction. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and qualities of materials and execution; to

review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Laboratory Mockups: Full-size physical assemblies constructed and tested at testing facility to verify performance characteristics.
2. Integrated Exterior Mockups: Mockups of the exterior envelope constructed on-site as freestanding temporary built elements or as indicated in-place portions of permanent construction, consisting of multiple products, assemblies, and subassemblies, with cutaways enabling inspection of concealed portions of the Work.
3. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes; doors; windows; millwork; casework; specialties; furnishings and equipment; and lighting.
4. Product Mockups: Mockups that may include multiple products, materials, or systems specified in a single Section.
5. In-Place Mockups: Mockups constructed on-site in their actual final location as part of permanent construction.

E. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.

F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

G. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source; for example, plant, mill, factory, or shop.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall have the same meaning as testing agency.

I. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

J. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with

requirements. Contractor's quality-control services do not include contract administration activities performed by State's Representative.

1.3 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to State's Representative.

B. Delegated-Design Services Statement: Submit a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.4 CONFLICTING REQUIREMENTS

A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the State's Representative regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to State's Representative for clarification before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to State's Representative for a decision before proceeding.

1.5 ACTION SUBMITTALS

A. Mockup Shop Drawings: For mockups.

1. Include plans, sections, elevations, and details, indicating materials and size of mockup construction.

2. Indicate manufacturer and model number of individual components.
3. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

## 1.6 INFORMATIONAL SUBMITTALS

A. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
2. Main wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.

B. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

C. Permits, Licenses, and Certificates: For State's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

## 1.7 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, telephone number, and email address of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspection.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Statement on condition of substrates and their acceptability for installation of product.
2. Statement that products at Project site comply with requirements.
3. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
4. Results of operational and other tests and a statement of whether observed performance complies with requirements.
5. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Statement that equipment complies with requirements.
2. Results of operational and other tests and a statement of whether observed performance complies with requirements.
3. Other required items indicated in individual Specification Sections.

1.8 QUALITY ASSURANCE

A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is

experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented according to ASTM E329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

a. Provide test specimens representative of proposed products and construction.
b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
c. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
d. When testing is complete, remove test specimens and test assemblies, mockups, and laboratory mockups; do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to State’s Representative, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups of size indicated.
2. Build mockups in location indicated or, if not indicated, as directed by State's Representative.
3. Notify State's Representative seven days in advance of dates and times when mockups will be constructed.
4. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed to perform same tasks during the construction at Project.
5. Demonstrate the proposed range of aesthetic effects and workmanship.
6. Obtain State's approval of mockups before starting corresponding work, fabrication, or construction.

    a. Allow seven days for initial review and each re-review of each mockup.

7. Promptly correct unsatisfactory conditions noted by State's preliminary review, to the satisfaction of the State's Representative, before completion of final mockup.
8. Approval of mockups by the State's Representative does not constitute approval of deviations from the Contract Documents contained in mockups unless State's Representative specifically approves such deviations in writing.
9. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
10. Demolish and remove mockups when directed unless otherwise indicated.

K. Integrated Exterior Mockups: Construct integrated exterior mockup according to approved Shop Drawings and as indicated on Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials. Comply with requirements in "Mockups" Paragraph.

1. Coordinate construction of the mockup to allow observation of air barrier installation, flashings, air barrier integration with fenestration systems, and other portions of the building air/moisture barrier and drainage assemblies, prior to installation of veneer, cladding elements, and other components that will obscure the work.

L. Room Mockups: Construct room mockups according to approved Shop Drawings and as indicated on Drawings, incorporating required materials and assemblies, finished according to requirements. Provide required lighting and additional lighting where required to enable State's Representative to evaluate quality of the Work. Comply with requirements in "Mockups" Paragraph.

1.9 QUALITY CONTROL

A. State Responsibilities: Where quality-control services are indicated as State's responsibility, State will engage a qualified testing agency to perform these services.

1. State will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to State are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.

1. Engage a qualified testing agency to perform quality-control services.

a. Contractor shall not employ same entity engaged by State, unless agreed to in writing by State.

2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
4. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

D. Testing Agency Responsibilities: Cooperate with State’s Representative and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify State’s Representative and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.

3. Conduct and interpret tests and inspections and state in each report whether tested and inspected Work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform duties of Contractor.

E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

G. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Preliminary design mix proposed for use for material mixes that require control by testing agency.
6. Security and protection for samples and for testing and inspection equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.10 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Contractor will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying State's Representative promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to State's Representative and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to State's Representative.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for State's and authorities' having jurisdiction reference during normal working hours.

1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspection, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

# SECTION 014200

# REFERENCES

## PART 1 - GENERAL

### 1.1 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": Approved by the State.

C. "Directed": A command or instruction by the State Representative. Other terms including "requested," "authorized," "selected," "approved," "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": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Installer": Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

J. "Experienced": When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

K. "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.

L. "Submit": Deliver information in the specified format to the State for the State's review and approval.

1.2 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. Conflicting Requirements: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to the State for a decision before proceeding.

1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to the State for a decision before proceeding.

D. Copies of Standards: Each entity engaged in construction on Project must 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 and make them available on request.

E. Abbreviations and Acronyms for 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:

ADAAG Americans with Disabilities Act (ADA)

CFR Code of Federal Regulations

| | |
|---|---|
| CRD | Handbook for Concrete and Cement |
| DOD | Department of Defense Specifications and Standards |
| FED-STD | Federal Standard (See FS) |
| FS | Federal Specification |
| FTMS | Federal Test Method Standard (See FS) |
| MILSPEC | Military Specification and Standards |
| UFAS | Uniform Federal Accessibility Standards |

1.3 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 Research's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

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:

| | |
|---|---|
| AA | Aluminum Association, Inc. (The) |
| AAADM | American Association of Automatic Door Manufacturers |
| AABC | Associated Air Balance Council |
| AAMA | American Architectural Manufacturers Association |
| AAN | American Association of Nurserymen (See ANLA) |
| AASHTO | American Association of State Highway and Transportation Officials |
| AATCC | American Association of Textile Chemists and Colorists (The) |
| ABMA | American Bearing Manufacturers Association |
| ACI | American Concrete Institute/ACI International |
| ACPA | American Concrete Pipe Association |
| ADC | Air Diffusion Council |
| AEIC | Association of Edison Illuminating Companies, Inc. (The) |

**References**

| | |
|---|---|
| AFPA | American Forest & Paper Association (See AF&PA) |
| AF&PA | American Forest & Paper Association |
| AGA | American Gas Association |
| AGC | Associated General Contractors of America (The) |
| AHA | American Hardboard Association |
| AHAM | Association of Home Appliance Manufacturers |
| AI | Asphalt Institute |
| AIA | American Institute of Architects (The) |
| AISC | American Institute of Steel Construction |
| AISI | American Iron and Steel Institute |
| AITC | American Institute of Timber Construction |
| ALA | American Laminators Association (See LMA) |
| ALCA | Associated Landscape Contractors of America |
| ALSC | American Lumber Standard Committee |
| AMCA | Air Movement and Control Association International, Inc. |
| ANLA | American Nursery & Landscape Association<br>(Formerly: AAN - American Association of Nurserymen) |
| ANSI | American National Standards Institute |
| AOSA | Association of Official Seed Analysts |
| APA | APA - The Engineered Wood Association |
| APA | Architectural Precast Association |
| API | American Petroleum Institute |
| ARI | Air-Conditioning & Refrigeration Institute |
| ASCA | Architectural Spray Coaters Association |
| ASCE | American Society of Civil Engineers |
| ASHRAE | American Society of Heating, Refrigerating and Air-Conditioning Engineers |

| | |
|---|---|
| ASME | ASME International<br>(The American Society of Mechanical Engineers International) |
| ASSE | American Society of Sanitary Engineering |
| ASTM | American Society for Testing and Materials |
| AWCI | AWCI International<br>(Association of the Wall and Ceiling Industries International) |
| AWCMA | American Window Covering Manufacturers Association (See WCMA) |
| AWI | Architectural Woodwork Institute |
| AWPA | American Wood-Preservers' Association |
| AWS | American Welding Society |
| AWWA | American Water Works Association |
| BHMA | Builders Hardware Manufacturers Association |
| BIA | Brick Industry Association (The) |
| BIFMA | BIFMA International<br>(Business and Institutional Furniture Manufacturer's Association International) |
| CCC | Carpet Cushion Council |
| CCFSS | Center for Cold-Formed Steel Structures |
| CDA | Copper Development Association Inc. |
| CEA | Canadian Electricity Association |
| CFFA | Chemical Fabrics & Film Association, Inc. |
| CGA | Compressed Gas Association |
| CGSB | Canadian General Standards Board |
| CIMA | Cellulose Insulation Manufacturers Association |
| CISCA | Ceilings & Interior Systems Construction Association |
| CISPI | Cast Iron Soil Pipe Institute |
| CLFMI | Chain Link Fence Manufacturers Institute |
| CPA | Composite Panel Association |

| | |
|---|---|
| | (Formerly: National Particleboard Association) |
| CPPA | Corrugated Polyethylene Pipe Association |
| CRI | Carpet & Rug Institute (The) |
| CRSI | Concrete Reinforcing Steel Institute |
| CSA | CSA International<br>(Formerly: IAS - International Approval Services) |
| CSI | Construction Specifications Institute (The) |
| CSSB | Cedar Shake & Shingle Bureau |
| CTI | Cooling Technology Institute<br>(Formerly: Cooling Tower Institute) |
| DHI | Door and Hardware Institute |
| EIA/TIA | Electronic Industries Alliance/Telecommunications Industry Association |
| EIMA | EIFS Industry Members Association |
| EJMA | Expansion Joint Manufacturers Association, Inc. |
| FCI | Fluid Controls Institute |
| FGMA | Flat Glass Marketing Association (See GANA) |
| FM | Factory Mutual System (See FMG) |
| FMG | FM Global<br>(Formerly: FM - Factory Mutual System) |
| GA | Gypsum Association |
| GANA | Glass Association of North America<br>(Formerly: FGMA - Flat Glass Marketing Association) |
| GRI | Geosynthetic Research Institute |
| GTA | Glass Tempering Division of Glass Association of North America (See GANA) |
| HI | Hydraulic Institute |
| HI | Hydronics Institute |
| HMMA | Hollow Metal Manufacturers Association (See NAAMM) |
| HPVA | Hardwood Plywood & Veneer Association |

| | |
|---|---|
| HPW | H. P. White Laboratory, Inc. |
| IAS | International Approval Services (See CSA International) |
| ICEA | Insulated Cable Engineers Association, Inc. |
| ICRI | International Concrete Repair Institute (The) |
| IEC | International Electrotechnical Commission |
| IEEE | Institute of Electrical and Electronics Engineers, Inc. (The) |
| IESNA | Illuminating Engineering Society of North America |
| IGCC | Insulating Glass Certification Council |
| ILI | Indiana Limestone Institute of America, Inc. |
| IRI | Industrial Risk Insurers |
| ITS | Intertek Testing Services |
| IWS | Insect Screening Weavers Association (Now defunct) |
| KCMA | Kitchen Cabinet Manufacturers Association |
| LGSI | Light Gage Structural Institute |
| LMA | Laminating Materials Association<br>(Formerly: ALA - American Laminators Association) |
| LPI | Lightning Protection Institute |
| LSGA | Laminated Safety Glass Association (See GANA) |
| MBMA | Metal Building Manufacturers Association |
| MCA | Metal Construction Association |
| MFMA | Maple Flooring Manufacturers Association |
| MFMA | Metal Framing Manufacturers Association |
| MGPHO | Medical Gas Professional Healthcare Organization, Inc. |
| MHIA | Material Handling Industry of America |
| MIA | Marble Institute of America |
| ML/SFA | Metal Lath/Steel Framing Association (See SSMA) |

| | |
|---|---|
| MSS | Manufacturers Standardization Society of The Valve and Fittings Industry Inc. |
| NAAMM | National Association of Architectural Metal Manufacturers |
| NAAMM | North American Association of Mirror Manufacturers (See GANA) |
| NACE | NACE International<br>(National Association of Corrosion Engineers International) |
| NAIMA | North American Insulation Manufacturers Association (The) |
| NAMI | National Accreditation and Management Institute, Inc. |
| NAPM | National Association of Photographic Manufacturers (See PIMA) |
| NBGQA | National Building Granite Quarries Association, Inc. |
| NCMA | National Concrete Masonry Association |
| NCPI | National Clay Pipe Institute |
| NCTA | National Cable Television Association |
| NEBB | National Environmental Balancing Bureau |
| NECA | National Electrical Contractors Association |
| NeLMA | Northeastern Lumber Manufacturers' Association |
| NEMA | National Electrical Manufacturers Association |
| NETA | InterNational Electrical Testing Association |
| NFPA | National Fire Protection Association |
| NFRC | National Fenestration Rating Council |
| NGA | National Glass Association |
| NHLA | National Hardwood Lumber Association |
| NLGA | National Lumber Grades Authority |
| NOFMA | National Oak Flooring Manufacturers Association |
| NPA | National Particleboard Association (See CPA) |
| NRCA | National Roofing Contractors Association |
| NRMCA | National Ready Mixed Concrete Association |

| | |
|---|---|
| NSA | National Stone Association |
| NSF | NSF International<br>(National Sanitation Foundation International) |
| NTMA | National Terrazzo and Mosaic Association, Inc. |
| NWWDA | National Wood Window and Door Association (See WDMA) |
| PCI | Precast/Prestressed Concrete Institute |
| PDCA | Painting and Decorating Contractors of America |
| PDI | Plumbing & Drainage Institute |
| PGI | PVC Geomembrane Institute |
| PIMA | Photographic & Imaging Manufacturers Association<br>(Formerly: NAPM - National Association of Photographic Manufacturers) |
| RCSC | Research Council on Structural Connections |
| RFCI | Resilient Floor Covering Institute |
| RIS | Redwood Inspection Service |
| RMA | Rubber Manufacturers Association |
| SAE | SAE International |
| SDI | Steel Deck Institute |
| SDI | Steel Door Institute |
| SEFA | Scientific Equipment and Furniture Association |
| SGCC | Safety Glazing Certification Council |
| SIGMA | Sealed Insulating Glass Manufacturers Association |
| SJI | Steel Joist Institute |
| SMA | Screen Manufacturers Association |
| SMACNA | Sheet Metal and Air Conditioning Contractors' National Association |
| SPFA | Spray Polyurethane Foam Alliance<br>(Formerly: SPI/SPFD - The Society of the Plastics Industry, Inc.;<br>Spray Polyurethane Foam Division) |

**References**

| | |
|---|---|
| SPI | The Society of the Plastics Industry |
| SPIB | Southern Pine Inspection Bureau (The) |
| SPI/SPFD | The Society of the Plastics Industry<br>Spray Polyurethane Foam Division (See SPFA) |
| SPRI | SPRI (Single Ply Roofing Institute) |
| SSINA | Specialty Steel Industry of North America |
| SSMA | Steel Stud Manufacturers Association<br>(Formerly: ML/SFA - Metal Lath/Steel Framing Association) |
| SSPC | SSPC: The Society for Protective Coatings |
| STI | Steel Tank Institute |
| SWI | Steel Window Institute |
| SWRI | Sealant, Waterproofing, and Restoration Institute |
| TCA | Tile Council of America, Inc. |
| TIA/EIA | Telecommunications Industry Association/Electronic Industries Alliance |
| TPI | Truss Plate Institute |
| TPI | Turfgrass Producers International |
| UFAC | Upholstered Furniture Action Council |
| UL | Underwriters Laboratories Inc. |
| UNI | Uni-Bell PVC Pipe Association |
| USITT | United States Institute for Theatre Technology, Inc. |
| USP | U.S. Pharmacopeia |
| WASTEC | Waste Equipment Technology Association |
| WCLIB | West Coast Lumber Inspection Bureau |
| WCMA | Window Covering Manufacturers Association<br>(Formerly: AWCMA - American Window Covering Manufacturers Association) |
| WDMA | Window & Door Manufacturers Association<br>(Formerly: NWWDA - National Wood Window and Door Association) |
| WIC | Woodwork Institute of California |

WMMPA Wood Moulding & Millwork Producers Association

WWPA Western Wood Products Association

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:

ICC International Code Council
(Formerly: CABO - Council of American Building Officials)

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:

CE Army Corps of Engineers

CPSC Consumer Product Safety Commission

DOC Department of Commerce

EPA Environmental Protection Agency

FAA Federal Aviation Administration

FCC Federal Communications Commission

FDA Food and Drug Administration

GSA General Services Administration

HUD Department of Housing and Urban Development

LBL Lawrence Berkeley Laboratory (See LBNL)

LBNL Lawrence Berkeley National Laboratory

NCHRP National Cooperative Highway Research Program (See TRB)

| | |
|---|---|
| NIST | National Institute of Standards and Technology |
| OSHA | Occupational Safety & Health Administration |
| RUS | Rural Utilities Service (See USDA) |
| TRB | Transportation Research Board |
| USDA | Department of Agriculture |
| USPS | Postal Service |

E. 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:

| | |
|---|---|
| CALTRANS | State of California, Department of Transportation |
| CAPUC | (See CPUC) |
| CBHF | State of California, Department of Consumer Affairs<br>Bureau of Home Furnishings and Thermal Insulation |
| CPUC | California Public Utilities Commission |
| DGS | State of California, Department of General Services |
| DPR | State of California, Department of Parks and Recreation |
| TFS | Texas Forest Service<br>Forest Products Laboratory |

END OF SECTION 014200

# SECTION 015000

# TEMPORARY FACILITIES AND CONTROLS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

### 1.2 USE CHARGES

A. Installation, removal, and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to State's Representative, testing agencies, and authorities having jurisdiction.

### 1.3 INFORMATIONAL SUBMITTALS

A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.

B. Site Fire-Safety Plan: Contractor to provide prior to start of construction and must be verified by the OSFM Deputy. The plan must adhere to CFC Chapter 33 and Site Fire Safety Plan per CFC 3303.1.1.

C. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.

1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.
2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
3. Indicate methods to be used to avoid trapping water in finished work.

1.4 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before State's acceptance, regardless of previously assigned responsibilities.

B.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as State's property.

3.2 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

## 3.3 TEMPORARY UTILITY INSTALLATION

A. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

B. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

C. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

D. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

E. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

## 3.4 SUPPORT FACILITIES INSTALLATION

A. Comply with the following:

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

B. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

C. Parking: Use designated areas of State's existing parking areas for construction personnel.

D. Storage and Staging: Use designated areas of Project site for storage and staging needs.

E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

F. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

G. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."

H. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

## 3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property State to access property for that purpose.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

C. Temporary Erosion and Sedimentation Control: Comply with requirements specified in Section 311100 "Clearing and Grubbing."

D. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to

undisturbed areas and to adjacent properties and walkways, according to requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant-protection zones.
2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

E. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

F. Tree and Plant Protection: Comply with requirements specified in Section 015639 "Temporary Tree and Plant Protection."

G. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

H. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.

I. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.

1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to State.

J. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.

K. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

L. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

## 3.6 MOISTURE AND MOLD CONTROL

A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.

B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard and replace stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.

D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

## 3.7 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. State reserves right to take possession of Project identification signs.
2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

# SECTION 015639

# TEMPORARY TREE AND PLANT PROTECTION

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes:

1. Protection and pruning of trees and plants.
2. Tree damage compensation computation.

### 1.2 MEASUREMENT AND PAYMENT

A. The contract lump sum price for Mitchell Canyon Education Center shall include full compensation for all work involved with protecting, repairing, removing, and pruning existing trees and plants.

B. Tree Damage Compensation

1. The value of trees destroyed or damaged during construction will be reimbursed to the State through a deduction from the Contract amount calculated in accordance with the formulas below.

    a. Destroyed is defined as having sustained irreparable damage to trunk and/or a large portion of the canopy to the extent that the tree is incapable of surviving or achieving a normal growth pattern, and/or is rendered structurally unstable or unsafe.
    b. Damaged is defined, without limitation, as any cutting, breaking, tearing, bruising, or skinning of the trunk, roots, or significant limbs.

2. Destroyed Tree Value Computation:

    a. Trees totally destroyed will be reimbursed at the Total Tree Value as follows:

    *Total Tree Value = $2.16 x (Trunk circumference in inches at DBH)$^2$.*

    *Example: 24-inch Diameter Pine*

    *Circumference = 75.4 inches*
    $2.16 x $(75.4)^2$ = $12,280
    *Total Tree Value $12,280*

3. Damaged Tree Value Computation:

a. Trees damaged will be reimbursed in an amount proportional to the Total Tree Value based upon the amount of damage to the trunk and roots as follows:

*Damage = Total Tree Value x (Trunk Damage Factor + Root Damage Factor),*

*Where…*

*Total Trunk + Root Damage Factor does not exceed 1.0.*

*Trunk Damage = Maximum width of trunk damage divided by trunk circumference.*

*Root Damage = Percentage of root damage based on size of root damaged.*

*Percentages will be added for multiple roots damaged within the root zone of one tree. Assumed root zone for all trees is a 20-foot diameter or 314 square ft.*

*The following table determines percentage of overall root damage based on size of root damaged.*

| ***Root size (inches)*** | ***Equivalent Percent of Root Zone*** | ***Damage Factor*** |
|---|---|---|
| *2 to 3* | *10* | *0.1* |
| *4 to 5* | *20* | *0.2* |
| *6 and larger* | *30* | *0.3* |

*Example: 24-inch diameter Pine with 6-inch-wide trunk damage and with one 2-inch root and one 4-inch root damaged.*

*Trunk damage: 6 75.4 = 0.08*
*Root damage: 0.1 + 0.2 = 0.3*
*Damage $ = $12,280 x (0.08 + 0.3)*
*Total Damage $4,666*

C. All destroyed trees shall remain the property of the State.

1.3 REFERENCES

A. Definitions:

1. Caliper Size – Diameter of a trunk measured by a diameter tape at 6-inches above the ground for tree trunks 4-inch and less in diameter; and 12-inches above the ground for trees larger than 4-inch in diameter.
2. DBH – Diameter at Breast Height of tree, or 54-inches from ground level, measured on the high side of the tree.
3. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction as indicated on Drawings and directed by State Representative.
4. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction as indicated on Drawings and directed by State Representative. The tree protection zone shall be a distance of 5 times the DBH from the tree trunk, or at the tree drip line, whichever is greater, defined by a circle concentric with each tree**.**

B. Referenced Standards:

1. Tree Pruning Standards: Comply with ANSI A300, “Trees, Shrubs, and Other Woody Plant Maintenance - Standard Practices.”

1.4 ADMINISTRATIVE REQUIREMENTS

A. Pre-construction Meeting:

1. Conduct a meeting at Mitchell Canyon Education Center Project site with the State Representative to review:

a. Construction schedule.
b. Methods and procedures related to temporary tree and plant protection
c. Availability of materials, personnel, and equipment needed to progress without delays.
d. Enforcement of protection zones
e. Field quality control

1.5 SUBMITTALS

A. Action Submittals

1. Product Data: For each product used.
2. Shop Drawings:

a. Include plans, elevations, sections, and locations of protection-zone fencing and signage, showing relation of equipment-movement routes and material storage locations with protection zones.

3. Samples: For each type of the following:

a. Organic Mulch: Sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch.
b. Protection-Zone Fencing: Assembled Samples.

4. Tree Pruning Schedule:

a. Written schedule detailing scope and extent of pruning of trees that interfere with or are affected by construction. Include:

1) Species and size of tree
2) Location on site plan. Include unique identifier for each.
3) Reason for pruning
4) Description of pruning to be performed
5) Description of maintenance following pruning

B. INFORMATIONAL SUBMITTALS

1. Qualifications:

a. Arborist
b. Tree Service firm

2. Arborist's Pre-construction Evaluation:

a. Documentation including photographs of existing trees and plantings indicated to remain, to establish preconstruction conditions that might be misconstrued as damage caused by construction activities.

3. Arborist's Instructions:

a. Recommend care, maintenance and protection of trees affected by construction during and after completion of the Work.

4. Certification:

a. Arborist's certification 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.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Arborist: An arborist certified by the International Society of Arboriculture (ISA) or licensed in jurisdiction where the Project is located.

2. Tree Service Firm: A tree service firm with a minimum 5-years' experience that has successfully completed temporary tree and plant protection work similar to that required for this Project

1.7 SITE CONSTRAINTS

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. Skinning or bruising of bark.
5. Erection of sheds or structures.
6. Impoundment of water.
7. Excavation or other digging unless otherwise indicated.
8. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
9. Use of trees as support posts, power poles, or signposts; anchorage for ropes, guy wires, or power lines; or other similar functions.
10. Dumping of poisonous or noxious materials on or around trees and roots. Such materials include but are not limited to paint, petroleum products, contaminated water, or other deleterious materials.
11. Cutting of tree roots by utility trenching, foundation digging, placement of curbs and trenches, and other miscellaneous excavation without prior written approval by the State Representative.
12. Damage to trunk, limbs, or foliage caused by maneuvering vehicles or stacking material.
13. Compaction of the root area by movement of trucks or grading machines, storage of equipment, gravel, earth fill, or construction supplies, etc.

B. Do not direct vehicle or equipment exhaust toward protection zones.

C. Prohibit heat sources, flames, ignition sources, welding, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Backfill Soil: Stockpiled soil, Stockpiled soil mixed with planting soil or Planting soil shall be of suitable moisture content and granular texture for placing around tree; free of stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, construction/demolition debris, and other extraneous materials harmful to plant growth.

B. Organic Mulch: Free from deleterious materials and suitable as a top dressing for trees and shrubs, consisting of one of the following:

1. Type: Apply 6-8-inch uniform thickness of organic mulch unless otherwise indicated. Do not place mulch within 6 inches of tree trunks.
2. Mulch either containing or originating from areas already infested with Phytophthora ramorum (the agent of SOD) is not permitted.

C. TPZ Fencing: Fencing fixed in position and meeting the specifications identified in the Landscape Plan, Sheet L2.0, Detail 1.

PART 3 - EXECUTION

3.1 GENERAL

A. Perform all Work necessary and required to protect and maintain all trees, shrubs, groundcover, and turf, not identified for removal, within and adjacent to the limits of the Work in healthy growing condition at all times during the Project.

B. The State Representative may designate additional trees to be protected that are not previously identified in the Contract Documents. Such designations may occur during the pre-construction meeting and/or during construction based on site conditions, construction methods, etc.

C. Do NOT cut or fell trees without specific permission from the State Representative. Trees cut or damaged without written permission of the State Representative will be subject to provisions of Repair and Compensation.

3.2 PREPARATION

A. Retain the services of a licensed arborist to inspect all trees in and adjacent to the construction area with the State Representative. Document by written memorandum and photographs of any unusual existing conditions. Submit findings to the State Representative prior to commencement of work.

B. Review all required protection measures with the State Representative.

C. Locate and clearly flag trees to be protected, as shown on the Contract Documents and as directed by the State Representative.

D. Field verify all dimensions, grades, and coordinates that affect existing trees and plants. Mark elevations at the base of all trees within the limits of the Work on the grading plan. Report discrepancies in writing to the State Representative and obtain the State Representative’s instructions prior to proceeding with the Work affected.

3.3 TREE PROTECTION

A. Protect all trees within the designated construction area from damage by fencing off the TPZ of individual and/or groups of trees.

1. Install fencing along edges of TPZ in a manner that will prevent people from easily entering protected areas except by entrance gates.
2. Install fencing around trees to be preserved at a distance required from the base of the trunk to the protection zone.
3. Relocate the fence when required during construction to avoid compaction or other injury of tree roots.
4. Maintain all fencing until Project completion. Remove only as directed by the State Representative.

B. Protect tree root systems of trees within the TPZ from ponding, eroding, or excessive wetting or drying and from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials.

C. Do NOT place fill against the trunks of protected trees.

D. Do NOT place fill within the TPZ, unless approved by the State's Representative.

E. Review all protected trees whose root zones may be impacted by the new construction with the State Representative. When working within the TPZ is unavoidable and approved by the State's Representative, install tree trunk protection measures as specified herein or as otherwise shown on the Drawings.

1. Place tree trunk protection measures on all trees that have approved construction activities occurring within the TPZ.
2. Construct tree trunk and root protection with 2"x 6"x 8' lumber placed at 12-inch on center and attached vertically around the entire trunk of the tree with 3-inch-wide nylon straps. Lumber shall extend to the natural base of the tree and outward as necessary to protect exposed roots.
3. Approval of Work within the TPZ shall not waive the Contractor's responsibility for complying with the requirements of this Section.

F. TPZ Signage: Install TPZ signage in visibly prominent locations in a manner approved by State's Representative.

G. Mulch areas inside tree-protection zones and other areas indicated. Do not exceed indicated thickness of mulch.

1. Apply 6-8-inch uniform thickness of organic mulch unless otherwise indicated. Do not place mulch within 6 inches of tree trunks.

2. Mulch either containing or originating from areas already infested with Phytophthora ramorum (the agent of SOD) is not permitted.

3.4 GRADING

A. Grading is to be avoided within the tree protection zone unless absolutely necessary. Grading techniques and mitigation procedures are to be specified by the State Representative.

B. During construction the existing site surface drainage patterns shall not be altered within the area of the tree protection zone, except as shown on the Drawings.

C. Do NOT alter the existing water table within the area of the tree protection zone.

3.5 EXCAVATION

A. Excavate within TPZ by hand, vacuum, or with air spade, or by tunneling under the roots by drilling, auger boring, or pipe jacking.

B. Close excavations within 24 hours.

C. Do not allow exposed roots to dry out before placing permanent backfill. Place temporary earth cover over roots or pack roots with either wet peat moss or 4 layers of wet, untreated burlap. Maintain wetted cover to the point of runoff so roots stay moist.

D. Where excavations in TPZ are not closed within 24 hours, re-wet cover material over roots as often as necessary and shade the side of the exposed subgrade adjacent to the tree with burlap or canvas.

3.6 ROOT PRUNING

A. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities.

B. Cut roots manually with sharp pruning instruments; do NOT break, tear, chop, or slant the cuts. Do NOT use a backhoe or other equipment that rips, tears, or pulls roots.

C. Root Pruning at Edge of Protection Zone: Prune tree roots by cleanly cutting all roots to the depth of the required excavation.

D. Root Pruning within Protection Zone: Use narrow-tine spading forks to comb soil to expose roots. Cleanly cut roots as close to excavation as possible.

3.7 BACKFILLING AND COMPACTION IN TPZ

A. Carefully backfill excavations with materials approved for backfilling. Jet backfill when trench has been backfilled to half its depth and again when fully backfilled, making certain no air pockets exist around roots.

B. Tamp carefully using hand tools. Fill settled areas and retamp as necessary to offset settlement. Compacting with mechanical equipment is NOT allowed to avoid compaction of tree root systems.

C. Contour backfill to adjacent grades without dips, sunken areas, humps, or other surface irregularities.

3.8 CROWN PRUNING

A. No pruning shall be conducted unless approved by the State's Representative and directed by a certified arborist.

B. Prune branches that are affected by temporary and permanent construction or as otherwise directed by arborist or State Representative.

1. Prune trees according to ANSI A300 (Part 1) [and as indicated on Drawings].
2. Do not remove or reduce living branches to compensate for root loss caused by damaging or cutting root system.
3. Prune to remove only damaged broken, dying, or dead branches unless otherwise directed.

C. Cut evenly, using proper tools and skilled workers, to achieve neat severance with the least possible damage to the tree in accordance with ISA Pruning Guidelines.

D. Do NOT break or chop.

E. Do NOT paint or apply sealants to wounds.

F. Chip removed branches and [spread over areas identified by State's Representative] [stockpile in areas approved by State's Representative] [dispose of off-site].

3.9 SHRUB, GROUNDCOVER, AND TURF PROTECTION

A. Keep damage to shrubs, groundcover, turf and other plant materials to a minimum and restore to original condition. Restore turf with sod lawn unless otherwise shown on the drawings or approved by the State Representative.

3.10 FIELD QUALITY CONTROL

A. Report in writing to the State Representative any utilities, grade changes, or other conditions not shown on the Drawings found within the tree protection

zone(s) during the course of the Work and obtain instruction prior to proceeding with the Work affected.

B. Retain the services of 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.

C. Periodically monitor runoff redirected from construction areas or generated by construction activity is not entering or crossing protection zones.

3.11 REPAIR, REPLACEMENT, AND REMOVAL

A. Repair any tree damaged during the course of construction at no additional cost to the State. Make all such repairs within 24-hours under the guidance of a certified arborist to prevent progressive deterioration of damaged trees.

B. Remove [**and replace] dead** and damaged trees not designated for removal that are determined by the State Representative to be either unrepairable, incapable of restoration to normal growth pattern, or that are structurally unstable or unsafe at no additional cost to the State.

1. Provide new trees of same size (up to 13-inch caliper) as those damaged. Plant and maintain as directed. Species to be selected by State Representative.
2. For trees exceeding replaceable size (over 13-inch caliper) the Port shall be compensated on the basis of an evaluation schedule on the damaged trees by a qualified consulting arborist registered with the American Society of Consulting Arborists.

C. Dispose of trees destroyed during construction that were not identified for removal at no additional cost to the State in. Dispose in a manner indicated in the Contract or as otherwise directed by the State Representative, including, but not limited to, chipping in place and/or hauling off site.

3.12 TREE PROTECTION MAINTENANCE

A. Repair any damage due to construction activity, storm drainage, or any condition that requires immediate attention

B. Maintain proper placement of tree protection and TPZ fencing.

C. Periodically inspect trees and plants to remain and submit written reports to the State Representative outlining additional maintenance Work required to ensure the health and general well-being of the plant material.

D. Water trees to remain by saturating the soil within the tree protection zone and 2 to 3-feet beyond to a minimum depth of 2-feet, as demonstrated by

the soil probe. Quantities and lengths of watering time are variable and shall depend upon seasonal rainfall.

E. Maintain TPZ free of weeds and trash.

3.13 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove excess excavated material, displaced trees, trash, and debris and legally dispose of them off State property, as directed by the State Representative.

B. Burning and burying waste is NOT permitted.

END OF SECTION

# SECTION 016000

# PRODUCT REQUIREMENTS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

1. Section 012500 "Substitution Procedures" for requests for substitutions.

### 1.2 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products, unless indicated otherwise.
3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in Part 2 "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.

1. Evaluation of Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification.

C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.

D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:

1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
2. Data indicating compliance with the requirements specified in Part 2 "Comparable Products" Article.

E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 013300 "Submittal Procedures."

F. Substitution: Refer to Section 012500 "Substitution Procedures" for definition and limitations on substitutions.

## 1.3 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

## 1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products, using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

1.5 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of the State or endorsed by manufacturer to State.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for State and issued in the name of the State or endorsed by manufacturer to State.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included in the Project Manual, prepare a written document, using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. State reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," State’s Representative will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

B. Product Selection Procedures:

1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

    a. Sole product may be indicated by the phrase "Subject to compliance with requirements, provide the following."

2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

    a. Sole manufacturer/source may be indicated by the phrase "Subject to compliance with requirements, provide products by the following."

3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

4. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed or an unnamed product that complies with requirements.

    a. Non-limited list of products is indicated by the phrase "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following."
    b. Provision of an unnamed product is not considered a substitution, if the product complies with requirements.

5. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

6. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed or a product by an unnamed manufacturer that complies with requirements.

    a. Non-limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following."

b. Provision of products of an unnamed manufacturer is not considered a substitution, if the product complies with requirements.

7. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

   a. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.

C. Visual Matching Specification: Where Specifications require the phrase "match State's sample," provide a product that complies with requirements and matches State's sample. State's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by State's Representative from manufacturer's full range" or a similar phrase, select a product that complies with requirements. State's Representative will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

E. Sustainable Product Selection: Where Specifications require product to meet sustainable product characteristics, select products complying with indicated requirements. Comply with requirements in Division 01 sustainability requirements Section and individual Specification Sections.

1. Select products for which sustainable design documentation submittals are available from manufacturer.

## 2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration of Comparable Products: State's Representative will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, State's Representative may return requests without action, except to record noncompliance with the following requirements:

1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes, such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects, with project names and addresses and names and addresses of State's Representatives and States, if requested.
5. Samples, if requested.

B. State's Action on Comparable Products Submittal: If necessary, State's Representative will request additional information or documentation for evaluation, as specified in Section 013300 "Submittal Procedures."

1. Form of Approval of Submittal: As specified in Section 013300 "Submittal Procedures."
2. Use product specified if State's Representative does not issue a decision on use of a comparable product request within time allocated.

C. Submittal Requirements, Two-Step Process: Approval by the State's Representative of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

D. Submittal Requirements, Single-Step Process: When acceptable to State's Representative, incorporate specified submittal requirements of individual Specification Section in combined submittal for comparable products. Approval by the State's Representative of Contractor's request for use of comparable product and of individual submittal requirements will also satisfy other submittal requirements.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

# SECTION 017300

# EXECUTION

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of State's portion of the Work.
6. Coordination of State-installed products.
7. Progress cleaning.
8. Starting and adjusting.
9. Protection of installed construction.

B. Related Requirements:

1. Section 011000 "Summary"
2. Section 024119 "Selective Site Demolition" for demolition and removal of selected portions of the building.

### 1.2 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

### 1.3 INFORMATIONAL SUBMITTALS

A. Certified Surveys: Submit one digital copies signed by land surveyor.

B. Certificates: Submit certificate signed by **land surveyor**, certifying that location and elevation of improvements comply with requirements.

1.4 CLOSEOUT SUBMITTALS

A. Final Property Survey: Submit **one digital** copies showing the Work performed and record survey data.

1.5 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify State's Representative of locations and details of cutting and await directions from State's Representative before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in State's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to State's Representative for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.

C. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems**,** and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas service piping, and water-service piping; underground electrical services; and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work, including Specification Section number and paragraph, and Drawing sheet number and detail, where applicable.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

## 3.2 PREPARATION

A. Existing Utility Information: Furnish information to State that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to State’s Representative in accordance with requirements in Section 013100 "Project Management and Coordination."

## 3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks

and existing conditions. If discrepancies are discovered, notify State's Representative promptly.

B. Engage a land surveyor experienced in laying out the Work, using the following accepted surveying practices:

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify State's Representative when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by State's Representative.

## 3.4 FIELD ENGINEERING

A. Identification: State will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of State's Representative. Report lost or destroyed

permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to State's Representative before proceeding.

2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

E. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor , that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.

## 3.5 INSTALLATION

A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb, and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure satisfactory results as judged by State's Representative. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations, so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy of type expected for Project.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.

F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.

G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by State's Representative.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. 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.

I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by State's Representative. Fit exposed connections together to form hairline joints.

J. Repair or remove and replace damaged, defective, or nonconforming Work.

1. Comply with Section 017700 "Closeout Procedures" for repairing or removing and replacing defective Work.

## 3.6 CUTTING AND PATCHING

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of Work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements in Section 011000 "Summary."

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable

seams that are as invisible as practicable, as judged by State's Representative. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: 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.

    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

    a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

## 3.7 PROGRESS CLEANING

A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

    a. Use containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls." and Section 017419 "Construction Waste Management and Disposal."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations 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.

3.8 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.9 PROTECTION AND REPAIR OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.

C. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.

D. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

# SECTION 017419

# CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

## PART 1 - GENERAL

### 1.1 SUMMARY

A. This section specifies diversion of construction debris from the landfill.

1. Waste Management Goals: a minimum of 75% of the total project waste should be diverted from landfill by, in order of preference 1) weight, 2) volume, whichever is most feasible to measure.
2. Provide a construction waste management plan, a construction waste estimate and a final waste management report to show evidence of recycling, and reuse of recovered materials.
3. Inform the Contracting Officer where Construction Waste Management requirements could detrimentally impact construction schedule.

B. Waste Management Objective for the Project:

1. The Government has established that this Project shall 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. Of the inevitable waste that is generated, as many of the waste materials as economically feasible shall be reused or recycled. Waste disposal in landfills shall be minimized.

C. 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. Asphalt Concrete
7. Paper

    a. Bond
    b. Newsprint
    c. Cardboard and paper packaging materials

8. Metals

    a. Ferrous
    b. Non-Ferrous

9. Glass
10. Plastics
11. Beverage Containers

## 1.2 RELATED REQUIREMENTS

A. Appendix 017419A: Construction Waste Estimate.

B. Appendix 017419B: Waste Management Report.

C. Section 013300: Submittal Procedures.

D. Section 017700: Closeout Procedures.

## 1.3 REFERENCES

A. The California Integrated Waste Management Board (CIWMB); including the California Materials Exchange (CalMAX), Telephone 877-520-9703; www.ciwmb.ca.gov/calmax/. This provides a source of information, statewide, to buy and sell recycled materials.

B. Local Integrated Waste Management Programs and Re-Use Programs in the Project area.

C. The Department of Toxic Substances Control (DTSC).

## 1.4 CONSTRUCTION WASTE SUMMARY REPORTS

Provide delivery receipts for the recovered materials and waste materials sent to the permitted recycling facilities, processing facilities, or landfill with the following information:

1. Name of firm accepting the recovered materials or waste materials
2. Specify type of facility (e.g. recycler, processor, Class III landfill, MRF)
3. Location of the facility
4. Type of materials
5. Net weights (or volume) of each type of material
6. Date of Delivery
7. Value of the materials or tipping fee paid

## 1.5 APPLICATION FOR PROGRESS PAYMENT

The following should be submitted with the Application for Progress Payment:

1. Construction Waste Summary Reports as stated above in section 1.4 CONSTRUCTION WASTE SUMMARY REPORTS.
2. Payment could be withheld until diversion goals are met. The contractor is ultimately responsible for implementation of the Construction Waste Management Plan and achieving the diversion goals.

## 1.6 DEFINITIONS

A. Class III Landfill – A landfill that accepts non-hazardous waste such as household, commercial, and industrial waste, including construction, remodeling, repair, and demolition operations.

B. Construction and Demolition Waste – Including solid wastes, such as building materials, packaging, rubbish, debris, and rubble resulting from construction, remodeling, repair, and demolition operations.

1. Rubbish: Including both combustible and noncombustible wastes, such as paper, boxes, glass, crockery, metal and lumber scrap, tin cans, and bones.
2. Debris: Including both combustible and noncombustible wastes, such as leaves and tree trimmings that result from construction or maintenance and repair work.

C. Divert – Using material for any purpose other than disposal in a landfill or transformation facility.

D. Waste Materials – Large and small pieces of listed materials which are excess to contract requirements and generally include materials to be recycled an/or recovered from existing construction and items of trimmings, cuttings, and damaged goods resulting from new installations, which can be effectively used in the Work.

E. Reuse – Using a material or product that is recovered from construction, renovation, or demolition activities.

F. Recycling – The process of collecting and preparing recycle materials and reusing them in their original form or manufacturing processes that do not cause the destruction of recyclable materials in a manner that precludes further use.

G. Recovery – Any process that reclaims materials, substances, energy, or other products contained within or derived from waste on-site.

H. Sources Separation – Sorting recovered materials into specific material types with no or a minimum amount of contamination on site.

I. Commingled or Off-site Separation – Collecting all material types into a single bin or mixed collection system and separating the waste materials into recyclable material types in an off-site facility.

## 1.7 SUBMITTALS

A. Construction Waste Management Plan, Construction Waste Estimate
Before the start of construction, submit a construction waste management plan and a construction waste estimate for approval, including the following:

1. Indicate how the Contractor proposes to recover at least 75% of the construction wastes and debris for reuse and recycling.
2. The Construction Waste Management Plan should coordinate the recovery effort with the construction schedule.
3. Include a list of reuse facilities, recycling facilities and processing facilities that will be receiving the recovered recyclable materials.
4. Identify materials that are not recyclable or not recovered which will be disposed of in a landfill (or other means acceptable by the State of California and local ordinance and regulations) and explain why the materials are not recovered.
5. List the permitted landfill, or other permitted disposal facilities, that will be accepting the disposed waste materials.
6. Indicate instances or situations where compliance with the requirements of this specification do not apply or do not appear to be possible.
7. Prepare the Construction Waste Estimate identifying each type of waste material to be reused or recycled.

## 1.8 WASTE MANAGEMENT REPORT

A. Upon completion of Work including final cleanup, provide a final Waste Management Report containing the information required on Appendix 017419B, Waste Management Report forms.

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 edit and use forms included in Appendix 017419B, Waste Management Report, or use them as a basis for Contractor's forms.
5. The Government will provide electronic copies of Appendix 017419B for Contractors' use.

B. Submit Waste Management Report under provisions of Section 017700 – Closeout Procedures.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 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.

B. Distribution: Contractor shall distribute copies of the Construction Waste Estimate and Waste Management Report forms to the Job Site Foreman, each Subcontractor, and the Contracting Officer.

C. Meetings: Contractor shall conduct Waste Management meetings with subcontractors who generate construction waste. Contractor shall present current status of the Waste Management Report at regular job-site meetings.

D. Material 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 the 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.

END OF SECTION 017419

**CONSTRUCTION WASTE ESTIMATE** **DATE: _____**

| Waste Material (Edit to Suit) | Unit | Estimated Quantity Generated | Percent to Landfill | Percent Reused | Percent Recycled |
|---|---|---|---|---|---|
| Land Clearing Debris | CY | | | | |
| Soil | CY | | | | |
| Wood | CY | | | | |
| Sheet Wood | CY | | | | |
| Concrete | CY | | | | |
| Bricks | CY | | | | |
| Concrete Masonry Units | CY | | | | |
| Asphalt Concrete | CY | | | | |
| Paper | CY | | | | |
| Cement Fiber Products | CY | | | | |
| Metal (ferrous) | TON | | | | |
| Metals (non-ferrous) | LBS | | | | |
| Paint | GAL | | | | |
| Rigid Foam | CF | | | | |
| Glass | CF | | | | |
| Plastics | CF | | | | |
| Carpet and Pad | SY | | | | |
| Beverage Containers | LBS | | | | |
| Insulation | CF | | | | |
| Gypsum Board | CF | | | | |
| Porcelain Plumbing Fixtures | EA | | | | |
| Fluorescent Light Tubes | EA | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**WASTE MANAGEMENT REPORT**
**COST / INCOME**

| Waste Material (Edit to Suit) | Unit | Receiving Facility | Landfill Cost | | | Reused | | Recycled | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Handling | Transport | Fee | Cost | Income | Cost | Income |
| Land Clearing Debris | CY | | | | | | | | |
| Soil | CY | | | | | | | | |
| Wood | CY | | | | | | | | |
| Sheet Wood | CY | | | | | | | | |
| Concrete | CY | | | | | | | | |
| Bricks | CY | | | | | | | | |
| Concrete Masonry Units | CY | | | | | | | | |
| Asphalt Concrete | CY | | | | | | | | |
| Paper | CY | | | | | | | | |
| Cement Fiber Products | CY | | | | | | | | |
| Metal (ferrous) | TON | | | | | | | | |
| Metals (non-ferrous) | LBS | | | | | | | | |
| Paint | GAL | | | | | | | | |
| Rigid Foam | CF | | | | | | | | |
| Glass | CF | | | | | | | | |
| Plastics | CF | | | | | | | | |
| Carpet and Pad | SY | | | | | | | | |
| Beverage Containers | LBS | | | | | | | | |
| Insulation | CF | | | | | | | | |
| Gypsum Board | CF | | | | | | | | |
| Porcelain Plumbing Fixtures | EA | | | | | | | | |
| Fluorescent Light Tubes | EA | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| **TOTALS:** | | | | | | | | | |

# SECTION 017700

# CLOSEOUT PROCEDURES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. Project Record Documents.
3. Operation and maintenance manuals.
4. Warranties.
5. Instruction of the State's personnel.
6. Final cleaning.

### 1.2 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Make final changeover of permanent locks and deliver keys to the State. Advise the State's personnel of changeover in security provisions.
3. Complete startup testing of systems. Submit test reports.
4. Submit test/adjust/balance records.
5. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
6. Advise the State of changeover in heat and other utilities.
7. Submit changeover information related to the State's occupancy, use, operation, and maintenance.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, the State will either proceed with inspection or notify Contractor of unfulfilled requirements. The State will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by the State, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.3 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 1 Section 01290 "Payment Procedures."
2. Submit one copy of the State's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by the State. The copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
5. Deliver tools, spare parts, extra materials, and similar items to location designated by the State. Label with manufacturer's name and model number where applicable.
6. Submit pest-control final inspection report and warranty.
7. Instruct the State's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
8. Complete final cleaning requirements, including touchup painting.
9. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, the State will either proceed with inspection or notify Contractor of unfulfilled requirements. The State will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit one copy of punch list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

1.5 PROJECT RECORD DOCUMENTS (AS-BUILTS)

A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for the State's reference during normal working hours.

B. Provide Project Record Documents in accordance with the General Conditions.

1.6 OPERATION AND MAINTENANCE MANUALS

A. Assemble two (2) complete sets of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:

1. Operation Data: Include emergency instructions and procedures, system and equipment descriptions, operating procedures, and sequence of operations.
2. Maintenance Data: Include manufacturer's information, list of spare parts, maintenance procedures, maintenance and service schedules for preventive and routine maintenance, and copies of warranties and bonds.

B. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.

1.7 WARRANTIES

A. Submittal Time: Submit written warranties on request of the State for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 DEMONSTRATION AND TRAINING

A. Instruction: Instruct the State's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Provide instructors experienced in operation and maintenance procedures.
2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
3. Schedule training with the State, with at least seven days' advance notice.
4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.

B. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline.

1. Include instruction for system design and operational philosophy, review of documentation, operations, adjustments, troubleshooting, maintenance, and repair.

3.2 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

    a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    g. Sweep concrete floors broom-clean in unoccupied spaces.
    h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
    i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
    j. Remove labels that are not permanent.
    k. 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 already show evidence of repair or restoration.

        1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

    l. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
    m. Replace parts subject to unusual operating conditions.
    n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
    o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
    p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed

by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

q. Leave Project clean and ready for occupancy.

C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the State's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 017700

**SECTION 02 41 13**
**SELECTIVE SITE DEMOLITION**

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes the work necessary to successfully complete demolition to prepare site for the phasing and new construction, including the following:

1. Clean line saw cutting of existing asphalt pavement, concrete sidewalks, concrete curb/gutter, etc., as specified herein.

2. Protection from injury or defacement existing building elements to be preserved.

3. Removal of debris and deleterious materials such as rubbish.

4. Removal and stockpile of materials for landscaping use at approved location.

5. Disposal of unwanted or objectionable materials off site.

6. Disconnecting, capping or sealing, and abandoning site utilities in place.

7. Disconnecting, capping or sealing, and removing site utilities.

8. Removing above-grade site improvements within limits indicated.

1.2 REGULATORY REQUIREMENTS:

A. No burning shall be allowed.

B. Do not use explosives.

C. Comply with the following 2025 California Code of Regulations:

1. Title 8: CAL-OSHA, Chapter, Subchapter 4 – Construction Safety Orders.
2. Title 24: Part 2, California Building Code, Chapter 33, Protection of Pedestrian during Construction or Demolition.
3. Bay Area Air Quality Management State Representative.

1.3 DEFINITIONS

A. ANSI: American National Standards Institute.

B. CAL-OSHA: California Occupational Safety and Health Administration.

C. ANSI: American National Standards Institute.

D. CFR: Code of Federal Standards.

E. EPA: Environmental Protection Agency.

F. NFPA: National Fire Protection Association.

G. Remove: Detach items from existing construction and legally dispose of them off-site unless they indicated to be removed and salvaged or recycled.

H. Remove and Salvage: Detach items from existing construction, prior to demolition, and deliver them to the State Representative.

I. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed and salvaged, or recycled.

1.4 SUBMITTALS

A. Follow Submittal procedure outlined in Division 1– General Requirements.

1.5 PROJECT CONDITIONS

A. Ensure that demolition work does not adversely affect adjacent water courses groundwater and wildlife, or contribute to excess air and noise pollution.

B. Do not dispose, of waste or volatile materials such as mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers. Ensure proper disposal procedures are maintained throughout project.

C. Do not pump water containing suspended materials into watercourses, storm or sanitary sewers, or onto adjacent properties.

D. Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authorities.

E. Protect trees, plants and foliage on site and adjacent properties where indicated.

F. Except for materials indicated to be stockpiled or to remain, cleared materials are the Contractor's property. Remove cleared materials from site and dispose of in lawful manner.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Backfill excavations resulting from demolition operations with on-site or import materials conforming to structural backfill defined in Section 31 23 33 “Utility Trenching and Backfill”.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points during construction.

B. Protect existing site improvements to remain during construction.

C. Provide the following temporary facilities to facilitate the demolition operations, as necessary:

1. Temp Traffic Controls
2. Protection of Persons and Property
3. Protection of Utilities
4. Protection of Trees
5. Noise and Dust Abatement
6. Clear and restore area to their original condition
7. Protect existing site improvements and adjacent structures from removal and damage.
8. Protect and maintain benchmarks and survey control points during construction.

3.2 RESTORATION

A. Restore areas and existing works outside areas of demolition to match conditions to their original condition, as acceptable to the State Representative.

B. Restore damaged improvements to their original condition, as acceptable to the State Representative.

## 3.3 UTILITIES

A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed or abandoned.

B. Arrange to shut off indicated utilities with utility companies or verify that utilities have been shut off.

C. Existing Utilities: Do not interrupt utilities serving facilities occupied by State Representative or others unless authorized in writing by the State Representative and then only after arranging to provide temporary utility services according to requirements indicated.

D. Coordinate utility interruptions with utility company affected.

E. Do not proceed with utility interruptions without the permission of the State Representative and utility company affected. Notify the State Representative and the utility company affected 14 working days prior to utility interruptions.

F. Excavate and remove underground utilities that are indicated to be removed.

G. Securely close ends of abandoned piping with tight fitting plug or wall of concrete minimum 6-inches thick.

H. Adjustment of manhole frames and other castings Caltrans Standard Specifications Section 15-2.05A.

## 3.4 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Remove slabs, paving, curbs, and gutters, as indicated. Where concrete slabs, curb, gutter and asphalt pavements are designated to be removed, remove bases and subbase to surface of underlying, undisturbed soil.

C. Unless the existing full-depth joints coincide with line of pavement demolition, neatly saw-cut to full depth the length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.

D. Remove driveways, curbs, gutters and sidewalks by saw cutting to full depth. If saw cut falls within 30-inches of a construction joint, expansions joint, score mark or edge, remove material to joint, mark or edge.

## 3.5 SALVAGED IMPROVEMENTS

A. Salvaged Improvements: Carefully remove items indicated to be salvaged and store where indicated on plans or where designated by the State Representative. Avoid damaging materials designated for salvage.

3.6 DISPOSAL

A. Remove surplus obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off the State Representative's property.

B. Remove: Unless items are otherwise to remain or be reinstalled, remove and dispose of items. Do not store removed items that are of value to the contractor on site.

C. Remove and Reinstall: Remove items; clean, service and otherwise prepare for service; reinstall in the same location (or in the location shown on drawings).

D. Unidentified Materials: If unidentified materials are discovered, including hazardous materials that will require additional removal other than is required by the Contract Documents, immediately report the discovery to the State Representative. If necessary, the Contractor will arrange for testing or analysis of the discovered materials and will provide instructions regarding the removal and disposal of the unidentified materials.

3.7 CONSTRUCTION WASTE MANAGEMENT

A. Separate reusable and recyclable products from contaminated waste and debris in accordance with the General Contractor's Waste Management Plan. Place recyclable and reusable products in designated containers and protect from moisture and contamination.

END OF SECTION 02 41 13

**SECTION 03 11 00**
**CONCRETE FORMWORK**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 SUMMARY

A. Furnish, install, and remove forms for structural cast-in-place concrete including shoring and form supports.

B. Work included in this section includes formwork required for concrete for the Building Foundations, Retaining Walls, Site Elements, and other structural items shown on the Drawings.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Cast-in Place Concrete: Section 03 30 00

B. Cast-in Place Concrete Finishing: Section 03 35 00, including finish for concrete building formed surfaces and including patching and curing of concrete.

C. Exterior Concrete Paving: Section 32 05 23, for exterior site concrete pavement and curbs.

1.4 CODES AND STANDARDS

A. The latest editions of the following references, codes, and standards are hereby made a part of this Section and formwork shall conform to the applicable requirements therein except as otherwise specified herein or shown on the drawings. Nothing contained herein shall be construed as permitting work that is contrary to code requirements.

1. “Recommended Practice for Concrete Formwork,” ACI 347.

2. California Building Code (CBC), latest edition.

1.5 ALLOWABLE TOLERANCES

A. Design, construct, set, and maintain formwork so as to ensure completed work within the suggested tolerance limits specified in ACI 347, Section 3.1.1.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

A. Earth / Bedrock Forms: Unless otherwise indicated or required by the Drawings or these specifications, concrete for footings may be placed directly against vertical excavated surfaces provided the material will stand without caving and provided that minimum reinforcing steel clearances indicated on the Drawings are maintained and suitable provisions are taken to prevent raveling of top edges or sloughing of loose material from walls of excavation. Sides of excavation shall be made with a neat cut and the width made as detailed on the Drawings. Where sides are unstable or excavations are not accurately cut, over-excavate to permit placement and removal of formwork.

B. Fabricated Forms

1. Exposed Architectural Concrete:

a. Plywood Forms: plywood shall comply with U.S. Product Standard PS 1-09 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark. Thickness shall be of sufficient design and strength to hold concrete properly in place and alignment. Furnish in largest practical sizes to minimize number of joints and to conform to joint system shown on drawings

b. Metal, Metal Framed Plywood Faced, or other Panel-Type Forms: Provide continuous, straight, smooth, exposed surfaces. Furnish in largest practical sizes to minimize number of joints and to conform to joint system shown on drawings.

c. 2x6 Douglas Fir boards, to provide continuous, straight, smooth, exposed surfaces. Miter all inside corners. Furnish in largest practical sizes to minimize number of joints and to conform to joint system shown on drawings.

d. All materials for exposed architectural concrete are subject to approval by the architect and specification section 03 35 00.

2. Unexposed Concrete: Plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit. Of sufficient design and strength to hold concrete properly in place and alignment. These materials are subject to approval by the architect and specification section 03 35 00.

3. Chamfer Strips, Reveals, and Score Marks: Extruded polyvinylchloride specifically produced for concrete work; Greenstreak, Vinylex Corp., Preco Industries, Vulcan Metal Products, or approved equivalent.

4. Other Framing, Formwork, bracing or falsework: At Contractor option subject to meeting necessary strengths and surface tolerances. All design required for these elements to be the responsibility of the contractor.

C. Form Release Agents

1. Exposed Concrete Including Surfaces to Receive Paint and Other Coatings: Chemically active type producing water insoluble soaps. Form release agents shall be delivered in manufacturer's sealed and trademarked containers and shall be guaranteed to provide clean, stain-free concrete release and not to interfere with future applied coatings and finishes. Release agents shall contain no petroleum solvents such as creosote, paraffin, waxes, or diesel oil.

2. Concealed Concrete: Contractor option except that release agents shall not interfere with bond of any applied finish.

D. Form Sealer (Wood Forms)

1. MeadowBurke “Form Sealer,” or approved equivalent, and of a type which will not interfere with bond of applied finishes.

E. Form Ties

1. Metal, spreader type, removable to 1" from concrete face. Ties for exposed concrete shall leave smooth 1” diameter conical holes with no spalling upon form removal. Ties for exposed concrete shall be of same type throughout Project. Wire ties and wood spreaders will not be allowed.

F. Cold Joints (Exterior Paving Slab on Grade)

1. Standard 24 GA. galvanized steel, keyed profile, sized to suit slab thickness, punched on permit passage of continuous or doweled reinforcing bars of size and spacing shown on the drawings.

## PART 3 - EXECUTION

### 3.1 PREPARATION

A. Vertical and Horizontal Controls: Establish and maintain necessary benchmarks, lines, or controls throughout construction.

B. Secure information and provide for underfloor electric raceways, openings, sleeves, chases, reglets, pipes, recesses, nailers, anchors, ties, inserts, and similar embedded items. Coordinate with concrete work for requirements governing embedment and sleeving of pipes, raceways, and conduits.

## 3.2 CONSTRUCTION

A. Formwork - General: Construct wood forms of sound material, straight and rigid, thoroughly braced, mortar tight, and of such strength that the pressure of concrete and the movement of men and equipment will not displace them. Visible waves in exposed concrete surfaces after stripping of forms may result in rejection of that portion of the concrete. The design and engineering of formwork shall be the complete responsibility of the Contractor.

B. Plywood Forms for Exposed Concrete: Plywood panels shall be clean, smooth, uniform in size, and free from damaged edges or faces (including holes other than those required for form ties). Use full panels wherever possible. Make plywood panel pattern regular and symmetrical, joints plumb or level, horizontal joints continuous. Block plywood edges, which do not occur at bearing points in order to eliminate, joint offsets.

C. Framing and Bracing: Framing, bracing, and supporting members shall be of ample size and strength to carry safely, without excessive deflection (exceeding allowable tolerances), all dead and live loads to which formwork may be subjected and shall be spaced sufficiently close to prevent any apparent bulging or sagging of forms.

D. Form Ties: Form ties shall be of sufficient strength and used in sufficient quantities to prevent spreading of the forms. Ties for exposed concrete surfaces shall be arranged symmetrically and shall be aligned both vertically and horizontally (do not stagger), with layout pattern acceptable to Engineer based on Drawing layouts and, where not shown, in accordance with reviewed formwork layout shop drawing submittals.

E. Forms for concrete shall be constructed full height and width between indicated construction joints or emphasized joints in concrete surface and shall not be broken for pour or construction joints within these areas.

F. Construct forms no higher than 12" above top of pour or construction joint.

G. Construction Joints: Construction joints shall be in accord with requirements of Section 033000: "Cast-in-Place Concrete." Confine construction or pour joints to rustication strip locations where they occur; where rusticated joints do not occur in a surface, provide a surfaced pouring strip where construction joints intersect exposed surfaces to provide straight line at joints. Prior to subsequent pour, remove strip and tighten forms. Construction joints shall show no "overlapping" or offsetting of concrete surfaces and shall, as closely as possible, present the

same appearance as butted plywood joints. Joints in a continuous line shall be straight and true.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated.
2. Form keyed joints as indicated. Align construction joint within rustications attached to form-facing material.

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 bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

H. Score Lines: Where "score," emphasized or rustication lines are indicated on vertical surfaces, obtain such lines by accurate placement of moldings in forms. Pieces shall be in longest lengths practical with joints mitered.

I. Arrange forms to allow proper erection sequence and to permit form removal without damage to concrete.

J. Form Sealer: Uncoated plywood forms for smooth Architectural Concrete shall be sealed on contact faces and edges using two (2) coats of specified form sealer in strict accord with manufacturer's directions.

K. Form Release Agent: Thoroughly clean forms and coat with release agent prior to initial use and before each reuse. Apply release agent in strict accord with manufacturer's directions and coverage recommendations avoiding starved areas or excessive applications. Apply release agents reinforcing steel is placed.

L. Reuse of Forms: Control reuse of forms for exposed surfaces to provide surface of uniform color and texture without sharp demarcation between adjacent surfaces.

1. 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 Fahrenheit for 24 hours after

placing concrete if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.

2. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place per requirements of “03 30 00 Cast In Place Concrete”.

3. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

4. Clean and repair surfaces of forms to be reused in the Work. Do not use split, frayed, delaminated, or otherwise damaged form-facing material. Apply new form-release agent.

5. 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 cast-in-place architectural concrete surfaces.

M. Prior to placement of concrete, remove dirt, debris, and foreign material from forms. Leave no wood in concrete except nailers.

## 3.3 FALSEWORK

A. Contractor shall be fully responsible for proper strength, safety, and adequacy of formwork supports, and bearing surfaces thereof, used on and in connection with the work. Falsework shall be designed to support imposed loads without deformation, deflection, or settlement.

B. Vertical and lateral loads shall be carried to ground by falsework system, or by the completed structure after it has attained the requisite strength.

C. Erect shoring and vertical supports so that they cannot tilt or settle. Securely brace inclined shores against slipping or sliding. Cut bearing ends of shores square and with a tight fit at splices. Splices, where used, shall be secure against bending and buckling.

## 3.4 REMOVAL OF FORMS AND FALSEWORK

A. The removal of forms and falsework shall be carried out in such manner as to ensure the complete safety of the structure. Supports shall not be removed until members have sufficient strength to support safely their own weight and any superimposed loading with proper factor of safety.

B. Forms for exposed concrete surfaces shall be removed in such a manner as to preclude damage to finishes. Pinch bars and similar tools shall not be used for prying against exposed surfaces. Stripping shall commence at top edge or

vertical corner where the use of wooden wedge is possible. Wedging shall be done gradually and shall be accompanied by light tapping on panels to loosen them. When free at one end, gradually loosen remaining area without jerking.

C. After concrete is placed, the concrete shall achieve a minimum of 80% compressive strength and the following minimum times shall elapse before the removal of forms or shoring:

   1. Vertical Forms (Curbs): 3 days

   2. Side Forms (Footings, Slabs on Grade): 48 hours

D. Upon removal of forms, remove bolts, wires, clamps, rod, etc., not necessary to the work to a minimum of 1" from the surface. Conduct operations so as to eliminate the danger of rust stains from form tie materials or other unprotected ferrous materials embedded in or adjacent to exposed concrete surfaces.

END OF SECTION 03 11 00

**SECTION 03 15 00**
**DRILLED DOWELS AND EPOXY ANCHORS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 SUMMARY

A. Provide all material, labor, equipment, and services necessary for the installation of all dowels and/or epoxy anchors. The work shall include but not necessarily be limited to the following:

1. Design hole depths to achieve the required test loads for the approved epoxy.

2. Drill holes in existing concrete elements for new dowels and/or epoxy anchors.

3. Insert dowels and/or epoxy anchors in holes.

B. Work included in this section includes dowels and anchors required for concrete for the Building Foundations, Retaining Walls, Site Elements, and other structural items including slabs on grade and foundation concrete as shown on Drawings.

1.2 RELATED SECTIONS

| | | |
|---|---|---|
| A. | Concrete Reinforcing: | Section 03 20 00. |
| B. | Cast-in-Place Concrete: | Section 03 30 00. |
| C. | Concrete Masonry Unit | Section 04 22 00. |

1.3 QUALITY ASSURANCE

A. Standards: Comply with the following applicable standards unless otherwise specified herein:

1. CBC - California Building Code, latest edition

2. ICC-ES - "Evaluation Report" of ICC Evaluation Service, Inc

3. ACI 315—American Concrete Institute, “Details and Detailing of Concrete Reinforcement.”

4. ASTM A615—American Society for Testing and Materials, “Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.”

5. ASTM C109—“Compressive Strength of Hydraulic Cement Mortars (using 2-in. or 50-mm Cube Specimens).”

6. ASTM C309 – “Liquid Membrane-Forming Compounds for Curing Concrete.”

7. AC 308 – ICC-ES Acceptance Criteria for the testing of Cracked Concrete epoxy anchors in compliance with adapted ACI 318 Chapter 17 requirements.

B. Tests and Inspections: Tests and inspections shall be done by Testing Agency.

1. Sampling and Testing

   a. Reinforcing bar dowels and/or anchors shall be sampled and tested in accordance with ASTM A615 as specified in Section 03 20 00, “Concrete Reinforcing.”

2. Inspection

   a. Special Inspection as required by CBC Chapter 17, Section 1705.3 & Table 1705.3.

      1. Drilling and placing of anchors in the drilled holes shall be inspected periodically by a qualified inspector from the Testing Agency.

      2. Adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension loads shall be inspected continuously by a qualified inspector from the Testing Agency.

3. Testing

   a. Field tests of post installed dowels and/or anchors are only required where one of the following conditions are met:

      1. The scope under consideration is under the authorization/jurisdiction of OSHPD or DSA or is otherwise subject to the requirements of CBC chapters 17A & 19A.

b. Where required above, field testing of post installed anchors shall be according to the following:

1. Test each size and type of dowel and/or anchor to tension loads specified in schedules on the Drawings, by the Manufacturer or this section

2. Test Frequency:

   i. Structural Applications: All dowels and/or anchors shall be tested

      a. Exception: for sill plate anchorage or cases where the design tension load is less than 100 lbs, a minimum of 10% of all anchors shall be tested

      b. Exception: where dowels and/or anchors are used to transmit shear only, and more than 12 dowels and/or anchors exist in each member, a minimum of 25% of all anchors shall be tested

   ii. Nonstructural Applications: 50% of all dowels and/or anchors, and 50% of each group shall be tested

   iii. Testing of shear dowels across cold joints in slabs on grade, where the slab is not part of the lateral force-resisting system shall not be required.

3. Testing shall be in accordance with ASTM E488, “Standard Test Methods for Strength of Anchors in Concrete Elements” or ASTM E3121 “Standard Test Methods for Field Testing of Anchors in Concrete or Masonry”

4. Test loads shall be held a minimum of 10 minutes each without slip

5. If any one dowel and/or anchor installed in any one day fails the tension and slip test, all dowels and/or anchors installed that day shall be tested. If any anchor fails testing, all anchors of the same type shall be tested, which are installed by the same trade, not previously tested until twenty (20) consecutive anchors pass, then resume the initial test frequency.

6. Do not apply test loads until at least seven days after placement of dowels and/or epoxy anchors, unless approved by Engineer.

1.4 SUBMITTALS

A. Shop Drawings: Submit shop drawings for Engineer's review. Indicate placing and assembly diagrams for dowels and epoxy anchors, dimensions and details of dowel and anchor, accessories, and cover. Do not scale dimensions from structural drawings to determine lengths of dowels and anchors.

1. Review of drawings will cover only the general scheme and character of the details, but not the checking of dimensions, nor will such review relieve the Contractor from responsibility for executing the work in accordance with the Drawings.

B. Manufacturer's Catalog Data for epoxy anchors

C. ICC-ES Report: Submit Current ICC-ES report showing Cracked Concrete Compliance for each epoxy or adhesive system.

D. Test and Inspection Reports from qualified inspector

1. Anchor placement inspection report including all items referenced by ICC-ES report

2. Anchor pull testing values

1.5 STORAGE

A. Provide dry and weather tight job site storage of epoxy within temperature ranges required by manufacturer.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Epoxy Adhesive

1. Simpson Strong-Tie:

a. 'SET-3G' Epoxy for cracked concrete (ICC- ESR-4057).

b. 'SET- 3G' for grouted & ungrouted concrete masonry units (ICC-

ESR -4844).

c. ‘‘ET- 3G’ for URM / red clay brick (IAMPO-UES ER-870)

2. Hilti Fastening Systems:

a. ‘HIT-HY 200’ epoxy concrete anchors for hammer drilled holes and anchors embedded 12 inches or less (ICC-ES Report ESR-3187)

a. ‘HIT-RE 500-V3’ for hammer or core drilled holes and concrete anchors embedded more than 12 inches (ICC-ESR Report 3814)

b. ‘HIT-HY 270’ for grouted and un-grouted CMU (grouted or un-grouted) and URM/ clay brick (ICC-ESR Reports 4143 & 4144)

B. Reinforcing Bar Dowels and/or anchors

1. ASTM A615—Grade 60

C. Threaded Rods

1. Galvanized: F1554 Gr. 55—Threaded full length with standard UNC threads.

2. Stainless steel: ASTM A193 Gr. B7

## PART 3 - EXECUTION

### 3.1 PREPARATION

A. Inspect areas to be drilled to verify conditions of access, interferences, and existing materials.

1. Verify location of all existing mild steel reinforcement in existing concrete prior to drilling. Pacometer tests, radiograph tests, or other appropriate tests shall be required to locate steel.

2. Where drilling causes existing concrete to spall or crack, remove unsound materials and replace as approved by the Engineer.

3. Proceed with drilling following removal or replacement of unsound or damaged concrete.

B. Holes for dowels and epoxy anchors shall be drilled in existing concrete using a rotary hammer drill with a carbide-tipped drill bit.

1. Hole depth shall be in accordance with manufacturer's recommendations as determined by the Contractor to suit the proposed epoxy and to achieve the required test loads. Minimum hold depth shall be indicated in Schedules and Details on the Drawings

2. Clean hole by blowing out with oil-free compressed air, brushing hole out with a nylon brush and blowing out again with oil-free compressed air.

3. Mix contents of two cartridges using nozzle as required by manufacturer and inject adhesive into bottom of hole and fill hole approximately half full.

4. Insert dowel into hole containing adhesive to specified embedment depth. Adhesive should be visible at the top of the hole.

5. Install dowel strictly in accordance with approved manufacturer's recommendations.

6. Dowels and/or anchors shall be clean and free of dust, paint, grease, loose mill scale, rust corrosion or any other contaminant that would affect bonding of steel to epoxy.

## 3.2 PROTECTION

A. Protect dowels or epoxy anchors from displacement or disturbance during curing time specified by the manufacturer, or for at least 24 hours, whichever is greater.

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B. Protect existing exposed surfaces and surrounding area during drilling and placing operations. Clean and/or repair marred or damaged surfaces as directed by the State's Representative.

## 3.3 CLEAN-UP

A. Remove from the site all debris resulting from the work of this Section.

END OF SECTION 03 15 00

# SECTION 03 20 00
# CONCRETE REINFORCING

## PART 1 GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

### 1.2 SUMMARY

A. The work under this section includes all materials, labor, accessories, equipment and related services to furnish and place all reinforcement in cast-in-place concrete construction, as shown on Drawings, as specified herein, and all required accompanying accessories.

B. Work included in this section includes reinforcement required for concrete for the for the Building Foundations, Retaining Walls, Site Elements, and other structural items, including concrete curbs, grade beams, piers and mat slab as shown on Drawings.

### 1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Concrete Formwork: Section 03 11 00.

B. Cast-in-Place Concrete: Section 03 30 00.

C. Cast-in-Place Concrete Finishing: Section 03 35 00 (including finish for concrete building formed surfaces including patching and curing of concrete.

D. Concrete Masonry Unit: Section 04 22 00.

E. Expansion Anchors, Screws and Powder-Actuated Fasteners: Section 05 05 19.

F. Exterior Concrete Paving: Section 32 05 23, for concrete pavement, curbs, and CIP Concrete Forms.

### 1.4 CODES AND STANDARDS

A. Code: Reinforcement shall conform to the requirements of the 2022 California Building Code.

B. Standards:

Perform all work in accordance with the latest editions and revisions of the following standards which hereby become part of this section.

1. American Concrete Institute (ACI)

   a. ACI 318 "Building Code Requirements for Reinforced Concrete".

   b. ACI 301 "Specifications for Structural Concrete for Buildings".

   c. ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete".

2. Concrete Reinforcing Steel Institute (CRSI):

   a. "Recommended Practice for Placing Reinforcing Bars."
   b. “Suggested Specifications, Reinforcement, including Provisions for Coated Reinforcing Bars.”

3. American Welding Society (AWS):

   a. AWS D1.1 "Structural Welding Code - Steel".

   b. AWS D1.4 "Structural Welding Code - Reinforcing Steel".

4. American Society of Testing and Materials (ASTM):

   a. “Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement” (ASTM A615)

   b. “Specification for Steel Wire, Plain, for Concrete Reinforcement” (ASTM A82)

   c. “Specification for Low-Alloy Steel Deformed Bars for Concrete Reinforcement” (ASTM A706)

## 1.5 SUBMITTALS

A. Shop Drawings

1. The Contractor shall prepare shop drawings showing detailed layout of reinforcement, including dimensions, openings, bar spacing, bending details, bar schedules, and similar items required for the proper construction of the work. Drawings shall show grades of reinforcing

steel and shall be prepared in compliance with the Structural and Architectural Drawings.

2. The shop drawings for the top bars and the bottom bars for the slabs shall be prepared on different sheets. Reinforcement of concrete walls and beams shall be shown on elevations with sections as required. Elevations of walls and beams shall be at least 1/4" = 1'-0" scale.

3. Shop drawings shall be prepared in accordance with ACI 315 "Details and Detailing of Concrete Reinforcement".

4. Shop drawings relating to the parts comprising a proposed unit shall be submitted simultaneously so that parts may be checked individually and as an assembly for said unit. Shop drawings shall list the Contract Drawings used as reference in the development of said shop drawings. Shop drawings shall be submitted per the format called for in the General Requirements.

5. Numbering: All shop drawings shall be numbered in a logical and sequential manner.

B. Recycled Content Submittals

1. Contractor shall provide documentation for reinforcing steel recycled content. Include statement indicating costs.

C. Submissions

1. Submit under provisions of Standard Provisions.

D. Mill Certificates: Submit steel producer's certificates of mill analysis, tensile and bend tests for reinforcing steel. Certificates shall reference heat numbers, and corresponding heat numbers shall be indicated on the tags of unbroken bundles of bars. If mill certificates are not available for the heats supplied, or if heat identification is missing from bundles supplied, verification testing of the supplied bars shall be required, paid for by the Contractor. Submit Certificates to Special Inspector in accordance with Source Quality Control requirements of this section.

E. Product Data

1. Bar Supports.

2. Coated bar tie wire.

3. Mechanical couplers.

4. Headed reinforcing.

F. Samples

1. One sample of each type of bar support.

2. One 12 inch length of each type of tie wire.

3. One sample of each size of headed reinforcement.

## 1.6 PRODUCT HANDLING

A. Delivery: Deliver reinforcement to the job site bundled, tagged and marked. Use metal tags indicating bar size, lengths and other information corresponding to markings shown on shop drawings. Note heat identification requirements for correspondence to mill certificates.

B. Storage: Store reinforcement at the jobsite in a manner to prevent damage and accumulation of dirt and excessive rust.

# PART 2 - PRODUCTS

## 2.1 MATERIALS

A. All reinforcing shall conform to the requirements of ASTM A615 Grade 60 or ASTM A706 Grade 60, unless otherwise noted on the structural drawings.

B. Mechanical couplers

1. Mechanical couplers shall only be used where specifically indicated on the structural drawings.
2. Mechanical couplers shall satisfy the requirements of 2019 CBC and ACI 318 Sections 18.2.7 & 25.5.7 for both Type 1 and Type 2 splices as noted on the structural drawings.

3. Mechanical couplers shall have a current ICC-ES Evaluation Report which evidences compliance with requirements of these specifications.

4. Mechanical couplers: “Bar-Lock” as manufactured by Bar-Lock Coupler Systems or ICC-ES approved equivalent.

C. Headed reinforcing:

1. Headed reinforcing may only be used where specifically indicated on the structural drawings. The connection of the head to the bar shall develop the lesser of 95% of the ultimate tensile strength of 160% of the specified minimum yield strength of the bar.

2. Headed reinforcing shall have a current ICC-ES Evaluation Report which evidences compliance with requirements of these specifications.

3. Headed reinforcing “HRC 100 series T-headed bars” as manufactured by “Headed Reinforcement Corp”, or approved equivalent.

D. Smooth dowels: ASTM A615 Grade 40, smooth; shop painted with iron oxide zinc chromate primer.

E. Tie Wire

1. Black annealed wire, 16 gauge or heavier.

F. Supports for Reinforcement: Bolsters, chairs, spacers and other devices for supporting, spacing and fastening reinforcement in place:

1. Use wire bar type supports complying with CRSI recommendations, unless otherwise indicated. Do not use wood, brick, and other unacceptable materials.

2. For slabs on grade use supports of precast concrete blocks of size sufficient to resist settlement into soil, but not less than 3 inches square, with embedded plastic-coated wires.

3. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with either hot-dip galvanized or all-plastic protected legs CRSI Class 1, gray, or CRSI Class 2, stainless-steel bar support. For this project, soffits and faces of slabs and beams shall be considered as exposed-to-view unless specifically noted otherwise.

## PART 3 - EXECUTION

### 3.1 FABRICATION

A. Fabrication of reinforcing bars shall conform to required shape and dimensions, with fabrication tolerances complying with the CRSI Manual and ACI 315. Fabrication shall not commence until shop drawings have been reviewed and returned by the Engineer as appropriate. In case of fabricating

errors, do not re-bend or straighten reinforcement in a manner that will injure or weaken the material.

B. Unacceptable materials: Reinforcement with any of the following defects will not be permitted in the work:

1. Bar lengths, depths, and bends exceeding specified fabrication tolerances.

2. Bends or kinks not indicated on Drawings or final Shop Drawings.

3. Bars with reduced cross-section due to excessive rusting or other causes.

C. Welded splices shall be used only where specifically indicated on the structural drawings. When used, the splice shall have bars butted and welded to develop in tension at least 100 percent of the specified tensile strength of the bar.

D. Welding of stirrups, ties, inserts or other similar elements to longitudinal reinforcing bars shall not be permitted.

## 3.2 INSPECTION AND SOURCE QUALITY CONTROL

A. Contractor to examine the substrate, formwork, and the conditions at which concrete reinforcement is to be placed, and correct conditions which would prevent proper and timely completion of the work. Do not proceed with the work until satisfactory conditions have been obtained.

B. Contractor shall submit the following to the Special Inspector for all supplied reinforcing steel:

1. Certificates of compliance with specified standards for reinforcing bars.
2. Welding electrodes.

3. Reinforcing bar coating.

4. Certified mill test reports including physical and chemical analysis.

C. Special Inspector will:

1. Collect test reports and certificates of compliance.

2. Review test reports and certificates of compliance for conformance with Contract Documents.

3. Select random samples of reinforcing steel for testing by a Testing Laboratory, at the discretion of the Special Inspector.

D. Testing Laboratory will test random samples of reinforcing steel selected by the Special Inspector for compliance with strength, ductility, and chemical requirements of ASTM A615 or A706.

## 3.3 INSTALLATION

A. Comply with the specified standards for details and methods of reinforcement placement and supports, and as herein specified.

B. Clean reinforcement to remove loose rust and mill scale, earth, and other materials which reduce or destroy bond with concrete.

C. Position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.

D. Place reinforcement to obtain the required minimum coverages for concrete protection. Arrange, space, and securely tie bar supports together with 16 gauge wire to hold reinforcement accurately in position during concrete placement operations. Set wire ties so that twisted ends are directed away from exposed concrete surfaces.

E. Provide sufficient numbers of supports and of strength to carry reinforcement. Do not place reinforcing bars more than 2" beyond the last leg of any continuous bar support. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.

F. Splices shall only be made at locations and by the method indicated on the structural drawings. Any proposed alternate location or method must be submitted in writing to the State’s Representative for approval.

G. Welding

1. Welding is not permitted unless specifically detailed on the structural drawings.

2. Employ shielded metal arc, gas metal arc or flux cored arc method and conform to requirements of AWS D1.4 using qualified procedures.

3. Welding shall not be done within two bar diameters of any bent portion of a bar which has been bent cold.

4. Welding of crossing bars is not permitted.

H. Special Inspector (or licensed engineer will structurally observe) will inspect:

1. The placement of reinforcement to be in conformance with the Contract Documents as required by CBC Section 1704 and Table 1705.3.

2. The mechanical coupling of reinforcing steel to be in accordance with the applicable ICBO Evaluation Report.

I. Testing Laboratory will inspect the following and report results to the Special Inspector:

1. Inspect welding as required by CBC Section 1705.3 and Table 1705.3 in accordance with AWS D1.4, including checking materials, equipment, procedure and welder qualifications as well as the welds.

2. Inspector will use nondestructive testing or any other aid to visual inspections that the inspector deems necessary to be assured of the adequacy of the weld.

3. For welding of ASTM A 706 reinforcing steel not larger than No. 5 bars used for embedments, continuous presence during welding is not necessary provided the materials, qualifications of welding procedures and welders are verified prior to the start of work, periodic inspections are made of the work in progress, and a visual inspection of all welds is made prior to completion or prior to shipment of shop welding.

END OF SECTION 03 20 00

**SECTION 03 30 00**
**CAST-IN-PLACE CONCRETE**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 SUMMARY

A. Furnish and install cast-in-place concrete required for the Project as shown on the Drawings and specified herein for the concrete for the Building Foundations, Retaining Walls, Site Elements, and other structural items.

This Section also includes:

1. Concrete curbs, grade beams, site walls, piers and mat slab.

2. Curing of formed concrete surfaces.

3. Installation of anchor bolts, hangers, anchors, reglets, plates, inserts, and miscellaneous metal or other materials embedded in concrete.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Concrete Formwork: Section 03 11 00 (including erection, stripping, and removal).

B. Concrete Reinforcing: Section 03 20 00.

C. Cast-in-Place Concrete Finishing: Section 03 35 00 (including finish for concrete building formed surfaces including patching and curing of concrete.

D. Expansion Anchors, Screws and Powder-Actuated Fasteners: Section 05 05 19.

E. Exterior Concrete Paving: Section 32 05 23, for concrete pavement and curbs within the park property and CIP Concrete Forms.

## 1.4 DEFINITIONS

A. Architectural Concrete: The term "Architectural Concrete" where used herein shall mean concrete normally exposed to view.

## 1.5 REFERENCES, CODES, AND STANDARDS

A. The following references, codes, and standards are hereby made a part of this Section and concrete work shall conform to the applicable requirements therein except as otherwise specified herein or shown on the Drawings. Nothing contained herein shall be construed as permitting work that is contrary to code requirements.

B. "Building Code Requirements for Reinforced Concrete", ACI 318, latest edition.

C. California Building Code, latest edition, Chapter 19.

D. "Specification for Tolerances for Concrete Construction and Materials", ACI 117

## 1.6 SUBMITTALS

A. Submit under provisions of Standard Provisions.

B. Product data for proprietary materials and items, including admixtures, pigments, joint fillers, manufactured grouts, curing materials and vapor retarder.

C. Delivery tickets for each batch of concrete delivered, bearing the following information.

1. Mix identification.

2. Weight of cement, aggregate, water and admixtures, and aggregate size.

D. Samples: See Section 03 35 00 Cast-In-Place Concrete Finishing. Provide panel using proposed mix design for Architectural Concrete or integrally colored concrete. Panels shall be cast, reviewed by State’s Representative.

E. Quality Control:

1. Mix design for each concrete mix.

2. Laboratory test reports for concrete mixes.

3. Material certificates for concrete materials, including cements, aggregates and admixtures.

4. Statement of installer/finisher qualifications for Architectural Concrete.

1.7 ENVIRONMENTAL CONDITIONS

A. Cold Weather Requirements: Comply with ACI 306(R)-16, "Cold Weather Concreting."

B. Hot Weather Requirements: Comply with ACI 305(R)-20, "Hot Weather Concreting."

1.8 FINISH

A. Refer to specification Section 03 35 00 for finishing cast concrete after formwork is stripped.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cement: ASTM C 150-20, Type II. Cement shall be of same brand, type, and source throughout Project. Where aggregates are potentially reactive, use low alkali cement.

B. Fly Ash: ASTM C 618 CLASS C OR F, with the following requirements:

1. Fly ash shall be added to all concrete at a 20% minimum up to a 35% maximum rate of replacement by weight of the scheduled amount of cement.
2. Modified ASTM requirements:

   a. Loss on Ignition (L.O.I.): Maximum 1%
   b. Sulfur Trioxide ($SO_3$) shall not exceed 3% by weight.
   c. Water requirement – maximum: 100% of control
   d. $R = \frac{Ca\ O \text{ minus } 5\%}{Fe_2 0_3}$

      R = Sulfate Resistance = 0.75 maximum

      $\frac{Ca\ O}{Fe_2O_3}$ Percentage fly ash oxide analysis

C. Normal Weight Concrete Aggregate: Aggregate shall be 1" x #4 coarse, clean, uncoated, processed aggregate containing no clay, mud, loam or foreign matter, as follows:

1. Crushed stone, processed from natural rock or stone.

2. Natural or crushed gravel. Do not use pit, bank run, or pea gravel.

Conform to ASTM C-33 uniformly graded, 3/4-inch (19-mm) maximum aggregate size. Source shall be constant unless 10 days' prior notice is given for approval after rechecking of the mix design.

D. Water: Clean and potable, free from impurities detrimental to concrete.

E. Admixtures: The use of admixtures shall be subject to prior approval of the Engineer per ACI 318 Section 26.4.1.5 Admixtures. Calcium Chloride, Thiocyanates, and admixtures containing more than 0.05% chloride ions by mass of cementitious material are not permitted. Batch admixtures in strict accordance with manufacturer's recommendations.

1. Water-Reducing Admixture: ASTM C 494, Type A.

2. Water-Reducing and Retarding Admixture: ASTM C 494, Type D

3. Air-Entrainment Admixture: ASTM C260/C260M-10a

4. High-Range, Water-Reducing Admixture: ASTM C 494, Type G.

5. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

6. Color Admixtures: see Section 03 35 00 Cast-In-Place Concrete Finishing

7. Certification: Prior to preparation of mix designs, submit written conformance to above requirements and the chloride ion content of the admixture(s).

F. Expansion Joint Fillers:

1. Exposed Fillers (On-Grade Slabs and similar flatwork where joints are not otherwise noted or specified): ASTM D 1751-18, preformed, non-extruding strips, 3/8" thick unless otherwise noted, precut to proper size.

G. Granular Fill: Open graded gravel with maximum ¾-inch (19 mm) aggregate size conforming to Class 2 Aggregate Base as defined in Caltrans Standard Specifications Section 26.

H. Sand: ASTM C33, uniformly graded, clean sand, free from excessive fines, organic materials, and other deleterious substances.

I. Non-Shrink Grout (Metallic): Euclid Chemical Co. "Firmix," Master Builders "Embeco 636," Sonnenborn-Contech "Ferrolith G," or approved equivalent, premixed, metallic grout, conforming to Corps of Engineers Spec. CRD-C-621.

J. Non-Shrink Grout (Non-Metallic): Euclid Chemical Co. "Euco N-S,", LM "Crystex," UPCO "Upcon," U.S. Grout Corp. "Five Star," Master Builders "Masterflow 713," or approved equivalent, non-metallic, non-staining, premixed grout having a compressive strength at 28 days of not less than 6,800 psi, non-shrink at all flow levels.

K. Curing Compounds: Conform to requirements of Concrete Finishes Section

L. Waterstop: Products listed are by Sika Southern Metal and are specified to establish the required level of performance, quality, and appearance.

1. Provide dumbbell/center bulb waterstops Sika Southern Metal Catalog Number 28DBCB, or approved equivalent.

2.2 MIXES

A. Mix Designs

1. Mix designs for concrete shall be Contractor-designed at contractor expense. Designs shall be prepared by a qualified agency approved by the Engineer. Submit mix designs for review by the Engineer at least 2 weeks prior to placing any concrete. Submissions shall completely indicate brands, types, and quantities of admixtures included. If concrete is to be placed by pumping, recommendations of ACI Committee 304 shall be followed.

a. Slabs on Grade, Mat, Foundations and Retaining Walls (Normal Weight)

i. Minimum compressive strength, f'c at 28 days ..... 3,000 psi *
ii. Design compressive strength, f'c…… … 2,500 psi
iii. Maximum slump range: ..... 3"-4"
iv. Maximum water to cement ratio: ..... 0.42
*Note: No special inspection required as f'c (design) = 2,500 psi

b. Walls (Normal Weight)

i. Minimum compressive strength, f'c at 28 days ..... 4,000 psi
ii. Maximum slump range: ..... 3”-4"
iii. Maximum water to cement ratio: ..... 0.45

*Note: No special inspection required as f'c (design) = 2,500 psi

2. Mix designs shall be proportioned in accord with CBC Section 1905.3 "Proportioning on the Basis of Field Experience and/or Trial Mixtures" & ACI 301 & ACI 318 Section 26.4.4.1. Submit mix designs for each class of concrete for review. If trial batches are used, the mix design shall be prepared by an independent testing laboratory and shall achieve a compressive strength 1,200 psi higher than the specified strength.

2.3 MAT SLAB, SLAB AND VAPOR BARRIER & BASE PREPARATION

A. Place mat slabs over 15 mil. vapor barrier over 6" clean, free-draining crushed rock placed on a moisture conditioned subgrade scarified at least 18 inches and compacted to at least 90 percent relative compaction in accordance with the Geotechnical Engineer’s recommendations, in the Geotechnical Report. The edges of the mat should be thickened to at least 15 inches and be extended at least 3 inches into the subgrade soils slope subgrade to drain. The Water Vapor Barrier must have the following qualities: The Water Vapor Transmission Rate, ASTM E 96, shall be 0.008 perms [grains/hr-ft2-inHg] or lower. The Water Vapor Barrier shall meet ASTM E 1745, Class A (Plastics) standards and it should be installed with seams lapped 6 inches according to ASTM E 1643. The vapor barrier material shall be subjected to conditioning testing as outlined in ASTM E 154 sections 8, 11, 12, and 13.

B. Place exterior slabs over 6" clean, free-draining crushed rock placed on a moisture conditioned subgrade scarified at least 18 inches and compacted to at least 90 percent relative compaction in accordance with the Geotechnical Engineer’s recommendations, in the Geotechnical Report.

PART 3 - EXECUTION

3.1 MIXING

A. Concrete shall be ready mixed per ASTM C 94-16(b). Equipment shall be adequate for the purpose and kept in good mechanical condition at all times.

B. The rate of delivery, haul time, mixing time, and hopper capacity shall be such that mixed concrete delivered shall be placed in the forms within 90 minutes or 300 revolutions of the drum from the time of introduction of cement and

water to the mixer. Any interruption in placing in excess of 90 minutes or 300 revolutions will cause shutdown of the work for the day and the wasting of any mixed concrete remaining in hoppers or mixers. In case such interruption occurs, the Contractor shall provide construction joints where and as directed and cut concrete back to such line, cleaning forms and reinforcing as herein specified. Delivery tickets shall show departure time from plants. Revolution counters shall be set at "0" and shall commence to operate when drum revolution begins after introduction of all ingredients into the mixer.

C. No water shall be added to the mix after the initial introduction of mixing water for the batch except when, on arrival at the job site, the slump of the concrete is less than that specified. In this case, additional water may be added from the truck system to bring the slump within required limits. The drum or blades shall then be turned an additional 30 revolutions until the mix is uniform.

D. Mixers shall be equipped with an automatic device for recording number of revolutions of drum or blades prior to completion of mixing operation.

E. Concrete shall be kept continuously agitated until discharged into the hopper at the job site.

F. Contractor shall note that the appearance of concrete surfaces depends upon uniform color and texture within any one area and between adjacent areas and shall exercise strict batching and mixing controls to achieve this end.

3.2 PLACING

A. Per Geotechnical Engineer report, because of the previous improvements at the site, undocumented fill may be existed on site. If encountered and not removed by design cut, the existing fill should generally be removed and replaced with engineered fil. It is critical that the footing excavations not be allowed to dry before placing concrete. If shrinkage cracks appear in the footing excavations, the excavations should be thoroughly moistened to close all the cracks prior to concrete placement.

B. Notify Engineer 72 hours (3 working days) minimum prior to placing of any concrete.

C. Thoroughly wet absorbent forms before concrete is placed. Aggregate base/sand beds for slabs on grade shall be moist but not saturated when concrete is placed.

D. Placing of concrete shall be done immediately after mixing. No concrete shall be placed or used after it has begun to set and no re-tempering will be allowed. The method used in placing shall be such that concrete is conveyed to place and deposited without separation of the ingredients. Place no

concrete with a free unconfined fall in excess of five (5) feet. Concrete shall not be allowed to cascade through reinforcing steel in such a manner as to promote segregation. Do not support runways on reinforcing steel. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.

E. Where concrete slab surfaces have obtained 75% of their 28 day compressive strength (56 day for fly ash replacement concrete) and such surfaces are to be used for construction traffic, including concrete buggies and other conveyances, such surfaces shall be protected over traffic lanes by not less than 1 layer of waterproof kraft paper and 1 layer of 5/8" (min.) ply-wood.

F. Remove splash or accumulations of hardened or partially hardened concrete. Protect contact faces of forms for exposed concrete from splash during placement of adjacent concrete. Place concrete containing piping and electric raceways in a manner that will prevent damage to them.

G. Distribution of concrete shall be even and continuous and no placement joints shall show. Before a placement is started, make certain that adequate equipment, workers, and concrete will be available to place in cycles, which will permit proper and thorough integration of each layer of concrete. Upon stopping of a placement, the top surface shall be level.

H. Place no concrete for any element until reinforcing for same is fastened in place nor until forms are complete. Place no concrete before work that is to be embedded has been set. Notify other crafts so that they may deliver anchors, inserts, etc., or other work to be embedded in ample time and also notify them when their assistance in setting is required. Do not disturb reinforcing or other materials that have been set in place.

I. Comply with ACI 318-14 chapter 26.8-Embedments for requirements governing embedded conduits and pipe. Sleeves and inserts will be provided and set under other Sections of the work.

J. Remove debris, mud, and water from places to receive concrete. Verify depths of any depressed slab conditions for suitability with type and method of surfacing to be applied over concrete.

K. Remove concrete splash and/or grout from exposed surfaces and from surfaces that will receive painter's finish.

L. Place no concrete in water unless written permission has been obtained from Engineer as to proposed procedures.

M. 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. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

2. Do not use calcium chloride, salt, or other materials containing antifreeze agents.

3. Do not use chemical accelerators unless otherwise specified and approved in design mixtures.

N. Hot-Weather Placement: Comply with ACI 305(R) 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.

## 3.3 VIBRATION AND CONSOLIDATION

A. Thoroughly consolidate all concrete by means of internal mechanical vibrators. Such consolidation shall be produced as will be obtained by placing the vibrator- directly in concrete at 18" - 30" intervals for a period of 5 to 15 seconds and withdrawing slowly or as directed, depending on the consistency of the concrete. One vibrator will be required for each location where simultaneous placing takes place, to ensure thorough vibrating of all sections. Provide sufficient spare vibrators on the job so as to have them readily available in case any vibrator in use should suddenly cease to function properly. When spare vibrators are employed, provide additional spares. Under no condition shall vibrator be placed against reinforcing steel or attached to forms. Do not use vibrators to transport material.

B. Vibrators shall be of the flexible immersion type having a frequency of not less than 8,000 RPM. Use and type of vibrator shall conform to ACI 309, "Recommended Practice for Consolidation of Concrete."

C. Spading will not be permitted on exposed concrete surfaces.

D. Voids and rock pockets shall be eliminated. Voids and rock pockets occurring in exposed concrete may subject that portion to rejection.

## 3.4 CONSTRUCTION JOINTS

A. Placement of construction joints and the manner in which they are provided for shall be only as approved by the Engineer or as shown on the Drawings. Construction joints shall be as few as possible and will not be permitted simply to save forms.

B. Under no condition will construction joints be permitted in Architectural Concrete surfaces other than where specifically shown and specified. See Concrete Formwork Section.

C. Clean and roughen construction joints by removing entire surface and exposing clean solidly embedded aggregate by means of sandblasting or other approved methods. Clean forms and reinforcing of drippings, debris, etc. Thoroughly consolidate initial pour with grout so that no variation in texture will occur in Architectural Concrete surfaces.

## 3.5 CURING CONCRETE

A. Curing Concrete shall conform to Section 90-7 “Curing Concrete” of the Caltrans State Standard Specifications and ACI 318 Section 26.5.3. The Curing Compound Method, Curing Compound Method or Forms in Place Method are acceptable methods. Comply with ACI 306.1 for cold-weather protection and with ACI 305(R) for hot-weather protection during curing.

Concrete surfaces exposed to the atmosphere within 7 days of placement shall be protected and cured per Caltrans State Standard Specifications, Section 90-7 “Curing Concrete” and as necessary until specified design strength has been achieved. At greater rates of cement replacement with fly ash the early strength and setting for flat work can be delayed, and in some cases, the 28-day design strength may have to be exceeded to 56 days or more. In this case, the construction needs, and schedules may impact the cement replacement percentage.
Care should be taken to ensure that proper curing is maintained for concretes in which fly ash has been substituted for a portion of the Portland cement.

B. If forms are permitted to be removed prior to expiration of curing period, exposed concrete surfaces shall be kept continuously wet by means of fog sprays or non-staining cotton or burlap mats kept moist or by approved curing compound. Application of curing compounds shall conform to requirements of Cast-in-Place Concrete Finishing Section 03 35 00.

## 3.6 EXPANSION JOINT FILLERS

A. Preformed Filler Joints: Place filler material so that top of surface is level and aligned uniformly 1/4" below adjacent concrete surface. Provide where walks abut vertical surfaces, at not over 24 ft. centers horizontally in paving and at other locations so noted on the Drawings. Follow Drawings for pattern where indicated; where not indicated, coordinate locations with Engineer before proceeding.

## 3.7 GROUTING

A. Where grouting is required and such grout is exposed in the finished work, use non-metallic, non-shrink grout only.

## 3.8 QUALITY CONTROL

A. Tests and inspections shall comply with CBC Section 1903 and shall be performed by qualified individuals, engineering companies, or testing laboratories who shall perform those special inspections required by Table 1705.3 of the latest California Building Code, those tests and inspections specified below, and other such tests and inspections as the Engineer may require establishing the acceptability of the work.

B. Testing and inspection services shall be retained by the State Representative at its expense, except that when tests or inspections reveal failure of materials to meet contract requirements, costs for subsequent tests and inspections will be deducted from the moneys due the Contractor. Excessive inspection time required by Contractor's failure to provide sufficient workers or to pursue properly the progress of the work shall likewise be deducted from the Contract Price.

C. Furnish material and handling for test cylinders and any other samples which testing agency requires for analysis of concrete work.

D. Batch Plant Inspection: Concrete is subject to batch plant inspection as per CBC 1703.5.2.

E. Compression Strength Tests to determine Strength and Durability of Concrete shall be provided per ACI 318-14 Chapter 26.12. Concrete test samples: samples for concrete tests shall be taken in accordance with ASTM C 172. Test cylinders shall be cured under conditions not more favorable than the most unfavorable conditions for portions of concrete which specimens represent. Casting and curing on test cylinders shall be the responsibility of the Contractor. Testing of samples shall be carried out by an independent testing agency meeting the requirements of ASTM C 1077. Concrete shown

to be defective shall be removed and replaced. Cost of core tests, repairs and removal, and replacement of defective concrete shall be paid by Contractor.

Compressive Strength Tests on concrete shall comply with the following:

1. Frequency of concrete sampling: Samples for concrete compressive strength tests of each class of concrete placed each day shall be taken not less than once per day or per batch, nor less than once for every 150 $yd^3$ of concrete, nor less than once for every 5000 $ft^2$ surface area for slabs or walls. A sample shall consist of four standard cylinders, one to be tested at 7 days, one to be tested at 14 days, and the remainder to be tested at 28 days, as required.

2. Acceptance of concrete shall be based on strength test results of standard cured cylinders in accordance with ASTM C 31 and tested at 28 days in accordance with ASTM C 39. Strength test results are defined as the average of a minimum of two specimens. Additional specimens for testing may be made at contractor's option and expense.

3. When cylinders are made, tests of slump, air content, temperature, and density shall be made and recorded with the strength test results.

4. Strength of each concrete class shall be deemed satisfactory when the following criterion is met:
    a. No individual compressive-strength test result (i.e. the average of two cylinders minimum) falls below specified compressive strength by more than 500 psi.

5. When compressive strength tests indicate low strength, follow procedure in ACI 318 Section 26.12.4 investigation of low-strength test results.

6. Submit certified test report of cylinders to engineer.

F. Slump Tests: Slump tests will be performed as per ASTM C143/C143M-20 (slump cone) at time of taking test cylinders.

G. State Representatives 's testing agency will supervise preparation and selection of samples taken at job site.

END OF SECTION 03 30 00

**SECTION 03 35 00**
**CAST-IN-PLACE CONCRETE FINISHING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 SUMMARY

A. The work under this section includes all materials, labor, accessories, equipment, and related services to finish cast-in-place concrete construction, as shown on Drawings, as specified herein, and all required accompanying accessories.

B. Work included in this section includes finishing required for concrete for the concrete for the Building Foundations, Retaining Walls, Site Elements, and other structural items including concrete curbs, grade beams, piers and mat slab as shown on Drawings.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Concrete Formwork: Section 03 11 00.

B. Cast-in Place Concrete: Section 03 30 00.

C. Joint Sealants: Section 07 92 00. For elastomeric joint sealants in contraction and other joints in cast-in-place concrete.

D. Concrete Floor Stain and Seal: Section 09 61 19.

E. Exterior Concrete Paving: Section 32 05 23, for concrete pavement and curbs within the park property.

1.4 DEFINITIONS

A. Architectural Concrete: The term "Architectural Concrete" where used herein shall mean concrete normally exposed to view.

1.5 SUBMITTALS

A. Product Data: Submit for any specified concrete color treatments.

B. Samples

1. State’s Representative's Selection: Where colors, etc. are specified to be selected by State’s Representative from manufacturer's standard range, submit full range for State’s Representative’s use.

2. Specified Materials and Colors: Submit samples of specified concrete color treatments.

1.6 MOCK-UP

A. Mockup / Field Sample: On proper substrate prepare a sample area approximately 4’ x 4', of finishes and textures. Include Sample showing the full range of variations expected in these characteristics:

1. Board forms including dimensions, texture, and alignment to top of wall.

2. Reveals, chamfers, form ties, tool joint and score line pattern.

3. Surface finish, integral color and seal/graffiti coating for State’s Representative's review.

Make changes until sample is satisfactory to State’s Representative. Sample shall comply with the approved finish requirements and be available for State’s Representative’s review. Obtain State’s Representative’s approval of Mockup Sample before casting concrete. Approved sample shall serve as a standard for finishing operations. If separate panel, then Contractor shall remove when no longer needed.

1.7 QUALITY ASSURANCE

A. Reference Standards apply to this Section and shall be the most current edition of the following:

1. Comply with Reference Standards of Section 03 30 00, Cast-In Place Concrete.

B. Requirements of Regulatory Agencies: Comply with air pollution regulations of governing authorities for sandblasting activities and operations.

C. Concrete Finishing: Supervised and performed by workmen experienced in concrete finishing operations and capable of demonstrating completion of finishing projects of similar scope and complexity, including the finishing of blast furnace slag replacement concrete.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Unless otherwise noted, integral color additives for Education Center Mat Slab shall be as follows: Lamp Black: 2 LBS / CY Verify integral color concrete mix design with State's Representative.

B. Unless otherwise noted, integral color additives for Retaining Walls shall be as follows: Lamp Black: 2 LBS / CY Verify integral color concrete mix design with State's Representative.

C. Unless otherwise noted, integral color additives for Exterior Concrete Paving shall be as follows: Lamp Black: 2 LBS / CY Verify integral color concrete mix design with State's Representative. See Spec Section 32 05 23 Exterior Concrete Paving for Exterior Concrete Paving.

2.2 MATERIALS

A. Water-Based Silane/Siloxane Water Repellent Treatment:

1. Use water-based silane/siloxane water repellent for concrete and most masonry and stucco surfaces to protect them from water penetration without altering the natural appearance.

2. Physical and Performance Properties:

a. Water Absorption Reduction (Brick) per ASTM C 67: Greater than 89 percent.

b. Water Absorption Reduction (CMU) per ASTM C 140: Greater than 93 percent.

c. Water Absorption Reduction (Mortar) per ASTM D 6532: Greater than 98 percent.

d. Water Vapor Transmission WVT per ASTM D 6490: Minimum 4 perms.

e. VOC Content: Less than 30 g/L.

3. Approved Products:

a. "Sure Klean Weather Seal Siloxane PD " OR EQUAL; PROSOCO, Inc. (800-255-4255) (Basis of Design).

2.3 FORM-FACING MATERIALS

A. General: Comply with Section 03 11 00 "Concrete Formwork" for formwork and other form-facing material requirements.

PART 3 - EXECUTION

3.1 PRECONDITIONS

A. Examine surfaces to receive finishing operations and conditions under which they are to be applied or conducted. Correct unsatisfactory surfaces or conditions prior to commencement of finishing operations.

1. Lines and Levels: Ensure that surfaces have been brought to proper lines and levels to produce finish surfaces within specified tolerance and at required elevations.

3.2 WORKMANSHIP

A. Formed Surfaces: Remove all fins and other projections, fill and patch depressions and plug form tie holes in permanently exposed areas, leave "As-cast" unless otherwise shown or specified.

1. Grouting of Form Tie Holes: After installation of plugs, fill depression with grout, strike flush with adjacent surfaces.

a. Grout Color: Match adjacent concrete color.

2. Protruding Formwork Nails, Staples, etc. cut off flush with concrete surface, grind smooth.

B. Slabs: Finish monolithically unless otherwise shown or specified, ensure that an even joint is maintained between successive concrete pours.

1. Levels: As shown on drawings or as directed by State’s Representative.

2. Drainage: Slope slabs uniformly to provide positive drainage into floor drains, gutters, etc. where indicated on drawings.

3. Finishes: As shown on drawings and as specified below.

D. Radius Corners: Provide ½” troweled radius corners on all exposed edges of at all exposed edges of walls, beams, ledges, corbels, concrete benches etc. as shown on plans as shown on plans. Verify and coordinate exposed radius corner with Architectural documents.

E. Tolerances: Finish concrete to smooth, even surfaces with no abrupt variations, within the following tolerances:

1. Slabs: In accordance with Reference Standard ACI 302.1R. Verify Flatness and Levelness of slabs using ASTM 1155 or ASTM E-1486 (Waviness Index) equivalent.

3.3 FINISH DESCRIPTIONS

A. Surface Finish of As-Cast Exposed to View Concrete: Concrete shall have uniform as-cast surface with minimal additional finishing being anticipated or required. Sacking of concrete is unacceptable.

1. Douglas Fir 2x6 sealed board forms.
2. Patch voids larger than 3/4 in. wide or 1/2 in. deep, surface blemishes will not be filled.
3. Remove projections larger than 1/8 in. by grinding without marring surface.
4. Fill tie holes and strike flush with adjacent surfaces, except as otherwise noted.
5. Surface tolerance Class A as specified in ACI 117.

B. Broom Finish: After floating operations have been completed and concrete has sufficiently hardened, lightly steel trowel slabs to remove irregularities and, prior to concrete becoming non-plastic, *Smooth Broom Finish* slabs using broom not less than twenty four (24) inches wide to produce a finished surface free of small pockets, disturbed aggregate or other defects. Obtain State's Representative approval of sample for texture of final finish before application.

1. Brooming: Produce even texture from edge-to-edge, lap adjacent strokes slightly to produce uniform pattern, perpendicular to the direction of traffic flow unless otherwise shown.

3.5 TOOLING

A. Layout: Locate score lines or control joints where shown on drawings or as directed by State's Representative.

B. Workmanship: Unless otherwise shown, use tool to produce a groove 6 mm (1/4 inch) wide at the top and 13 mm (1/2 inch) deep with rounded corners. Lines shall be straight, parallel and/or square, with square intersections unless otherwise shown.

C. Edges: Round edges of slabs with tool to match score line corners.

3.6 FIELD QUALITY CONTROL

A. General: Comply with field quality-control requirements in Section 03 30 00 "Cast-in-Place Concrete."

## 3.7 AS-CAST FORMED FINISHES

A. Rough-Board Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections exceeding specified limits on formed-surface irregularities.

1. Grout tie- holes with 1/8” reveal.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Remove fins and other projections exceeding specified limits on formed-surface irregularities. Repair and patch tie holes and defects.

C. Board Form Finish: Produce a textured surface free of pockets, streaks, and honeycombs, and of uniform appearance, color, and texture.

D. Sacking of concrete wall is unacceptable.

## 3.8 REPAIRS, PATCHING, PROTECTION, AND CLEANING

A. General: Minor defects in Cast-In-Place Concrete that do not affect its structural properties or weathertight integrity may be patched if approved by the State’s Representative.

1. Approval: Only defects that, in the opinion of the State’s Representative, can be restored to the specified quality of finish and have a reasonable appearance match may be patched.

B. Workmanship: Within three days after form removal, when approved by State’s Representative, fill and patch all rock pockets, "honeycomb" voids and other surface defects to achieve specified finish quality.

1. Filling and Patching: Remove any loose material, thoroughly wet area to be patched, fill with fine sand-cement grout and patching mortar, compact and screed to achieve proper levels.

   Form Tie Holes: Unless otherwise shown, fill and patch all form tie holes which would be exposed to view.

2. Finishing: Match adjacent surfaces and levels.

C. Cast-in-Place Concrete. See specification section 03 33 00.

D. Final Approval: Areas that have been patched will be re-inspected by the State's Representative. If the patching has not, in the opinion of the State's Representative, restored the specified quality and appearance of the surface, the concrete shall be removed to nearest control joints, re-placed and refinished.

## 3.9 CONCRETE WATER REPELLENT SEALER

A. Preparation

1. Verify surfaces to receive water repellent treatment are clean, free of efflorescence, oil, grease, or other foreign matter detrimental to application.

2. Remove loose particles and foreign matter. Remove grease or oil with a solvent, effective alkaline cleaner, or detergent as instructed by water repellent manufacturer. Scrub surfaces with water.

3. Allow surfaces to dry prior to application.

4. Protect all surrounding areas as recommended by the manufacturer or as directed by the State's Representative.

    a. Windows: Windows shall be protected from contact with materials by masking with polyethylene or other approved techniques.

    b. All polished stone, metal, or non-masonry surfaces shall be protected from contact with the material by masking with polyethylene.

    c. Masonry surfaces must be in good repair. All new construction or repointed surfaces must be allowed to cure for a minimum of 28 days prior to application. Surfaces must be completely dry.

5. Verify all windows, exterior intakes and air conditioning vents are covered and air handling equipment is shut down during application and until vapors have dissipated.

6. Coordination with Sealants: Do not apply water repellent until sealants for joints adjacent to surfaces receiving water-repellent treatment have been installed and cured.

B. WATER- Based Silane/Siloxane Water Repellent Treatment APPLICATION (VERTICAL APPLICATION)

1. Test each surface and/or material to be treated to ensure compatibility and water repellent treatment results. The surface to be treated must be clean and free of all foreign matter and as dry as possible to ensure proper penetration of water repellent treatment.

2. Do NOT dilute water repellent treatment.

3. Proceed with application of water repellent treatment in an orderly manner once application rate has been tested; work from bottom to top of each scaffold width and from one end of each elevation to the other.

4. Apply water repellent treatment wet-on-wet to vertical visibly dry and absorbent surfaces and comply with manufacturer's written instructions; use brush or spray application methods, at Contractor's option.

5. Preferred method of application is with low pressure, airless diaphragm-type spray equipment or with a heavily saturated roller or brush. Apply in coverage rate as recommended by manufacturer for type of material.

6. Spray Application:

    a. Apply water repellent treatment from bottom- up using a wet-on-wet application, creating a 4 to 8 inch rundown below the spray contact point. Let the first application penetrate for 5 to 10 minutes then reapply. Apply in accordance with manufacturer recommendation. Do not spray apply at pressures exceeding 50 psi.

7. Roller or Brush Application:

    a. Thoroughly saturate the surface uniformly with water repellent treatment for 5 to 10 minutes. Avoid excessive overlapping. Backroll or brush out heavy runs and drips that do not penetrate.

C. PROTECTION

1. Protect adjacent surfaces not scheduled to receive water repellent treatment. If applied on unscheduled surfaces, remove immediately, by manufacturer approved method.

2. Protect treated surfaces from rain for 6 hours.

3. Correct damage by cleaning, repairing or replacing, and repainting, as approved by A/E.

END OF SECTION 03 35 00

**SECTION 04 22 00**
**CONCRETE MASONRY UNIT**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 SUMMARY

A. The work under this section includes all materials, labor, accessories, equipment and related services to finish Concrete Masonry Unit construction, as shown on Drawings, as specified herein, and all required accompanying accessories.

B. Work included in this section includes the requirements for furnishing and installing Concrete Masonry Unit blocks including but not limited to the following items:

1. Restroom walls as indicated in the Drawings.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Drilled Dowels and Epoxy Anchors: Section 03 15 00.

B. Expansion Anchors, Screws and Powder-Actuated Fasteners: Section 05 05 19.

C. Joint Sealants: Section 07 92 00. For elastomeric joint sealants in contraction and other joints in cast-in-place architectural concrete.

1.4 SUBMITTALS

A. Comply with pertinent provisions of General Conditions and Special Provisions.

B. Certification: Prior to delivery of concrete masonry materials to the job site, deliver to the State’s Representative a letter from the manufacturer of the proposed masonry units certifying that all such units to be delivered to the job site are in strict conformance with the provisions of this Section.

C. Submittals: Submit mix proportions for Mortar design and Grout Design to Engineer for Review.

D. Shop Drawings: Indicate in shop drawings for reinforcing steel bending diagrams, assembly diagrams, splicing, and laps of rods, shapes, dimensions and details of bar reinforcing and accessories.

1.5 QUALITY ASSURANCE

A. Provide quality assurance (testing and inspection) specifications per CBC Sections 1705.4 and 2105.

B. Preconstruction Testing

1. Owner will select a qualified independent testing agency to perform preconstruction testing indicated below. Payment for these services will be made by Owner.

2. The following verification procedures are to be performed to a Level 2 Quality Assurance Level per TMS 402 3.1 unless otherwise noted

3. Determine the compressive strength of masonry ($f'_m$) by one of the following methods:

   a. The unit strength method, using the strength of the unit and type of mortar specified (Unit Strength Method) per CBC Section 2105.6 in accordance with TMS 602 Section 1.4 B.2., Table 2. Concrete Masonry Units: Test per ASTM C140, Grout: Test per ASTM C1019

   b. The Prism Method in accordance with ASTM C1314. Schedule masonry procurement sufficiently in advance to allow for prism construction and curing. Prism Test: For each type of construction required, construct and test three prisms per ASTM C1314.

4. Determine the compressive strength of grout ($f'_g$) by one of the following methods:

   a. Proportion Specification
      i. Verify grout conforms to ASTM C476
      ii. Submittal of mix design to indicate proportions is required
      iii. No compression testing is required

   b. Property Specification
      i. Grout compressive strength shall equal or exceeds the $f'_m$, but not less than 2,000 psi

ii. Compression strength verified by testing agency

C. Special Inspection

1. Owner will select a qualified independent special inspection agency to special inspections indicated below. Payment for these services will be made by Owner.

2. Special inspection is to be performed to a Level 2 Quality Assurance Level per TMS 402 3.1 unless otherwise noted.

3. Periodic Inspection: The following inspection tasks are to be performed periodically per TMS 602 Table 4. This is a partial list, please consult TMS 602 and CBC for additional requirements.

   a. Properties of concrete unit masonry, mortar, grout, and all reinforcing steel as defined in this specification and the general notes on the structural drawings.

   b. Placement of masonry, mortar, and reinforcement

4. Continuous Inspection: The following inspection tasks are to be performed continuously per TMS 602 Table 4. This is a partial list, please consult TMS 602 and CBC for additional requirements.

   a. Placement of grout

## 1.6 PRODUCT HANDLING

A. Protection: Protect concrete unit masonry before, during and after installation, and protect installed work of other trades.

   i. Avoid scattering concrete materials on the site.

   ii. Cover and protect against wetting prior to use.

B. Storage: Store masonry units above ground on level platforms allowing air circulation under stacked units.

C. Replacements: In event of damage, make repairs and replacements to satisfaction of the Engineer without additional cost to Engineer.

## 1.7 PROJECT CONDITIONS

A. Avoid placing masonry units when air temperature is below 40° F.

B. Protect masonry construction from direct exposure to wind and sun when erected in ambient air temperature of 99° F in the shade, with relative humidity less than 50%.

PART 2 - PRODUCTS

2.1 CONCRETE BLOCKS

a. Blocks shall conform to the requirements of ASTM C 90, precision block. Color and aggregate shall be standard as approved by State's Representative, and strengths ($f'_{CMU}$= 3,250 psi, MIN) as specified in ASTM C 90. Blocks shall be standard medium weight split face (single sided) 8x8x16 with running bond coursing.

b. Caps shall be Basalite standard solid beveled cap 8x4x16 running bond coursing. Color shall be standard grey Basalite #225 as approved by the State's Representative.

c. Limit moisture absorption during delivery and until time of installation to the maximum percentage specified for Type I units.

2.2 MORTAR

d. All mortar for concrete block shall be Type "M" and shall conform to ASTM C 270 and shall have minimum compressive strength of 2,500 psi. Color shall be standard grey Basalite #225) as approved by as approved by State's Representative.

e. Mortar shall be freshly prepared and uniformly mixed and be of spreadable, workable consistency.

f. Mortar should be retempered with water as required to maintain high plasticity. Retempering on mortar boards shall be done only by adding water within a basin formed with the mortar and the mortar worked into the water. Any mortar which is unused after one and one-half hours from the initial mixing time shall not be used.

g. After all ingredients are in the batch mixer they shall be mechanically mixed for not less than three minutes.

h. The use of fire clay, rock dust, dirt and other deleterious materials is prohibited in mortar.

i. Sand and aggregates for mortar shall conform to ASTM C 144.

2.3 REINFORCEMENT

A. Reinforcement:

1. Deformed bar placed in grout cavity:

   a. New, deformed billet steel bars conforming to ASTM A 615.

   b. Size & grade as shown on the drawings

2. Joint Reinforcement placed in bed joints

   a. Wire for fabrication of custom wall ties
      1) Manufacturer: Hohmann & Barnard,150 Motor Parkway Suite 410 Hauppauge, NY 11788, 385-460-5595
      2) Wire Size: (S) Standard Weight: 9 Gauge, (EH) Extra Heavy: 3/16"Ø
      3) Wire Material:
         a) Carbon Steel Wire: ASTM A1064/A1064M (Fy=70ksi)
         b) Stainless Steel Wire: ASTM A580/ASTM A580M - AISI Type 304
         c) Confirms w/ ASTM A951

   b. Welded ladder or truss mesh reinforcement

      1) Manufacturer:
         a) Grip-Rite (PrimeSource Building Products) 1321 Greenway Drive, Irving, TX 75038, 469-871-7332
         b) Hohmann & Barnard,150 Motor Parkway Suite 410 Hauppauge, NY 11788, 385-460-5595
      2) Wire Size:
         a) (S) Standard Weight: 9 Gauge Side Rods x 9 Gauge Cross Rods
         b) (SHD) Super Heavy Duty: 3/16"Ø Side Rods x 3/16"Ø Cross Rods
         c) (EH) Extra Heavy: 3/16"Ø Side Rods x 9 Gauge Cross Rods
      3) Wire Material:
         a) Carbon Steel Wire: ASTM A1064/A1064M (Fy=70ksi)
         b) Confirms w/ ASTM A951

B. Deliver bars new and free from rust and mill scale in original bundles with mill tags intact.

C. Ties and Anchors: Comply with requirements for type, metal and size of referenced unit masonry standards.

2.4 GROUT

j. Grout shall conform to ASTM C 476 and shall have minimum compressive strength of *f'g* = 2,000 psi (17.2 MPa) or higher as indicated on Drawings.

k. Coarse grout shall be proportioned by volume, shall consist of one part Portland cement, three (3) parts sand and one to 2 parts coarse aggregate.

l. Laboratory design mixes are acceptable in lieu of the above proportions and are required if the minimum strength is more than 2,500 psi. Grout shall be of fluid consistency with proper proportions of sand to gravel for pouring or pumping.

m. Aggregate for masonry grout shall conform to ASTM C 404.

n. Maximum slump shall be 8" with a low absorption masonry and 10" with a high absorption unit.

2.5 OTHER MATERIALS

a. All other materials not specifically described but required for a complete and proper installation of the work of this Section, shall be as selected by the Contractor subject to approval by the State's Representative.

PART 2 - EXECUTION

1. SURFACE CONDITIONS

a. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

1) Masonry shall not be started when the horizontal and vertical alignment of the foundation is out of plumb or line one inch or more.

b. Commencement of installation of any products of this Section shall be considered as acceptance of the substrate and conditions as being satisfactory for proper installation of products of this Section.

2. INSTALLATION

a. Coordinate as required with other work to assure proper and adequate provision in other work for interface with the work of this Section.

b. Install the work of this Section in strict accordance with the original design, the approved Shop Drawings, pertinent requirements of governmental agencies having jurisdiction, and the manufacturer's recommended installation procedures.

c. Provide bond indicated in drawings.

d. Avoid using chipped or broken units. If such units are discovered in the finished wall, State's Representative may require their immediate removal and replacement with new units without additional cost to the State Representative.

e. Care shall be taken to prevent grout and mortar stains. Keep wall continually clean; if grout does run over, clean immediately.

f. All masonry shall be laid true, level and plumb in accordance with the Drawings.

g. The masonry units shall be cut accurately to fit all plumbing, ducts, openings, electrical work, etc., and all holes are to be neatly patched.

h. No construction support shall be attached to the wall except where specifically permitted by the State's Representative.

i. The top surface of the concrete foundation shall be clean and free of laitance and the aggregate exposed before starting masonry construction.

j. Wall shall be laid up in straight, uniform courses with regular running bond courses.

k. All work, bond patterns or special details as shown on the Drawings shall be accurately and uniformly executed.

l. Joints:

1) The starting joint on foundations shall be laid with full mortar coverage on the bed joints except that the area where the grout occurs shall be free from mortar so that the grout will be in contact with the foundation.

2) Mortar joints shall be straight, clean, and uniform in thickness and shall be tooled as shown on the plans. Unless otherwise specified or details on the plans, in hollow unit masonry the horizontal and vertical mortar joints shall be 3/8" thick.

3) Visible joints shall be tooled with a concave surface. Cut joints flush for masonry walls to be concealed or to be covered by fluid-applied membrane waterproofing or other materials, unless otherwise indicated. Tooling shall be done when the mortar is partially set and still sufficiently plastic to bond. All tooling shall be done with a tool that compacts the mortar.

4) Vertical head joints shall be butted for a thickness equal to the face shell of the unit and these joints shall be shoved tightly so that the mortar bonds well with both units.
5) If it is necessary to remove a unit after it has been set in place, the unit shall be removed from the wall, cleaned and set in fresh mortar.

6) All work, bonds or special details shall be accurately and uniformly executed. Face joints shall be tooled as shown on the Plans and in the Specifications.

7) Where control joints are required or specified, they shall be as detailed on the Drawings.

m. Reinforcing:

1) When a foundation dowel does not line up with a vertical core, it shall be sloped at not more than one horizontal to six vertical. Dowels shall be grouted into a core in vertical alignment even though it is in an adjacent cell to the vertical wall reinforcing.
2) Reinforcing bars shall be straight except for bends around corners and where bends or hooks are detailed on the structural drawings.

3) Reinforcing steel where spliced shall be lapped a minimum of 40 bar diameters, unless otherwise indicated in drawings.

4) When full length vertical bars are used, they shall be held in position at top and bottom at intervals not exceeding 200 bar diameters of the reinforcement.

5) Horizontal reinforcing shall be laid on the webs of bond beam units and shall be solidly grouted in place. Reinforcing in channel units shall be spaced off the bottom of the unit.

6) Vertical reinforcing shall have a minimum clearance of 1/2" from the masonry shell.

n. Grouting:

1) Reinforcement shall be in place before grouting starts.

2) Mortar droppings shall be kept out of a grout space.

3) All grout shall be mechanically vibrated in place.

4) Vertical cells to be filled shall have vertical alignment to maintain a continuous unobstructed cell area not less than two inches by three inches.

5) All cells shall be solidly filled with grout and pours shall be stopped 1-1/2 inch below the top of a course to form a key or joints.

6) Grouting at beams over openings shall be done in one continuous operation.

7) Spaces around metal door frames and other built-in items shall be filled solidly with grout or mortar.

8) Columns, beams, joists, and similar structural members shall be anchored to the wall with anchor bolts or their equivalent. Anchors shall be fully, solidly embedded in place. Embedment shall not be less than shown on the drawings.

9) Low Lift Grouting: Structure shall be grouted in lifts per code. Grout shall be mechanically vibrated to insure full penetration into mortar joints and around steel.

END OF SECTION 04 22 00

# SECTION 05 05 19
# EXPANSION ANCHORS, SCREW ANCHORS & POWDER-ACTUATED FASTENERS

## PART 1 GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

### 1.2 SUMMARY

A. Provide all material, labor, equipment and services necessary for the installation of all expansion, screw anchors and/or powder-actuated pins. The work shall include but not necessarily be limited to the following:

1. Drill holes in existing and or new concrete elements for new expansion and screw anchors.

2. Install expansion and screw anchors in drilled holes.

3. Tighten the expansion anchors to the required torque.

B. Work included in this section includes dowels and anchors required for concrete for the Building Foundations, Retaining Walls, Site Elements, and other structural items including concrete curbs, grade beams, mat slab and foundation concrete as shown on Drawings.

### 1.3 RELATED SECTIONS

A. Cast-In-Place Concrete: Section 03 30 00.

B. Concrete Masonry Unit: Section 04 22 00.

### 1.4 QUALITY ASSURANCE

A. Standards: Comply with the following applicable standards unless otherwise specified herein:

1. CBC - California Building Code, latest edition.

2. ICC-ES- "Evaluation Report" of ICC Evaluation Service, Inc.

3. ASTM - American Society for Testing and Materials.

4. ASTM E488-18 - Strength of Anchors in Concrete and Masonry Elements.

5. A.C. 193 – ICC-ES Acceptance Criteria for the testing of Cracked Concrete Expansion and Screw anchors in compliance with ACI 318 Chapter 17.

B. Tests and Inspections: Test and inspections shall be done by the Testing Agency.

1. Sampling and Testing

    a. Anchors shall be sampled and identified in accordance with manufacturer's suggested identification method.

2. Inspection

    a. Special inspection as required by CBC Chapter 17, Section 1705.3 & Table 1705.3.

        1) Drilling and placing of anchors in the drilled holes shall be inspected periodically by a qualified inspector from the Testing Agency.

        2) For continuous inspection requirements of adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension loads see spec section 03 15 100 "Drilled Dowels and Epoxy Anchors"

3. Testing

    a. Test each size and type of anchors to tension loads specified in schedules on the Drawings:

        1) Test Load 10 percent of the total number of anchors installed each day:

        2) Testing shall be in accordance with ASTM E488, "Strength of Anchors in Concrete and Masonry Elements."

        3) Tension Test Loads: Refer to schedules on Drawings or this section for test loads.

        4) Test loads shall be held a minimum of 2 minutes each with a maximum slip of 1/8 inch

        5) If any one anchor installed in any one day fails the tension and slip test, all anchors installed that day shall be tested.

6) Do not apply test loads until at least two days after anchors are set and torqued.

1.5 SUBMITTALS

A. Shop Drawings: Submit shop drawings for State's Representative's review. Indicate placing diagrams for the anchors.

1. Review of drawings will cover only the general scheme and character of the anchor layout, but not the checking of dimensions, nor will such review relieve the Contractor from responsibility for executing the work in accordance with the Drawings.

B. Manufacturer's Catalog Data

1. Expansion Anchors, Screw Anchors and Components.

C. ICC-ES Evaluation Reports:

1. Submit Current ICC-ES report showing Cracked Concrete Compliance for Expansion Anchors and Screw Anchors.

D. Test and Inspection Reports from qualified inspector

1. Anchor placement inspection report including all items referenced by ICC-ES report.

2. Anchor pull testing values.

1.6 STORAGE

A. Provide job site storage in weatherproof and dry enclosure. Protect from contaminants such as grease, oil and dirt.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Expansion Anchors

1. Expansion anchors shall be steel "Wedge Anchors," stud type with wedge clips, tested in accordance with ICC-ES AC 193 and shall have 'Cracked Concrete' compliance.

2. The following "Wedge Anchors" have the minimum ICC-ES/CBC requirements for shear and tension values for use in lightweight aggregate concrete and/or stone aggregate concrete at the tabulated values for anchor diameter, minimum embedment, and concrete strength:

    a. Simpson Strong-Tie: 'Strong-Bolt 2' (ICC-ESR Report 3037), A316 Stainless Steel finish, w/ exposed bolt painted to match adjacent steel finish.

    b. Hilti Fastening Systems: 'Hilti "Kwik Bolt-TZ' ( ICC-ESR Report 1917), A316 Stainless Steel finish, w/ exposed bolt painted to match adjacent steel finish.

3. Carbon steel anchors shall consist of the following, or equivalent, materials:

    a. Studs - ASTM Al 08, AISI Grade Designation 1010.
    b. Wedge Clips - ASTM Al 08, AISI Grade Designation 1010.
    c. Nuts - ASTM A563, Grade A
    d. Washers - ASTM Al 08, AISI Grade Designation 1010.
    e. Hot-Dip Galvanized Coating with w/ exposed bolt painted to match adjacent steel finish on all items - ASTM A153 or ASTM B695, U.O.N.

B. Concrete & Grouted Masonry Screws

1. Simpson Strong-Tie:

    a. 'Titen HD' for indoor use (ICC-ESR Report 2713 for concrete and ICC-ESR Report 1056 for masonry)

    b. 'Stainless Steel Titen HD' for exterior use (IAPMO UES ER-493 for concrete & ICC-ESR Report 1056 for masonry)

2. Hilti Fastening Systems:

    a. 'KH-EZ' for indoor use (ICC-ES Report 3027 for concrete and ICC-ESR Report 3056 for masonry)

    b. 'KH-EZ SS316' for exterior use (ICC-ES Report 3027 for concrete and ICC-ESR Report 3056 for masonry)

C. Powder Actuated Fasteners

1. Simpson Strong-Tie: 'PDP' pins (ICC-ESR Report 2138) for wood and cold formed framing.

2. Hilti Fastening Systems: 'X-CP 72 P8' pins for wood (ICC ESR-2379) and 'X-U P8' for cold formed ((ICC ESR-2269)

## PART 3 - EXECUTION

### 3.1 PREPARATION

A. Inspect areas to be drilled to verify conditions of access, interferences and existing materials.

1. Drilling operations may be limited to particular times of the normal work day.

2. Verify location of all existing mild steel reinforcement in new and/or existing concrete prior to drilling. Use care and caution to avoid cutting or damaging existing reinforcing bars. Pacometer tests, radiograph tests, or other appropriate tests shall be required to locate steel. Maintain a minimum clearance of 1 inch between existing reinforcement and anchors.

3. Where drilling causes concrete to spall or crack, remove unsound materials and replace as directed by the Engineer.

4. Proceed with drilling following removal or replacement of unsound or damaged concrete.

### 3.2 ANCHOR HOLES

A. Holes for anchors shall be drilled in new and/or existing concrete using a rotary hammer drill with a carbide-tipped bit. Holes shall be same diameter as bolt diameters and holes shall be drilled to the depths indicated on the plans.

B. Anchor size and embedment shall be as indicated in Schedules and Details on the Drawings or this Section. In no case shall embedment of anchor be less than that shown in the valid ICC-ES Evaluation Report for that particular anchor.

C. Dust and other contaminants shall be completely removed from holes by blowing with oil-free compressed air.

### 3.3 ANCHOR EMBEDMENT AND TEST LOAD SCHEDULE

A. Anchors shall be installed with the minimum embedments as indicated in Schedules and Details on the Drawings and be tested to the values noted on the Drawings.

### 3.4 ANCHOR PLACEMENT

A. Anchors shall be placed and driven in holes to a depth that will provide the minimum embedment.

## 3.5 ANCHOR TIGHTENING

A. Anchors shall be tightened to the minimum torque values specified in schedules on the Drawings or this Section using torque wrenches or other approved methods for tightening the anchors.

B. Installation of anchors shall be in strict accordance with manufacturers written recommendations and as directed by the manufacturer's service representative.

C. Anchors shall set for a minimum of 2 days before any load test can be performed on the anchors.

## 3.6 PROTECTION

A. Protect anchors from displacement or disturbance after installation.

B. Protect existing exposed surfaces and surrounding area during drilling operations. Clean and/or repair marred or damaged surfaces as directed by the Engineer.

## 3.7 CLEAN-UP

A. Remove from the site all debris resulting from the work of this Section.

END OF SECTION 05 05 19

**SECTION 05 12 00**
**STRUCTURAL STEEL FRAMING**

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 SUMMARY

A. Provide all materials, labor, equipment and services necessary for the fabrication, erection and completion of all structural steel, including all bracing and shoring required for erection and related work. The work shall include and not necessarily be limited to the following:

1. Education Center.

2. Future Phase, N.I.C.: Shade Structure.

3. Future Phase, N.I.C.: Courtyard and restroom steel exterior columns

4. Verification of anchor bolt setting and of levels to assure adequate fit of the steel work.

1.2 DEFINITIONS

A. WPS: Welding Procedure Specification

B. Contractor's Quality Control Inspector (QCI): A representative of the contractor (fabricator or erector) designated by the contractor to perform quality control tasks as specified in AISC 360 or AISC 341

C. Quality Assurance Inspector (QAI): Special inspection or testing agency representing the State, designated to perform quality assurance tasks as specified in AISC 360 or AISC 341

D. NDT: Non-Destructive Testing

1.3 RELATED SECTIONS

A. Cast-in-Place Concrete: Section 03 30 00.

B. Drilled Dowels & Epoxy Anchors: Section 03 15 00

C. Expansion Anchors, Screws and Powder-Actuated Fasteners: Section 05 05 19.

D. Rough Carpentry: Section 06 10 00.

1.4 QUALITY ASSURANCE

A. Standards: Comply with the following applicable standards unless otherwise specified herein:

1. CBC—"California Building Code," latest Edition and all applicable local Building Codes.

2. AISC-- American Institute of Steel Construction's "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings," latest edition.

3. AISC—American Institute of Steel Construction's "Code of Standard Practice for Steel Buildings and Bridges," latest edition.

4. AWS—American Welding Society's "Structural Welding Code" AWS D1.1, latest Edition.

5. AISC—American Institute of Steel Construction's "Specification for Structural Joints Using ASTM A325 or A490 Bolts," latest edition.

6. ASTM—American Society for Testing and Materials.

7. SSPC—Steel Structures Painting Council.

8. ICBO—"Evaluation Report" of ICBO Evaluation Service, Inc.

9. RCSC—"Specification for Structural Joints Using High-Strength Bolts" by the Research Council on Structural Connections.

B. Tests and Inspections:

1. Contractor shall certify, test and inspect all materials, welding, fabrication and erection in accordance with the requirements of AISC and AWS D1.1 and as noted herein. The State's Representative will employ a Testing Agency to provide for additional testing and inspections only as noted in the sections below.

2. Mill analysis and test reports for the steel, certified and properly executed by the manufacturer, will constitute sufficient evidence of conformity with the specifications. Contractor shall identify steel in accordance with CBC Section 2202 as to heat number and furnish the Testing Agency. If the material cannot be identified or its source is questionable, one set of tension and bend tests shall be made by the Testing Agency in accordance with the CBC Section 2202.

    a. The cost of all tests including sampling and machining of test coupons shall be paid by the Contractor.

    b. The Contractor shall cooperate with Testing Agency and provide all material required to take coupons for testing, as required by the Engineer.

3. Certificates of compliance for welding electrodes and shear studs properly executed by the manufacturer(s) shall constitute sufficient evidence of compliance with the specification.

4. High strength bolts, nuts, washers and thread rods shall be sampled and tested in accordance with the requirements of the specification for High Strength Bolts for Structural Steel Joints, ASTM A325 or ASTM A490 Bolts.

5. Additional testing required as a result of corrective measures to correct defects shall be paid for by the Contractor.

C. Fabrication Inspection by Testing Agency: All fabrication of structural steel shall be inspected by the Testing Agency. This inspection, in addition to the welding inspection requirements specified herein, shall consist of, but shall not necessarily be limited to, the following:

1. Visually inspect steel shapes and plates for existence of defects such as laminations and non-metallic inclusions. Use ultrasonic equipment and other NDT methods to determine extent of defects.

2. Verify steel materials with mill certificates, particularly where yield strength limits, grain size and/or toughness properties are specified in Section 2.1. Verify weld filler metal materials with certificates and manufacturers recommended limitations.

3. Review sections used for conformity to dimensional standards specified.

D. Welding Inspection by the Contractor: All shop and field welding shall be inspected by the contractor's "Welding Inspector" as defined by AWS D1.1, Section 6.1. Governing Building Code regulations shall not be construed as

to alleviate either the Contractor's welding inspector or the Testing Agency from the welding inspection requirements of AWS D1,1. The Contractor's Quality Control Inspector shall be present during all shop and field welding operations, shall inspect the work as required by AWS D1.1, Section 6, shall possess and be familiar with all approved WPSs and shall cooperate with the Testing Agency.

E. Welding Inspection by the Testing Agency: All shop and field welding shall be inspected by a qualified and certified "Verification Inspector" as defined by AWS D1.1 Section 6.1, employed by the Testing Agency in accordance with AWS D1.1 Section 6 and in accordance with the Special Inspection Requirements of the governing Building Code. This inspector shall confirm the qualification of welders, the use of AWS qualified procedures, the manufacturer's recommended use of automatic equipment and the proper use of preheat. Inspection personnel shall be qualified for non-destructive testing at Level II as specified in Section 6, Paragraph 6.7 of AWS D1.1. The Testing Agency shall submit welding inspector qualifications to the State's Representative for approval. The Testing Agency shall submit a welding inspection checklist to the State's Representative for approval.

1. Welder Qualifications: All welders shall be qualified for the work in accordance with AWS D1.1, Section 5, Part C. Except as noted herein, the welders' qualification shall be considered as remaining in effect indefinitely unless there is a specific reason for questioning the welder's ability, in which case welder re-certification may be required. If in the opinion of the State's Representative, the welder is not suitable for the project, said welder may be disqualified from the project. Field Welders shall be qualified in all processes to be used on-site, in all positions, and on all thickness.

2. Equipment Electrical Meter Calibration Verification: The Contractor shall verify, to the satisfaction of the Testing Agency, that electrical meters are being used, and those in use accurately reflect voltage and amperage at the welding site for the length of cable in use.

3. Visual Inspection: Visually inspect all shop and field welding, including the superstructure, and supports and/or bracing of finishes and non-structural components. Visual inspection shall be in accordance with AWS D1.1., Sections 5 and 6, and shall include verification of fit up, preheat, calibration of equipment, equipment settings, materials, adherence to approved WPS, interpass temperatures, deposition rates, technique, proper fusion of each pass, ensure the weld is crack free at each pass, confirm porosity and undercut do not exceed AWS requirements and confirm the final weld profile, and confirm that all special requirements specified herein are adhered to. Visual inspectors shall examine each step of the welding process.

4. Welded Studs: Testing and inspection of steel studs welded to structural steel shall be in accordance with Section 7, Stud Welding, AWS D1.1.

5. Where welds have been indicated on the drawings as part of the Seismic Force-Resisting System (SFRS) or Demand Critical, in addition to the requirements above, inspection shall be in accordance with AWS D1.8 Section 7.

F. Erection Inspection: All erection of structural steel shall be inspected by the Contractor and the Testing Agency. Provisions under “Fabrication Inspection” and “Welding Inspection" shall apply.

1. All welding shall be inspected by the Testing Agency. Complete penetration welds shall be ultrasonically tested per the provisions under “Welding Inspection.”

2. High strength bolting shall be inspected by the Testing Agency in conformance with the “Specification for Structural Joints using High-Strength Bolts” as approved by the Research Council on Structural Connections.

1.5 SUBMITTALS

A. Mill Test Reports: Contractor shall furnish certified copies of all mill analysis and test reports covering the chemical and physical properties of the steel for review by the Testing Agency and the Engineer.

B. Certificates of compliance: Contractor shall submit certificates of compliance for bolts, welding electrodes, and shear studs.

C. Shop Drawings:

1. Contractor shall submit shop drawings showing anchor bolt layout, details of members, their connections, details of weld groove profiles, indication of size and spacing of bolts, and erection plans for the execution of the work showing the marking, and position of each member. Detail drawings shall indicate the position of each member on the framing plans. Shop drawings of details incorporating preheat, interpass temperature monitoring or post weld heat treatment or stress relief of any kind shall include explicit references to corresponding approved weld procedure specifications.

2. Checking by Contractor: Prior to submission of the shop drawings to the Engineer, they shall be pre-checked by the Contractor for general and detailed conformance with the Contract Documents and as coordinated with other subcontractors. The signature of a representative of the Contractor indicating that the drawings have been

pre-checked will be required. The Contractor shall be wholly responsible for the conformity of dimensions and details of the shop drawings with the Contract Documents.

3. Review by Engineer: Provide PDF Digital copies of any shop drawing submittal. After receipt of the shop drawings by the Engineer, they will be reviewed and necessary corrections will be marked on one copy, which will be returned. One copy shall be retained by the Engineer. Corrections shall then be made and the drawings resubmitted. This procedure will be continued until the drawings are approved or approved as noted and released for construction. Once approved, if variations between the shop drawings and the original construction drawings (plans & details) exist, the shop drawings shall take precedence.

4. Submissions: Per Division 1, Standard Provisions.

5. Additional copies of the approved shop drawings shall be at the Contractor's expense.

6. File: At least one copy of each approved shop drawing shall be kept available in the Contractor's field office. Drawings not bearing evidence of approval and release for construction by the Engineer shall not be kept on the job site.

D. Bolts: Submit manufacturer's data for high strength bolts and direct tension indicator washers.

E. Review of submittals and shop drawings will cover only the general scheme and character of the details, but not the checking of dimensions, nor will such review relieve the Contractor from responsibility for executing the work in accordance with the contract drawings.

F. Paint Samples:

1. Contractor shall provide four (4) color paint samples nominally 8" x 10" for approval by State's Representative prior to beginning coating process:

a. Color samples to be selected by State's Representative from Tnemec standard color chart.

## PART 2 – PRODUCTS

### 2.1 STRUCTURAL STEEL MATERIALS

A. Structural Steel shapes and Plates: ASTM A572 Grade 50, typical unless noted.

B. Rolled steel W and WT sections: ASTM A992, Grade 50.

C. Channel and angle sections may be ASTM A36.

D. Rectangular HSS Sections: ASTM A500, Grade B—Cold Formed Structural Tubing.

E. Steel Pipe: ASTM A53, Grade B.

F. Round HSS Sections: ASTM A500, Grade B, Fy = 42 ksi, Fu = 58 ksi.

G. Stainless Steel: Plate sheet and Coil: ASTM A240/A240M Type 316.

2.2 FASTENER PRODUCTS AND MATERIALS

A. Anchor Bolts for Columns: ASTM F1554 Grade 36 or 55. HDG per ASTM F2329.

B. Machine Bolts: ASTM A307 Grade A. If HDG then per ASTM A-153.

C. High-Strength Bolts, Heavy Hex Head: ASTM F3125 Grade A325, Connection Type X, N or SC, as indicated on the Drawings.

D. Heavy Hex Nuts: ASTM A563 Grade A. If HDG then galvanized per ASTM A-153.

E. Stainless Steel
   1. Stainless Steel Bolts: ASTM A193 B8M Type 316.

   2. Stainless Steel Nuts: ASTM A194 B8M Type 316.

   3. Round Bars, Bars: ASTM A-479, Type 316

   4. Plate: ASTM A-240, grade 316

F. Direct Tension Indicators: ASTM F959-94A for use with SC bolts.

G. Mild welded steel studs. ASTM A29. Shear studs and concrete connectors, Stud Welding AWS D1.1 Type B. Standard mild steel studs, AWS Type A.

H. Stainless Steel welded studs. ASTM A276 or A493, A316, AWS D1.6.

I. Connections to Wood Heavy Timber Framing: ASTM A47 Galvanized Malleable Iron washers.

J. Stainless steel Bolts: ASTM F593

## 2.3 WELDING PRODUCTS AND MATERIALS

A. Arc-welding Electrodes: Filler metals shall conform to Table 4.1 of AWS D1.1. Electrodes and equipment settings shall be as recommended by the filler metal manufacturer for the position, thickness or other conditions of actual use. All electrodes and filler metals shall be low hydrogen types.

1. Electrode wire diameter: FCAW wire diameter shall not exceed the values specified in AWS D1.1., Section 4.14.1.

B. Arc-welding equipment: Equipment for electric welding shall have calibrated meters for voltage and amperage that accurately indicate voltage and amperage quantities at the welding site for the length of the cable to be used. Contractor shall demonstrate to the satisfaction of the Testing Agency the accuracy of the meters, using external meters attached to extension cables of a length that reflects actual project conditions. If equipment meters do not accurately reflect electrical properties at the welding site, external meters shall be used at the welding site and shall be provided but the Contractor at the Contractor's expense.

## 2.4 COATING PRODUCTS AND MATERIALS

A. All steel framing shall be painted according to the following specifications:

1. Shop Primer: Tnemec **Series 90-97 Tneme-Zinc or 93-H2O Hydro-Zinc at 2.5 to 3.5 mils DFT.** VOC content shall comply with local governing air district.

2. Stripe-Coat Procedure: Tnemec Series **1095 Endura-Shield;** brush-applied to all welds, voids, nuts, bolts and sharp edges and areas inaccessible to roller application referencing Paint Application Guide No. 11 Protecting Corners, Edges, Crevices, and Irregular Steel Geometries by Stripe Coating.

3. Intermediate Coat: Tnemec Series **1095 Endura-Shield at 3.0 to 5.0 mils DFT.**

4. Final Coat: **Tnemec Series 1071V Fluoronar Semi-gloss** (Color to be approved by State Representative, see below); 2.5 to 3.5 mils DFT, per manufacturer's recommendations.

5. Contractor shall provide four (4) color paint samples nominally 8" x 10" for approval by State's Representative prior to beginning coating process:

a. Color samples to be selected by State's Representative from a complete range of color samples including custom color matches to match window framing and lightshelf.

B. Shop Galvanizing: All items noted on the drawings or specifications as galvanized shall be hot dipped galvanized in accordance with ASTM A123. Thickness of galvanized coating shall be in conformance with ASTM A123.

C. Hardware Galvanizing: All hardware products such as castings, fasteners, rolled, pressed, and forged products, and miscellaneous threaded objects noted on the drawings or specifications as galvanized shall be hot dipped galvanized in accordance with ASTM A153. Anchor Bolts for Columns specified as ASTM F1554 Grade 36 or 55 noted on the drawings or specifications as galvanized shall be hot dipped galvanized in accordance with ASTM F2329.

D. Galvanizing repair compound shall be ZRC Galvalite Cold Galvanizing Compound or approved equivalent.

## PART 3 – EXECUTION

### 3.1 GENERAL

A. Workmanship and details of structural steel work, unless otherwise specified, shall conform to Uniform Building Code and the AISCC Specification for Design, Fabrications and Erection of Structural Steel for Buildings. The quality of materials and the fabrication of all welded connections shall conform to the American Welding Society's Structural Welding Code, AWS D1.1.

B. The Contractor shall secure all field measurements necessary for the completion of this work. The contractor shall be responsible for all errors of detailing and fabrication and for the correct fitting of the structural members to each other and to their supports. Provide column anchor bolts and templates for setting under Section 77, Structural Cast-in-Place Concrete; and this Section to verify location.

C. All materials both before and after fabrication shall be protected from rust corrosion and shall be kept free from dirt, grease and other foreign matter.

D. Each framing member shall be free from twists and bends. Holes and all cut and sheared edges shall be neatly made without kinks, butts, and warped edges. All steel left exposed shall be straight, smooth and free of nicks, scars and dents. Exposed welds shall be uniform and neat.

E. Installation of steel studs, headed for shear connectors and threaded for parts connectors, welded to structural steel, shall be in accordance with Section 7, Stud Welding, of AWS D1.1.

F. Holes for Bolts: Holes for bolts shall be 1/16 inch larger than the nominal diameter of the bolt. If the thickness of the material is not greater than the nominal diameter for the bolt plus 1/8 inch, the holes may be punched. Holes in thicker material shall be drilled from the solid or sub-punched and reamed. Holes for high-strength bolts shall have all burrs removed by grinding.

G. Column Bearing Surfaces: Column bases, as required by the AISC specification, and all column bearing surfaces shall be milled to a true plane perpendicular to the axis of the member to assure a complete bearing at the contact face.

H. Camber: All beams and girders shall be cambered if and as indicated on the Drawings.

I. Dimensional Tolerances: Fabrication and erection tolerances shall conform to AISC requirements except where closer tolerances are shown on the Drawings.

## 3.2 WELDING

A. Welded Connections: Where structural joints are made by welding, the details of all joints, the techniques of welding employed, the appearance and quality of welds made, and the methods used in correcting defective work shall conform to requirements of “Structural Steel for Buildings” of American Institute of Steel Construction and “Structural Welding Code” of the American Welding Society.

1. Where welds have been indicated on the drawings as being part of the Seismic Force-Resisting System (SFRS) or Demand Critical, in additional to the requirements above, the details of all joints, the techniques of welding employed, the appearance and quality of welds made, and the methods used in correcting defective work shall conform to requirements of “Seismic Provisions for Structural Steel Buildings, AISC 341” and “Structural Welding Code-Seismic Supplement, AWS D1.8”

B. Qualification of Welders: Welding operators shall qualified by tests, as prescribed in the “Standard Qualification Procedure of the American Welding Society (AWS D1.1) to perform the type of work required, including process, position and thickness. All welders shall be capable of reading and following the approved written WPS.

1. Where welds have been indicated on the drawings as being part of the Seismic Force-Resisting System (SFRS) or Demand Critical, in addition to the requirements above, welding operators must also be certified in accordance with AWS D1.8. Section 5.

C. General Requirements: All welding shall conform to the following:

1. Equipment: Use equipment which will supply proper current, voltage, etc., as recommended by the manufacturer of electrodes to be used, adjusted to suit arrangement and thickness of base metal. Suitable meters and means of adjustment shall be provided for current and voltage

2. Preparation for Welding: All surfaces shall be clean, free of rust, paint and foreign matter of any kind. Scale shall be removed by wire brush, chipping or hammering as required. Thermal cut edges to be welded shall be chipped clean, and ground at least 1/32 inch to bright metal before welding. Clamp members as required, space and alternate welds all as may be necessary to prevent warping or misalignment.

3. Fitup: Weld joint profiles shall meet dimensional requirements and maximum tolerances specified by AWS D1.1 or as specified in approved Qualification Procedures. Joint fitup that does not comply shall be corrected using approved procedures and approved by the inspector before welding proceeds.

4. Preheat/ Interpass/ Postheat: Provide minimum preheat and interpass temperatures and Post-heat/Cool Down procedures as required by AWS D1.1, unless otherwise specified herein. Deposition rates shall be controlled to be within minimum and maximum interpass temperatures.

5. Weld Quality: Welds shall present a uniform surface, free of imperfections as defined by AWS, and without undercutting or over-lapping and free of excessive oxides, gas pockets and non-metallic inclusions. Welds shall be made with the proper number of beads or passes to secure sound, thoroughly fused joints. Each deposit shall not exceed 5/16 inch of weld for each pass, nor shall each deposit exceed maximum layer height and bead width specified in AWS D1.1. Each pass shall be cleaned by chipping and wire brushing to remove scale and slag, before placing any additional weld metal.

6. Sequence of Welding: For highly restrained connection and/or weldments, the sequence of welding shall be designed to minimize distortion of the members and to minimize the buildup of internal stresses.

7. Filler Metal: Filler metal shall conform to Table 4.1 of AWS D1.1. Weld metal shall be thoroughly fused with the base metal along all surfaces and edges of the union. Penetration shall be 1/16 inch minimum and shall be into the root of the joint.

D. Faculty and Defective Welding: Any welding performed without inspection or contrary to the approved WPS, or showing cracks, slag inclusion, lack of

fusion, undercut or other defects as defined by AWS, ascertained by visual or other means for inspection, shall be chipped out and properly replaced by the contractor, and re-inspected by the Testing Agency, all at the Contractor's expense.

## 3.3 ERECTION

A. Field Connections: Workmanship of field bolted and welded connections shall conform in all respects to methods and tolerances specified for fabrication. Holes shall be cut, drilled or punched to a diameter 1/16" larger than the bolt holes, UON. Holes shall not be burned or enlarged by flame cutting.

B. All bolted connections shall conform to the AISC and shall use high strength threaded fasteners, UON. High Strength bolted connections shall be made in conformance with the "Specification for Structural Joints using ASTM A325, heavy hexagonal structural diameter, approved by Research Council of Riveted and Bolted Joints of the Engineering Foundation."

C. Tighten nuts using wither "Calibrated Wrench" method, "Twist off Element" method, "Turn-of-Nut" method, or by the use of a "Direct Tension Indicator". Minimum bolt tension as per applicable standard ISC "Specification for Structural Joints using ASTM A325 or A490 Bolts" for each bolt type and size used. Washers may be omitted for ASTM A325 bolts when "Turn-of-Nut" method is used.

D. Column anchor bolts shall be furnished under this Section and set under Section 03 30 00, Structural Cast-in-Place Concrete. Provide washers under nuts and heads.

E. Metal templates shall be furnished with bolts for setting of all column anchor bolts. The Contractor shall furnish instructions for the setting of anchor bolts and shall ascertain that the items are properly set during the progress of the work.

F. Column base plates shall be set level to correct elevation, and temporarily supported until the supported members has been plumbed and the column base plate grouted. The entire bearing area under plates shall be grouted solid under Section 03 30 00, Structural Cast-in-Place Concrete with non-shrink grout placed in strict accordance with the manufacturer's recommended procedures for 28-day minimum ultimate compressive strength of 5,000 psi.

## 3.4 FRAMING AND BRACING

A. All structural steel shall be erected true and plumb. Temporary shoring and bracing shall be used wherever necessary and shall be adequate for all loads

to which the structure may be subjected, including wind and erection equipment and operation of same. Leave temporary bracing and shoring in place as long as may be required for safety, and until final framing construction is completed.

B. No final connections shall be made until the structure has been properly aligned. All temporary flooring, planking and scaffolding necessary in connection with the erection of the structural steel, or support of erection machinery shall be provided as part of the erection work. The temporary floors and scaffolding shall conform to the requirements of all laws governing safety regulations.

C. Drifting done during assembly shall not distort the metal or enlarge the holes. Mismatching of holes greater than 3/32 inch shall require reaming for the next larger bolt. Mismatching of holes greater than 1/8 inch shall be cause for rejection.

## 3.5 SHOP PAINTING

A. General: Shop prime all structural steel work except members or portions of members to be fireproofed or embedded in concrete. Prime embedded steel that is partially exposed on the exposed portions and the initial 2" of embedded areas only. Do not prime contact surfaces that are to be welded or high-strength bolted with friction-type connections or top flanges of beams to which metal decking will be welded.

1. Apply two coats of primer to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from the first.

B. Surface Preparation: After inspection, clean all steel work to be primed and prime before shipping from the shop. Remove loose rust, mill scale and spatter, slag or flux deposits. Clean all steel, including steel to be fireproofed or embedded in concrete as follows:

1. Clean steel in accordance with Steel Structures Painting Council's "Painting Manual" for Solvent Cleaning (SSPC-SP 1)**,** either Hand Tool Cleaning (SSPC-SP2) or Power Tool Cleaning SSPC-SP3) and Commercial Blast Cleaning (SSPC-SP6/NACE 3).

C. Also refer to Part 2.4 – Coating Products and Materials

## 3.6 FIELD TOUCH-UP PAINTING

A. After installation, all field welds and areas in which shop painting has been disturbed shall receive surface preparation as specified for shop painting.

## PART 4 – DEFECTIVE WORK

### 4.1 GENERAL

A. Work found to be defective, missing or damaged shall immediately be replaced with proper work. Such replaced work and the inspection for it shall be at the expense of the Contractor.

B. Straightening of any material, if necessary, shall be done by a process and in a manner that will not injure the materials, and which is approved by the Engineer. Sharp kinks or bends shall be cause for rejection. Heating will not be allowed.

C. De-lamination and other rolling defects in structural shapes and plates shall be cause for rejection when, in the judgment of the Engineer, repairs are not feasible or acceptable.

D. If defects or damaged work cannot be corrected in the field, the material shall be returned to the shop, new parts furnished, as the Engineer requests; the Contractor shall replace all work at their own expense.

E. Beams supporting metal deck that are not in alignment or at the right elevation shall be changed to suit proper support conditions of the metal deck.

F. Welds completed, or in process, that do not conform to the approved Welding Procedure Specification may be considered defective and shall be repaired at the Contractor’s expense.

END OF SECTION 05 12 00

**SECTION 05 50 00**
**METAL FABRICATIONS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 DESCRIPTION

A. This Section describes the requirements for furnishing and installing metal fabrications made from steel shapes, plates, sheets, bars, strips, tubes, pipes and castings not a part of structural steel or specified in other Sections, including but not limited to the following items:

1. Education Center: Storefront window jamb and head trim
2. Future Phase, N.I.C.: Shade Structure Metal Rods and hardware
3. Future Phase, N.I.C.: Courtyard and Storage Gate and Screen Metalwork
4. Miscellaneous angles, plates, bars, tubes, rods and other metal architectural and site landscape items not specified in other Sections but shown or required to complete the work.

B. Related Sections:

1. Drilled Dowels and Epoxy Anchors: Section 03 15 00.
2. Expansion Anchors, Screws and Powder-Actuated Fasteners: Section 05 05 19.
3. Cast-In-Place Concrete: Section 03 30 00.
4. Cast-In-Place Concrete Finishing: Section 03 35 00.
5. Structural Steel: Section 05 12 00.
6. Painting: Section 09 91 00.
7. Exterior Sun Control Devices: Section 10 71 10
8. Interior Daylighting Devices: Section 12 26 00

1.3 SUBMITTALS

A. Product Data: Include information on steel grade, galvanizing and paint products including color samples, and sealants.

B. Shop Drawings: Include plans, elevations and details of metal fabrications. Show anchorage and accessory items. Indicate materials, sizes, styles, fabrication, anchorage details, installation details and lengths for stainless steel rod assemblies. Furnish templates for anchors and bolts installed under other Sections.

C. Samples: Provide samples of each type of metal fabrication and finish. Provide four (4) paint color samples of finish and color for approval by State's Representative prior to beginning paint coating process. Rod samples – minimum 4-inch long piece of each diameter specified herein. Fitting samples – minimum 1 each fitting specified herein

D. Field samples: Install one complete rod assembly system at location selected by State's Representative. Obtain State's Representative's approval prior to installing additional rod systems. Approved sample may remain as part of completed work.

1.4 QUALITY ASSURANCE

A. Fabricator/ Manufacturer Qualifications: Firm experienced (5 years minimum) in successfully producing metal fabrications similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the work. Manufacturer to provide installation instructions when applicable.

B. Welding Qualifications: Qualify welding processes and welding operators in accordance with AWS D1.1, D1.2, and D1.3 as applicable. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved.

1.5 ENVIRONMENTAL QUALITY ASSURANCE

A. Recycled Content of Ferrous Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of pre-consumer recycled content is not less than 25-percent.

1.6 PROJECT CONDITIONS

A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit, by accurate field

measurements before fabrication. Show recorded measurements on shop drawings. Coordinate fabrication schedule to avoid delay of work.

1.7 SEQUENCING AND SCHEDULING

A. Mount metal fabrications only on steel or concrete assemblies reinforced to receive anchors, and where the location of concealed anchor plates has been marked for the installer.

B. Painting: Items specified in this Section as having a shop applied prime coat will be painted as specified in Metal Fabrications Section 05 50 00, Paragraph 2.5, below.

PART 2 - PRODUCTS

2.1 FERROUS METALS

A. General: Unless otherwise noted in the drawings or specifications, all ferrous metals shall be as identified by type below.

B. Metal Surfaces: For fabrication of metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.

C. Steel Plates, Shapes and Bars: ASTM A572 Grade 50, unless otherwise designated. Provide hot-dip galvanized in accordance with ASTM A123. Thickness of galvanized coating shall be in conformance with ASTM A123.

D. Steel Tubing: Cold formed, ASTM A500, welded or seamless process. Provide hot-dip galvanized tubing in accordance with ASTM A123. Thickness of galvanized coating shall be in conformance with ASTM A123.

E. Galvanized Structural Steel Sheet: ASTM A653, galvanized in accordance with ASTM A525, G90 coating designation.

F. Steel Pipe: ASTM A53, Type S, Grade A, suitable for close coiling, Duplex Finish (Galvanized then Shop Painted); Extra Strong (XS) weight (Schedule 80S), unless otherwise indicated or required to satisfy performance criteria.

G. Stainless Steel Plate: 304 and 304L ASTM A240, 14 Ga. mill plate, standard finish #4

H. Gray Iron Castings: ASTM A48, Class 30.

I. Malleable Iron Castings: ASTM A47, grade selected by fabricator.

J. Architectural Rods and Assemblies: Type 316 Stainless Steel.

2.2 ARCHITECTURAL STEEL RODS AND ASSEMBLIES

A. Manufacturers:

1. Feeney, Inc., Contact: sales@feeneyinc.com, http://www.feeneyinc.com; 2603 Union St, Oakland, CA 94607; (510) 893-9473; toll free: (800) 888-2418.

2. Or Equal.

B. Rod: ½" diameter: Stainless steel rod, standard capacity, satin finish, with right and left-hand UNF threads as needed for fittings or attachment.

C. Fittings: Type(s) specified below for Feeney.

Part number F34-1315 & 1316 L/R Tension Forks, standard capacity, type 316 stainless-steel, satin finish, with right and left-hand UNF threads, including conical nut and double headed clevis pin.

Part number RC- 1342 Rod Connectors, standard capacity, type 316 stainless-steel, satin finish, with right and left-hand UNF threads. Required for rod assemblies over 12-feet (4-meters) long.

Stainless steel end fittings and hardware as identified by manufacturer's model number or as specified on Drawings, as recommended by manufacturer for installation conditions.

D. Fasteners for Connecting Components to Other Construction (e.g. structural members eyelets, or eyebolts): Type and size as shown on Drawings.

E. Accessories

Isolation Washers & Sleeves. Install washers or sleeves per manufacturer's installation instructions, to alleviate direct contact of dissimilar metals and control vibration.

F. Fabrication.

1. Fabricate systems in accordance with approved shop drawings

2. Shop assembly: Preassemble items in shop to the greatest extent practicable to minimize assembly at project site. Disassemble units only to extent necessary for shipping and handling limitations. Mark units for reassembly.

G. Delivery, Storage, and Handling

1. Deliver materials in manufacturer's original protective coverings and packaging with corresponding labels and identifying information.

2. Protect materials against damage during transit, delivery, storage, and installation at site. Protect against bending, warping, twisting or surface damage. Store in accordance with manufacturers written instructions and in a dry location.

3. Inspect materials upon delivery for damage. Repair damage to be indistinguishable from undamaged areas; if damage cannot be repaired to be indistinguishable from undamaged parts and finishes, replace damaged items.

4. Deliver materials to project site ready for erection.

H. Examination

1. Examine work to which rod assemblies will be attached.

2. Coordinate with responsible entity to correct unsatisfactory conditions.

3. Commencement of work by installer is acceptance of substrate conditions.

I. Installation. Follow the Manufacturer’s installation instructions.

J. Cleaning

1. Clean all rod assembly components thoroughly using warm soapy water (or, stainless steel cleaner and protectant as recommended by the Manufacturer) to remove any residual lubricants, dirt and stains; rinse thoroughly with clear water and wipe dry with soft, clean cloths.

K. Protection

1. Protect system from damage until Date of Substantial Completion.

2. Repair or replace damaged products before Substantial Completion.

2.3 FASTENERS

A. All Fasteners shall be Hot-Dip Galvanized per ASTM A-153 or ASTM F-2329 or A316 Stainless Steel per ASTM F593 as called out on plans or specifications.

B. Bolts and Nuts: hot-dip galvanized finish, Regular hexagon-head bolts ASTM A325 (F3125), Type 1, with Heavy Hex Nuts ASTM A563 Grade

DH, and flat washers.

C. Machine Screws: stainless steel, ANSI B18.6.3.

D. Lag Bolts: hot-dip galvanized finish, ANSI B18.2.1.

E. Wood Screws: Flat head, stainless steel, ANSI B18.6.1.

F. Plain Washers: Round, hot-dip galvanized finish, ANSI B18.22.1.

G. Lock Washers: Helical, spring type, hot-dip galvanized finish, ANSI B18.21.1.

H. Expansion Anchors: Refer to specifications Section 03 25 50, Expansion Anchors.

2.4 GROUT

A. Non-Shrink Non-Metallic Grout: Euclid Chemical Co. "Euco N-S Grout", L&M Construction Chemicals, Inc. "Crystex", Master Builders Technologies, Inc. "Masterflow 928 and 713" or approved equal.

2.5 PAINT

A. Duplex System Finish Steel: All steel elements indicated to be Galvanized and Painted, including all embedded sleeves and plates to be Duplex System Finish steel. Provide primer and finish paint as supplied by a single manufacturer for the entire project as specified below:

1. Metal Primer for Hot Dip Galvanized Steel: **Series N69 Hi-Build Epoxoline II (Shop Applied) at 4.0 to 6.0 mils DFT.** VOC content shall comply with local governing air district.

    a. Exposed to view items to be field painted for repairs shall be primed with a primer compatible with final finish coats specified in Section 05 50 00

2. Galvanizing Repair Paint: High zinc dust content paint for re-galvanizing welds in galvanized steel; **Tnemec 90-93**," or approved equal. VOC content shall comply with local governing air district.

3. Stripe-Coat Procedure: As required. **Series 1095 | Endura-Shield**; brush-applied to all welds, voids, nuts, bolts and sharp edges and areas inaccessible to roller application referencing Paint Application Guide No. 11 Protecting Corners, Edges, Crevices, and Irregular Steel Geometries by Stripe Coating.

4. Intermediate: Tnemec Series **1095 | Endura-Shield**; 3.0 to 5.0 mils DFT per coat

5. Finish Coats: **Tnemec Series 1071V | Fluoronar Semi-gloss** (Color to be selected by State's Representative); 2.5 to 3.5 mils DFT per Tnemec recommendations.

    1. Education Center Storefront window jamb and head trim: Custom color selected from samples to match window framing and sunshades. Color to be Approved by State's Representative.

        a. Contractor shall provide a range of four (4) color site samples for approval by the State's Representative prior to beginning coating process. Colors will be selected from a complete range of color including custom color matches as selected by the State's Representative.

B. Ferrous Steel - Bare

1. Shop or Field Primer: **Series 90-97 Tneme-Zinc or 93-H2O Hydro-Zinc at 2.5 to 3.5 mils DFT** VOC content shall comply with local governing air district.

    a. Exposed to view items to be field painted for repairs shall be primed with a primer compatible with final finish coats specified in Section 05 50 00

2. Stripe-Coat Procedure: **Series 1095 Endura-Shield;** brush-applied to all welds, voids, nuts, bolts and sharp edges and areas inaccessible to roller application referencing Paint Application Guide No. 11 Protecting Corners, Edges, Crevices, and Irregular Steel Geometries by Stripe Coating.

4. Intermediate: Tnemec **Series 1095 Endura-Shield at 3.0 to 5.0 mils DFT.**

5. Finish Coat: Tnemec **Series 1071V | Fluoronar Semi-gloss** (Color TBC by State's Representative); 2.5 to 3.5 mils DFT, per manufacturer's recommendations.

## 2.6 FABRICATION, GENERAL

A. Workmanship

1. Use materials of size and thickness indicated or required to produce

strength and durability in finished product for use intended.

2. Work to dimensions indicated,
3. Form exposed work true to line and level with accurate angles and surfaces and straight, sharp edges.
4. Ease exposed edges to a radius of approximately 1/32-inch, unless otherwise indicated.
5. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces. Welds shall be imperceptible in the finished work.
6. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use Phillips flat - headcounter sunk screws or bolts for exposed fasteners, unless tamperproof security screws are indicated.
7. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware and similar items.
8. Fabricate joints exposed to the weather to exclude water or provide weep holes.

## 2.7 MISCELLANEOUS METAL FABRICATIONS

A. Miscellaneous Framing and Supports:

1. Provide miscellaneous framing and supports not a part of structural steel framework, as required to complete work.
2. Fabricate to sizes, shapes and profiles shown or required.
3. Fabricate from structural steel shapes and plates and steel bars of welded construction using mitered joints for field connection.
4. Cut, drill and tap units to receive hardware and similar items.
5. Furnish integrally welded anchors for casting into concrete or building into masonry.

## 2.8 DUPLEX SYSTEM FINISH

A. General: All Duplex System Finish elements as indicated in the drawings and specifications shall be a Duplex System Finish of Shop Painted or Powder Coated per AAMA 2605 over Zinc (Hot-Dip Galvanized) Coated in accordance with ASTM D7803 or ASTM D7803 for all ferrous components,

including tubing, fittings, supports, brackets, sleeves, embedded plates, fasteners, and all other ferrous components.

B. Surface Preparation:

1. Remove oil, grease and similar contaminants in accordance with SSPC SP-1 "Solvent Cleaning", prior to any additional surface preparation specified.
2. Clean and prepare metal surfaces. Remove weld splatters, rust and loose mill scale in accordance with SSPC SP-3 "Power Tool Cleaning".
3. Remove remaining mill scale and rust by methods specified in SSPC-SP 8, "Pickling". Power tool cleaning and pickling may be omitted from work fabricated from castings, provided surfaces are not heavily rusted.
4. Commercial Blast Clean the surface in accordance with SSPC SP-6 “Commercial Blast Cleaning” once surfaces have been degreased and mill scale removed.
5. Weld seams, metal slivers and sharp edges revealed by the blasting process shall be ground down.

C. Galvanizing: Provide zinc coating for items indicated or specified to be hot-dip galvanized, as follows:

1. Comply with ASTM A123 for galvanizing both fabricated and unfabricated iron and all steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, pipes and strip 1/8 in. thick and heavier and for assembled steel products.
2. Comply with ASTM A153, Classes A and B, for galvanizing iron and steel hardware.

D. Shop Applied Coatings (over Galvanized Coatings):

1. General: Duplex System painting or powder coating shall provide corrosion protection, UV color as well as sheen stability. Apply per manufacturer’s recommendations: Tnemec Inc. Representative Contact: Carl J. Bowers of Amos and Associates, (415) 264-7528, cbowers@tnemec.com.

2. Shop paint miscellaneous metal work, except members or portions of members to be embedded in concrete or masonry, surfaces and edges to be field welded and stainless steel, unless otherwise specified.

3. Surface Preparation (of Galvanized Surface): Prepare galvanized metal surface in accordance with SSPC-SP16 Brush-off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and non-Ferrous Metals and ASTM D6386 or D7803 as applicable to remove all loose zinc oxide or zinc hydroxide particles and to prevent all adhesion

problems from occurring.

a. Remove oil, grease and similar contaminants in accordance with SSPC SP-1 "Solvent Cleaning", prior to any additional surface preparation specified.

b. All hot-dip galvanized metal fabrications shall be Brush-Off Blasted before painting in accordance with SSPC-SP16 to create no less than a 1.0 mil dense and uniform surface profile / anchor pattern. Surfaces shall be clean, dry and roughened.

4. Application: Do not coat/paint when ambient temperature is below 40 degree Fahrenheit. Paint in dry weather or under cover; paint over dry rust-free surfaces. Stir paint and keep at uniform consistency during application. Apply paint by spray per manufacturer's directions to a dry film thickness of not less than 1.5 mils (approximately 370-375 SF of surface per gallon); do not thin paint in excess of manufacturer's recommendations. Allow paint to dry before handling or shipment.

5. Immediately after surface preparation, spray on a maximum of two (2) shop applied coats of primer to all fabricated metal items in accordance with manufacturer's instructions, at a rate of 2.0 mils D.F.T. thickness for each coat. Use painting methods which will result in full coverage and dry film thickness specified.

6. Spray on two (2) final shop applied coats at a rate of 2.0 – 3.0 mils D.F.T. thickness for each coat of finish paint to entire surfaces as noted or specified. Change color of second coat to distinguish it from the first coat. Use painting methods which will result in full coverage and dry film thickness specified.

7. Separate dissimilar metals with one coat of dielectric separator. Do not extend coating onto exposed or finished surfaces.

## 2.9 HOT DIP GALVANIZED FINISH

A. General: All steel for Hot Dip Galvanized Steel Finish shall be a Hot-Dip Galvanized Coated in accordance with ASTM D7803 for all elements indicated in Drawings, including tubing, fittings, supports, brackets, sleeves, embedded plates, fasteners, and all other ferrous components.

B. Surface Preparation:

1. Remove oil, grease and similar contaminants in accordance with SSPC SP-1 "Solvent Cleaning", prior to any additional surface preparation specified.

2. Clean and prepare metal surfaces. Remove weld splatters, rust and loose mill scale in accordance with SSPC SP-3 "Power Tool Cleaning".

3. Remove remaining mill scale and rust by methods specified in SSPC-SP 8, "Pickling". Power tool cleaning and pickling may be omitted from work fabricated from castings, provided surfaces are not heavily rusted.

4. Commercial Blast Clean the surface in accordance with SSPC SP-6 “Commercial Blast Cleaning” once surfaces have been degreased and mill scale removed.

5. Weld seams, metal slivers and sharp edges revealed by the blasting process shall be ground down.

C. Galvanizing: Provide zinc coating for items indicated or specified to be hot-dip galvanized, as follows:

1. Comply with ASTM A123 for galvanizing both fabricated and unfabricated iron and all steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, pipes and strip 1/8 in. thick and heavier and for assembled steel products.

2. Comply with ASTM A153, Classes A and B, for galvanizing iron and steel hardware.

## PART 3 – EXECUTION

### 3.1 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors.

### 3.2 INSTALLATION

A. General:

1. Fastening to In-Place Construction: Provide threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required.

2. Cutting, Fitting and Placement:

a. Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications.

b. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels.
c. Provide temporary bracing or anchors in formwork for items to be built into concrete, masonry or similar construction.

3. Fit exposed connections together forming tight hairline joints.

a. Weld connections not shop welded.

b. Grind exposed joints smooth and imperceptible, and touch-up shop paint coat.

c. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and intended for bolted or screwed field connections.
d. When cutting, grinding, or machining Stainless Steel, use clean blades and grinders that have not been used on Carbon Steel to avoid future corrosion effects from microscopic Carbon Steel deposited on the Stainless Steel.

4. Field Welding: Comply with Section 05 50 00 Metal Fabrications.

5. Install prefabricated items in accordance with manufacturer's instructions.

B. Setting Loose Plates:

1. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve surface bond. Clean bottom surface of bearing plates.
2. Set loose leveling and bearing plates on wedges, or other adjustable devices.
3. Tighten anchor bolts after the bearing members have been positioned and plumbed.
4. Cut-off protruding ends of wedges flush with the edge of the bearing plate before packing with grout.
5. Use metallic non-shrink grout in concealed locations where not exposed to moisture; use non-metallic non-shrink grout in exposed locations.
6. Pack grout solidly between bearing surfaces and plates to ensure no voids remain.

3.3 TOLERANCES

A. HDG Steel Screen and Gates:

1. Maximum Variation from True Position: 1/8 inch (3 mm).
2. Maximum Offset from True Alignment: 1/8 inch (3 mm).

3.4 ADJUST AND CLEAN

A. Touch-Up Painting of Duplex Galvanized and Paint Coated Surfaces: Immediately after erection, thoroughly clean surfaces, clean field welds, bolted connections, marred and abraded areas. Paint and touch-up paint with the specified paint system. Apply spot prime by brush or spray with specified primer to provide minimum dry film thickness specified. Apply specified final paint by brush or spray to provide minimum dry film thickness specified.

B. Touch up galvanized surfaces in accordance with ASTM A780.

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 Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 SUMMARY

A. Work Included: Rough carpentry, light hardware, and miscellaneous items of work not included in another Section. This Section also includes:

1. Roof framing.

2. Structural wood supports, grounds, backing, and blocking required for millwork and casework items and which are an integral part of wall, floor and/or ceiling construction.

3. Wood cants, stops, and nailers for roof as may be required.

4. Wood blocking, backing, and nailers for flashings and sheet metal work.

5. Plywood backboards for electrical equipment.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

1. Concrete Formwork: Section 03 10 00

2. Cast-in-Place Concrete Section 03 30 00.

3. Structural Steel Framing: Section 05 12 00

4. Thermal Insulation Section 07 21 00.

5. Joint Sealants Section 07 92 00.

6. Access Doors and Panels Section 08 31 00.

7. Door Hardware Section 08 71 00.

1.4.1 REFERENCES, CODES AND STANDARDS

The following references, codes and standards are hereby made a part of this Section and carpentry work shall conform to the applicable requirements therein except as otherwise specified herein or shown on the Drawings. Nothing contained herein shall be construed as permitting work that is contrary to code requirements.

A. "Standard Grading and Dressing Rules #17," of the West Coast Lumber Inspection Bureau, Current Edition, with current supplements.

B. "Western Lumber Grading Rules," of the Western Wood Products Assn., current edition, with current supplements.

C. "Plywood Design Specification" PS1, American Plywood Association, Current edition.

D. American Wood Protection Assn. (AWPA) UCS Standard, "User Specification for Treated Wood U1-21".

E. American Wood Protection Assn. (AWPA) UCS Standard "Processing and Treatment Standard T1-21".

F. American Wood Preservers Bureau (AWPB) Quality Control Standards.

G. Factory Manual "Loss Prevention Data No. 1-49-Perimeter Flashing", latest edition.

H. Underwriters Laboratories Inc. (UL), ASTM E 84.

I. California Building Code, Current Edition, Chapter 23.

1.5 QUALITY ASSURANCE:

Lumber and plywood shall be grade or quality marked by WWPA, WCLIB, APA, AWPA, UL 30 Min. ASTM E 84 test or by other grading and inspection agencies acceptable to the Engineer. Grade marks shall include the designation "S-DRY" (or "MC-15" as applies) where applicable. Grade and quality marks shall not be apparent on surfaces exposed in the finish work.

1.6 PRODUCT STORAGE

Store kiln dried materials, in enclosed areas, protected from moisture and separated from contact with concrete or soil.

1.7 SUBMITTALS

A. Provide documentation certifying that wood products were obtained from forests verified by an FSC accredited certification body. Include statement indicating costs.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Temporary Construction: Clean lumber at Contractor's option, rough or smooth as usage requires, strength as required for purpose.

B. Forest Stewardship Council (FSC) Certified: All wood shall be FSC Certified and shall be obtained from forests verified by an FSC accredited certification body.

C. All Exterior Exposed lumber: Western Red Cedar No. 2 or Better Clear, S4S, no knots or Sap.

D. Framing Lumber Not Otherwise Specified or Noted: Douglas Fir or Larch graded and grade marked according to Reference Standard 1.02 A or B. Maximum bow, crook, and cup shall be as established by WWPA Para. 752.00 for "Light" or better.

| Item | Grade | Reference (WCLIB) |
|---|---|---|
| Studs | See drawings | |
| Beams 4x and Larger | No. 1 | 123 (c) and 130 (b) |
| Joists and Rafters | No. 2 | 123 (c) |
| Posts and Columns | No. 1 | 131 (b) |
| Other members | No. 2 | 123 (d) |
| Reclaimed 2x Wall Framing | Graded, Use No. 2 or better. (Not for Shear Walls (3x required)) | |

1. Boards: Construction Grade.

2. Sill Plates (on Concrete or Concrete Masonry): Construction Grade Light Framing, pressure treated as hereinafter specified.

E. Plywood: Each panel shall be identified with the appropriate grade-trademark of the American Plywood Association (APA) and shall meet the requirements of Reference Standard 1.02C.

1. Miscellaneous Not Otherwise Specified (Concealed): CD or better and free of defects, which would adversely affect finish materials.

2. Miscellaneous (Exposed): “A” face or better.

3. Exterior plywood, interior plywood exposed to continuing moisture, and pressure treated plywood shall be fabricated with exterior glue. Plywood with interior glue shall be fully protected from soaking or continuing moisture at all times and shall not be used for any structural purposes.

4. Roof and Wall Sheathing not noted as “Structural I”: APA Rated Sheathing CD, Exposure 1 with proper span rating. Wall sheathing under cement plaster shall have a 24/0 or Wall-24 span rating for framing at 16” O.C. and a minimum 24/0, 7/16” or thicker for framing 24” O.C.

5. Roof and Wall Sheathing noted as “Structural I”: Structural I-CD, all veneers Group 1 species.

F. Rough Hardware: All hardware to be hot-dipped galvanized or stainless steel.

1. Bolts and Nuts: ASTM A 307 (a) and A 563 (a), Grade A.

2. Lag Bolts: Fed. Spec. FF-B-561.

3. Nails: Fed. Spec. FF-N-101, common unless otherwise noted or specified.

4. Powder Actuated Fasteners: Hilti, Simpson Strong Tie, or approved equivalent, unless otherwise noted, galvanized.

5. Heavy Timber Column Only Connection Washers: Malleable Cast Iron Hot-Dip Galvanized Washers, Portland Bolt or approved equal.

6. Round Plate Washers: ASTM F844, Current Edition.

7. Post- Installed Bolts: Simpson Strong Tie, Hilti, or approved equivalent. See also Section 03 15 00 Drilled Dowels & Epoxy Anchors.

8. Self Tapping Screws: Stainless steel screws.

9. Self Drilling Screws: Simpson Strong Tie SDS galvanized wood screws, or approved equivalent.

G. Pressure Treatment (Decay and Termite Prevention):

1. Pressure treat for decay and termite prevention, wood materials, which are embedded in or set against concrete, masonry, plaster, or roofing, or where otherwise exposed to continuing dampness or moisture required by California Building Code. Where materials are also required to be treated for fire retardance, fire retardant shall be in lieu of decay and termite treatment.

2. Treat in accord with Reference Standard 1.02 D and E quality marked as per Reference Standard 1.02 F.

3. Treat with either of the following processes at Contractor option except do not use waterborne salts where wood is in contact with built-up roofing and other bituminous products. Creosote type preservatives are not permitted.

   a. Alkaline Copper Quatenary (ACQ) 0.6 retention or ACZA.

   b. Members treated with waterborne salts shall be dried to a moisture content not exceeding 19% after treatment.

4. Where possible, pre-cut material before treatment.

5. Holes and cut-offs and handling and storage shall be in accord with AWPA M-4.

6. Ensure that ferrous metal fastenings and items in contact with wood treated with waterborne salts are hot dip galvanized (1.25 oz. coating).

2.2 MOISTURE CONTENT:

At time of closing in: 15% maximum for 2x thickness or less; 19% maximum for thickness greater than 2x, and 22% maximum thickness greater than 4x.

2.3 SIZES:

Surfaced to “Dry” sizes. Sizes noted are nominal unless shown as net.

2.4 SURFACING:

S4S unless noted or specified elsewhere.

PART 3 - EXECUTION

3.1 ERECTION AND INSTALLATION:

A. Bridging and Blocking: Conform to CBC Sections 2308.8.5, 2308.9.3, 2308.9.3.1, 2308.9.3.2, 2308.9.4.1, 2308.9.4.2 and 2308.10.6. Provide 2x blocking at intersections of finished surfaces for adequate bearing and at points where required for internal support of fixtures, cabinets, hardware, and other equipment suspended from ceiling or mounted on walls. Provide fireblocking and draftstopping as per CBC Section 717. Provide vent holes inblocking at concealed areas per the Drawings as required.

B. Connections and Fastenings: Conform to Section 2304.9, California Building Code, unless otherwise specified or shown on the Drawings, conform to minimum nailing requirements of Table 2304.9.1. For bolted connections, provide washers under heads and nuts bearing on wood, and draw nuts tight. Retighten before closing in framing.

C. Coordinate with Roofing Section and provide treated cants, stops, roof drains and flashings in accord with roofing manufacturer's requirements. Fit cant strips flush at ends and to wall surfaces corner mitered.

D. Wood cants, blocking, backing, and nailers for perimeter sheet metal flashings shall be anchored in accord with recommendations contained in Reference Standard 1.02 G.

E. Sill Plates: Sill plates on concrete shall be 3x6 pressure treated (decay and termite) Douglas fir or Larch. Unless otherwise noted, plates shall be attached with a minimum of 5/8" diameter steelanchor bolts at a maximum spacing of 4'-0" O.C. with a minimum of two bolts per piece of sillplate and a bolt located not more than 12" or less than 4" of each end of each piece.

F. Framing: Conform to CBC Sec. 2308 where same covers points not indicated in the Drawings. Properly lay out framing with pieces closely fitted, accurately plumbed, leveled and aligned, and rigidly secured in place. Select corner studs and trimmers free of crook or wind; plates free from perceptible variations from straight line. Locate studding for proper installation of finish, trim, cabinets, fixtures, piping, and other work. Set joists and beams with crown up. Vent roof framing as required to provide circulation of outside air in encased spaces above ceiling or soffit. Set headers on edge, doubled and supported at each end by cripples unless otherwise shown. Frame walls with piping and conduits to provide clearancesfor same. Fur walls or reinforcing plates and sills with metal as required for rigidity and bearing of finishes.

G. Plywood (General): Unless more stringent requirements are indicated on the Drawings or required by Code, application and nailing of plywood shall be in accord with recommendations of the American Plywood Association. Use full 4' x 8" sheets wherever possible to minimize joints, with minimum sheet size at any vent in either direction to be 24".

1. Roof Sheathing: Unless otherwise indicated, install with long dimension of panelacross supports with panel continuous over two or more spans. Stagger end joints and locate over framing. Allow 1/8" spacing at panel ends and ¼" at panel edges unless otherwise recommended by panel manufacturer.

2. Wall Sheathing: Allow 1/8" spacing at panel ends and ¼" at panel edges unless otherwise recommended by panel manufacturer. Where used under cement plaster, install with long dimension or strength axis across studs with panel continuous over two or more stud spaces. Install blocking or plywood cleats at all horizontal joints.

H. Flashing (Paper): Install flashing strips of duplex building paper (9" minimum width) at periphery of cased openings in exterior walls. Weather lap, fold and turn in under sills.

I. Plywood Soffits and Paneling: Allow 1/8" spacing at panel ends and edges unless otherwise recommended by panel manufacturer. Nail with hot dip galvanized siding nails. Use 6d for ½" and less material and 8d for greater thickness. Where plywood is applied over backing, make nail length sufficient for penetration of ½" length in bearing. Space nails 6" o/c. at panel edges and 12" o/c. at intermediate bearings. Align in both directions. Locate joints only when indicated on Drawings. Transverse joints will not be permitted unless specifically shown. Install soffit vents to fit neatly, plywood edges fully concealed, and joints of vent units butted.

J. All Foundation Plates or Sills and Sleepers on concrete or masonry foundations which is in direct contact with earth shall be treated wood or foundation grade redwood, all marked by an approved agency.

K. Any wood located nearer than 6 inches to the earth shall be treated wood or wood of natural resistance to decay.

L. Columns and posts located on concrete or masonry floors or decks exposed to the weather or to the water splash or in basements supporting permanent structures shall be supported by concrete piers or metal pedestals projecting at least 6 inches above exposed earth or 1 inch above the floor unless wood of natural resistance to decay or treated

wood is used.

M. Provide minimum 18-inch clearance under floor joists and 12 inches under girders.

N. Positive connection shall be provided between post and beam or girder construction.

O. Fire stops shall be provided in the following locations per CBC Section 717.

1. Concealed spaces of stud walls and partitions, included furred spaces, at the ceiling and floor levels and at 10 foot intervals both vertical and horizontal.

2. At all interconnections between vertical and horizontal spaces such as soffits, drop and cave ceilings.

3. In concealed spaces between stair stringers at the top and bottom of the run and between studs along and in line with the run of stairs if the walls under the stairs are unfinished.

4. In openings around vents, pipes, ducts, chimneys, fireplaces and similar openings thatafford a passage for fire at the ceiling and floor levels, with noncombustible materials.

5. At openings between attic spaces and chimney chases for factory-built chimneys.

P. All materials shall be approved grade and identified by a grade mark.

Q. Minimum nailing of structural members shall be in accordance with CBC Table 2304.9.1.

R. Allowable Spans for floor joists, ceiling joists, and rafters shall be in accordance with CBCTables Chapter 23.

S. Floor Joists shall be supported laterally at the ends and at each support by solid blocking.

T. The size, height, and spacing of studs shall be in accordance with CBC Table Chapter 23.

U. Studs shall be placed with their side dimension perpendicular to the wall.

V. Bearing stud walls shall have double top plates and a single bottom

plate the full width of thestuds.

W. The building shall be adequately braced per CBC Chapter 23.

X. Rafters shall be framed directly opposite each other at the ridge.

Y. Provide a minimum one-half inch air space around sides and ends of girders enteringmasonry or concrete.

AA. Provide a minimum of one and one-half inch bearing for joists resting on wood or metal notless than three inches on masonry.

BB. Provide a minimum of 3-inch bearing for ends of beams or girders supported on masonry orconcrete.

CC. Joists under and parallel to partitions shall be doubled.

DD. Trimmer and header joists shall be doubled or of lumber of equivalent cross section when thespan exceeds four feet.

EE. The ends of header joists more than six feet long shall be supported by framing anchors or joist hangers unless bearing on a beam, partition or wall.

FF. Trimmer and header rafters framing around openings shall be doubled, or of lumber of equivalent cross section when the span of the header exceeds 4 feet. The ends of the header rafters more than 6 feet long shall be supported by framing anchors or rafter hangers unless bearing on a beam, partition or wall.

GG. Lateral support shall be provided for studs in bearing walls over 10 feet in height per Table 2308.9.1.

END OF SECTION 06 10 00

# SECTION 06 16 43
# GYPSUM SHEATHING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

### 1.2 SUMMARY

A. Section Includes: Fiberglass-mat faced, moisture resistant exterior use gypsum sheathing for roofs, exterior soffits and exterior walls.

### 1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

1. Section 06 10 00 Rough Carpentry.
2. Section 07 13 90 Roofing Underlayment.
3. Section 07 25 00 Weather Barriers
4. Section 09 29 00 Gypsum Board.

### 1.4 REFERENCES

A. ASTM International (ASTM):

1. ASTM C473 Standard Test Methods for Physical Testing of Gypsum Panel Products.

2. ASTM C518 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

3. ASTM C1002 Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

4. ASTM C1177 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.

5. ASTM C1280 Standard Specification for Application of Gypsum Sheathing.

6. ASTM E72 Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.

7. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.

8. ASTM C 1396: Standard Specification for Gypsum Board.

9. ASTM D 226: Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

10. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.

11. ASTM E 119: Test Method for Fire Tests of Building Construction and Materials

12. ASTM E 1677: Standard Specification for an Air Retarder (AR) Material or System for Low-Rise Framed Building Walls.

1.5 SUBMITTALS

A. Product Data: Manufacturer's specifications and installation instructions for each product specified.

1.6 WARRANTY

A. Provide products that offer twelve months of coverage against in-place exposure damage (delamination, deterioration and decay).

B. Manufacturer's Warranty:

1. Five years against manufacturing defects.
2. Ten years against manufacturing defects when used as a substrate in architecturally
specified porcelain rainscreen system.

1.7 QUALITY ASSURANCE

A. Fire Resistance Rated Assembly Characteristics: Provide materials and construction identical to those tested in accordance with ASTM E 119 by an independent testing and inspection agency acceptable to authorities having jurisdiction.

1. Fire Resistance Ratings: Indicated by design designations from UL Fire Resistance Directory.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Georgia-Pacific Gypsum LLC
1. Fiberglass-Mat Faced Gypsum Board: DensGlass Gold Exterior Board.
2. Fiberglass-Mat Faced Gypsum Roof Board: DensDeck Prime Roof Board.

B. CertainTeed Saint-Gobain
1. Fiberglass Faced Fire Resistant Gypsum Sheathing: GlasRoc.

C. USG
1. Securock® Brand UltraLight Glass-Mat Sheathing Firecode® X

2.2 MATERIALS

A. Fire-Rated Fiberglass-Mat Faced Gypsum Board: ASTM C1177, Type X:

1. Thickness: 5/8 inch.
2. Width: 4 feet.
3. Length: 8 feet.
4. Weight: 2.5 lb/sq. ft.
5. Surfacing: Fiberglass Mat.
6. Flexural Strength, Parallel (ASTM C473): 100 lbf, minimum.
7. Flute Span (ASTM E661): 8 inches.
8. Permeance (ASTM E96): Greater than 32 perms.
9. R-Value (ASTM C518): 0.67.
10. Water Absorption (ASTM C473): Less than 10 percent of weight.
11. Surface Water Absorption (ASTM C473): Nominal 2.5 grams.
12. Compressive Strength (Applicable Sections of ASTM C472): Nominal 900
pounds per square inch.
13. Flame Spread/ Smoke Development (ASTM E84): Not more than 0 Flame Spread, 0 Smoke Development
14. Combustibility (ASTM E136): Noncombustible
15. Fire resistance rating (UL 790 and ASTM E108): Class A
16. Mold Resistance (ASTM D3273): Scored a 10
17. Acceptable Products:

a. 5/8 inch DensGlass Gold and DensDeck Roof Boards, Georgia-Pacific Gypsum.
b. 5/8 inch GlasRoc Exterior Sheathing, CertainTeed Saint-Gobain.
c. 5/8 inch Securock® Brand UltraLight Glass-Mat Sheathing Firecode® X

2.3 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and application.

B. Nails: 11-gauge hot-dipped galvanized roofing nails 1-3/4 inch, 7/16 inch diameter head – (Minimum).

C. Wood Screws: # 6 1-5/8 inch with a corrosion-resistance of more than 800 hours per ASTM B117 (Minimum).

D. Screws for Fastening Sheathing to Cold-Formed Metal Framing: #6 1-5/8 inch with corrosion-resistance of more than 800 hours per ASTM B117 (Minimum).

1. For steel framing less than 0.0329 inch thick, attach sheathing to comply with ASTM C 1002.

2. For steel framing from 0.033 to 0.112 inch thick, attach sheathing to comply with ASTM C 954.

2.4 MISCELLANEOUS MATERIALS

A. Sealant for Glass Mat Gypsum Sheathing Board: Elastomeric, medium-modulus, neutral-curing silicone joint sealant compatible with joint substrates formed by gypsum sheathing and other materials.

B. Sealant for Glass-Mat Gypsum Sheathing Board: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing.

B. Sheathing Tape for Glass-Mat Gypsum Sheathing Board: Self –adhering, glass fiber tape, minimum 2” wide for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing board.

D. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film.

E. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Inspection: Verify that project conditions and substrates are acceptable, to the installer, prior to beginning installation of work of this section.

3.2 DELIVERY, STORAGE, AND HANDLING

A. All materials shall be delivered in their original unopened packages and stored in an enclosed shelter providing protection from damage and exposure to the elements. WARNING: Store all Sheathing flat. Panels are heavy and can fall over, causing serious injury or death. Do not move unless authorized.

3.3 INSTALLATION, GENERAL

A. General: In accordance with ASTM C1280, GA-253 and the manufacturer's written instructions.

1. Manufacturer's Recommendations:
    a. Current "Product Catalog", Georgia-Pacific Gypsum.
    b. Installation Guides, CertainTeed Saint-Gobain.
    c. Installation Guides, USG.

B. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

C. Cut panels at penetrations, edges, and other obstructions of work; fit closely against abutting construction, unless otherwise indicated.

D. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

3.4 SHEATHING INSTALLATION

A. Comply with ASTM C 1280, GA-253 and manufacturer's written instructions.

1. Fasten sheathing to wood framing with screws.
2. Fasten sheathing to cold-formed metal framing with screws.

3. Install boards with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
4. Install boards with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing boards but do not cut into facing.

C. Sheathing may be installed with the long dimension of the sheathing either parallel or perpendicular to framing. Board orientation to be dictated by performance requirements. Abut ends and/or edges of the boards centered over face of framing members. Offset board joints by not less than one stud spacing

1. Space fasteners a maximum of 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards. Adjust spacing of fasteners to meet specific fire or structural performance requirements.

2. For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

## 3.5 WEATHER-RESISTANT SHEATHING PAPER INSTALLATION

A. General: Cover sheathing with weather-resistant sheathing paper as follows:

1. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion- or control-joint locations.

2. Apply barrier to cover vertical flashing with a minimum 4-inch overlap, unless otherwise indicated.

B. Building Paper: Apply horizontally with a 2-inch overlap and a 6-inch end lap; fasten to sheathing with galvanized staples or roofing nails.

C. Building Wrap: Comply with manufacturer's written instructions.

1. Seal seams, edges, fasteners, and penetrations with tape.
2. Extend into jambs of openings and seal corners with tape.

## 3.6 FLEXIBLE FLASHING INSTALLATION

A. Apply flexible flashing where indicated to comply with manufacturers written instructions.

1. Prime substrates as recommended by flashing manufacturer.

2. Lap seams and junctures with other materials at least 4 inches, except that at flashing flanges of other construction, laps need not exceed flange width.

3. Lap flashing over weather-resistant building paper at bottom and sides of openings.

4. Lap weather-resistant building paper over flashing at heads of openings.

5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

3.7 PROTECTION

A. Protect gypsum board installations from damage and deterioration until date of Substantial Completion.

END OF SECTION 06 16 43

**SECTION 06 40 00**
**ARCHITECTURAL WOODWORK**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 SUMMARY

A. Section Includes: All architectural woodwork, complete. The work includes the following:
   1. Casework cabinets at Education Center sink wall.
   2. Casework cabinets and wood shelving at Education Center upper sink wall (Future Phase, N.I.C.)
   3. Future Phase casework cabinets and wood shelving in Education Center (N.I.C.)

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

1. Section 06 10 00 - Rough Carpentry: Grounds and support framing.
2. Section 06 20 00 - Finish Carpentry.
3. Section 09 91 00 - Painting: Finishing wood trim items.
4. Section 12 26 61 - Countertops

1.4 SUBMITTALS

A. Product Data: Submit for each type of product indicated, including cabinet hardware, fire-retardant treatment, and finishing materials and processes.
   1. Manufacturers' product data for installation adhesives, including printed statement of VOC content.
   2. Composite wood manufacturer's product data for each composite wood product used indicating that bonding agent contains no urea formaldehyde.
   3. Adhesive manufacturer's product data for each adhesive used indicating that adhesive contains no urea formaldehyde.

B. Shop Drawings: Submit shop drawings including materials, component profiles, fastening methods, assembly methods, joint details, accessory listings, and schedule of finishes. Affix a Woodwork Institute (WI) Certified Compliance label to the first page of shop drawings.

C. Samples:
   1. Factory-finished Wood Casework: Submit finish samples 12 x 12 inch size, showing the complete finish color, sheen, and appearance of factory-finished wood casework.

D. Certificates: Before delivery to the jobsite, woodwork supplier to submit the following:
   1. If a Woodwork Institute (WI) Licensee: Submit a WI Certified Compliance Certificate, indicating the millwork products furnished for this Project, and certifying that they fully meet all the requirements of the WI Grade or Grades specified.
   2. If Not a Woodwork Institute Licensee: Submit evidence that the millwork supplier has arranged for inspection by a WI inspector after completion of fabrication and installation. If all conditions are found to be compliant, the WI inspector shall issue a WI Certified Compliance Certificate, indicating the millwork products furnished for this Project, and certifying that they fully meet all the requirements of the WI Grade or Grades specified.

1.5 QUALITY ASSURANCE

A. Standards:
   1. Comply with standards of The Woodwork Institute (WI) "Architectural Woodwork Standards, Edition 2, 2024".

B. Fabricator Qualifications: Equipped for and experienced in doing work including fabricating, finishing, and installing equal to standards specified, and able to provide evidence of such experience to the State Representative’s satisfaction.

C. Certifications: Furnish the following:
   1. First Page of Shop Drawings: WI Certified Compliance Label.
   2. Each Elevation of Casework: WI Certified Compliance Label.
   3. Each Plastic Laminate Countertop: WI Certified Compliance Label.
   4. Upon Completion of Installation: WI Certified Compliance Certificate for installation.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver casework items to jobsite only after proper facilities are available for handling, storing, and protecting items; receiving areas are broom cleaned; exterior openings are closed up; wet work and mechanical and electrical rough ins are completed.

B. Store materials in ventilated interior locations under constant minimum temperatures of 60 degrees F. and a relative humidity between 43 and 70 percent.

C. Provide temporary protective covers for items during delivery, installation, and until date of completion of Project.

1.7 PROJECT CONDITIONS

A. Environmental Requirements: Provide proper heat and humidity in area of installation to maintain equilibrium moisture content in wood until installation is completed. Relative humidity shall range from 40 to 65 percent at 70 degrees Fahrenheit.

B. Sequencing: Provide information as required for proper placement of backing.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Exposed Casework and Exposed Woodwork:
1. Manufacturer: Columbia Forest Products "Woodstalk", Klamath Falls, OR, or equal.
2. Panels: Wood fiber based MDF, FSC-certified to be from a well-managed forestry source, no added urea formaldehyde, 3/4-inch thick unless otherwise noted.
3. Face Veneers: Plain sliced maple, sanded faces, FSC-certified to be from a well-managed forestry source. Provide with veneer backing of same species and thickness as face veneer.
4. Matching of Adjacent Veneers: Book matched.
5. Matching of Adjacent Panels: Running matched, with solid hardwood frames and edge banding of same species, eased edges.
6. Finish: Factory-applied transparent clear finish conforming to the requirements of WI Section 5 - Finishing, System #7 - Catalyzed Vinyl Lacquer.

B. Cabinet Bodies, Shelving, and Concealed Surfaces:
1. Manufacturer: Sierra Pines "Medite II", Roseberg, OR; or equal.
2. Material: Wood fiber based MDF, 100 percent recycled content, SCS certified, no added urea formaldehyde, unfinished, meeting ANSI A208.1, M3 Industrial grade.

3. Size: 3/4-inch thick, unless otherwise noted.

C. Wall Shelving:
   1. Face Veneers: Plain sliced maple, sanded faces, FSC-certified to be from a well-managed forestry source. Provide with veneer backing of same species and thickness as face veneer.
   2. Panels: 3/4-inch thick, ply-core or stave-core plywood, FSC-certified to be from a well managed forestry source.
   4. Matching of Adjacent Veneers: Book matched.
   5. Matching of Adjacent Panels: Running matched, with solid hardwood frames and solid stock edge banding of same species as face veneers, eased edges.
   6. Finish: Factory-applied transparent clear finish conforming to the requirements of WI Section 5 - Finishing, System #7 - Catalyzed Vinyl Lacquer.

## 2.2 ACCESSORIES

A. Cabinet Hinges:
   1. Flush Overlay Casework: ANSI/BHMA A156.9, Grade 2, minimum 120-degree opening, concealed type, self-closing, plated finish; Blum, Hafele, or equal.

B. Drawer Slides: ANSI/BHMA A156.9, Grade 1, ball-bearing construction, full-extension, sized for the appropriate drawer size, with hold-in feature, rail-mounted; Accuride, Grant, Knape Vogt, or equal.

C. Pulls: 4-inch long, wire type, US26D brushed chrome finish; Trimco, Knape-Vogt, Stanley, or equal.

   1. Operable cabinet hardware shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist.

D. Cabinet Adjustable Shelf Standards: ANSI/BHMA A156.9, Grade 1; sized for the appropriate loading; Grant, Knape-Vogt, Stanley, or equal.

E. Countertop Support Brackets: Rangine Corp. (781-455-8700) "Rakks Counter Support and Sill Support Brackets", or equal.

F. Wall-Mounted Adjustable Shelf Standards: ANSI/BHMA A156.9, Grade 2; Knape Vogt #KVE180 brackets, with #KVE80 standards, or equal, factory-painted white finish.

G. Cabinet Locks: US26D brushed chrome finish; Stanley, Best, Corbin, or equal.

H. Grommets: Plastic, 2 inch diameter, with adjustable opening, color to match countertop.

I. Door Bumpers: Felt or plastic, two per door and drawer.

J. Door Glazing: Single glazed, 3/16 or 1/4 inch thick, fully-tempered.

K. Adhesive: FS MMM-A-130. Type recommended by laminate manufacturer to suit application, containing no urea formaldehyde, and complying with South Coast Air Quality Management District (SCAQMD) Rule #1168, effective July 1, 2005 and rule amendment date of January 7, 2005.

L. Fasteners: Size and type to suit application.

M. Bolts, Nuts, Washers, Lags, Pins, and Screws: Size and type to suit application; plain finish in concealed locations.

2.3 FIRE-RETARDANT TREATMENT

A. Comply with California Building Code, Latest Edition. Treat all exposed wood and plywood to achieve ASTM E84 UL Class A flame spread rating.

2.4 FABRICATION - GENERAL

A. Fabricate cabinets in flush-overlay type construction. Fabricate to the following standards, unless otherwise noted:
   1. Wood Veneer Casework: WI Premium Grade.
   2. Wood Veneer Wall Shelving: WI Premium Grade.

B. Fabricate cabinets and shelving with the required finish on all exposed surfaces, including edges of doors and shelves, and backing for doors.

C. Provide hinges, locks, and pulls as specified herein at casework doors. Install in accordance with manufacturer's written recommendations.

D. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

E. Exposed Wood: Set nails; apply wood filler in exposed nail indentations. Sand smooth surfaces and wood filler holes. Remove cutter marks by sanding

parallel to grain. Sand edges and corners of exposed wood surfaces to just remove sharp edges and splinters.

F. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, and other fixtures and fittings. Verify locations of cutouts from on-site dimensions. Seal contact surfaces of cut edges.

G. Each elevation of casework shall bear the WI Certified Compliance Label indicating that the cabinets and tops fully meet the requirements of the WI Grade specified.

2.5 PRE-FINISHED CABINETRY

A. Shop finish transparent finished cabinetry prior to delivery to the jobsite. Construction requirements, sanding, and similar work shall be as specified herein. All finishing work shall be done by experienced mechanic using equipment standard in the industry today.

B. Transparent Finish: Cabinetry shall have a "natural" (transparent) finish stain coat to provide a uniform color for all exposed and semi-exposed surfaces. Seal all stained surfaces and finish with not less than 3 coats of finish sanded between coats. Final coat shall be semi-gloss. Finish all drawer and closed cabinet interiors with sealer coat and minimum 2 coats of lacquer. All concealed surfaces shall be fully sealed.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify adequacy of backing and support framing. Do not begin installation until unsatisfactory conditions have been resolved.

3.2 INSTALLATION

A. Installation Standards:
   1. Transparent Finish Woodwork: WI Premium Grade.
   2. Plastic Laminate and Opaque Finish Woodwork: WI Custom Grade.

B. General: Install woodwork plumb, level, true, and aligned with adjacent materials. Use concealed shims where required for alignment.
   1. Scribe and cut woodwork accurately to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.

2. Secure in place with fastenings, clips, braces, brackets, anchors, shims, and blocks.
3. Coordinate woodwork with materials and systems that may be in or adjacent to woodwork. Provide cutouts for mechanical and electrical items that penetrate exposed surfaces.
4. Install components, trim, and exposed wood with nails or screws or bolts with blind fasteners at 8 inches on center. Set nail heads for putty in exposed locations. Sand work smooth.

C. Standing and Running Trim and Rails:
1. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available.
2. Stagger joints in adjacent standing and running trim and rails.
3. Cope at returns and miter at inside and outside corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints.
4. Plane back of casings to provide uniform thickness across joints.
5. At transparent finish trim, match color and grain pattern across joints.
6. Install trim after drywall joint finishing operations are completed.
7. Hardwood Trim: Drill pilot holes in hardwood prior to nailing or fastening to prevent splitting. Fasten to prevent movement or warping. Countersink nail heads on exposed carpentry work and fill holes.

D. Install hardware supplied by other Sections in accordance with manufacturer's instructions.

E. Remove damaged or otherwise disfigured portions and replace with new prior to Owner’s acceptance.

## 3.3 ADJUSTING AND CLEANING

A. Adjust doors, drawers, hardware, fixtures and other moving or operating parts to function smoothly and correctly.

B. Clean exposed interior and exterior surfaces of all casework, counters, hardware, fittings and fixtures.

C. Repair or replace all damaged or defective work as directed. Architect shall be the final judge of the disposition of any damaged or defective work.

END OF SECTION 06 40 00

**SECTION 06 40 10**
**EXTERIOR ARCHITECTURAL WOODWORK**

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 DESCRIPTION

A. This Section describes the requirements for furnishing and installing exterior architectural woodwork items including but not limited to the following:

1. Porch Exterior Columns
2. Porch Exterior Beam
3. South Courtyard Bench Slats
4. Future Phase, N.I.C.: Shade Structure Column Facing
5. Future Phase, N.I.C.: Shade Structure Roof Framing
6. Future Phase, N.I.C.: Restroom and Courtyard Screen Framing and Slats

B. Related Sections:

1. Metal fabrications are specified in Section 05 50 00.
2. Structural Steel is specified in Section 05 12 00.
3. Furring, blocking, shims, nailers, and other carpentry not exposed to view is specified in Section 06 10 00.

1.3 DEFINITIONS

A. None.

1.4 SUBMITTALS

A. Product data for each type of product and process specified in this Section and incorporated into items of architectural woodwork during fabrication, finishing, and installation.

B. Shop drawings showing location of each item, dimensioned plans and elevations, large-scale details, fasteners, plates, attachment devices, and other components including:

1. Apply "WI Certified Compliance Label" to first page of shop drawings.

C. Samples for verification purposes of the following:

1. Lumber for transparent finish in form of exterior wood stain, 50-square inches, for each species, with one half of exposed surface finished with coating specified in Section 06 40 10, Paragraph 2.9.

2. Lumber and panel products for factory-applied opaque finish, 8-1/2inches by 11-inches for panels and 50-square inches for lumber, for each finish system and color, with one half of exposed surface finished with coating specified in Section 06 40 10, Paragraph 2.9.

D. Product certificates signed by woodwork manufacturer certifying that products comply with specified requirements.

E. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Architects and Owners, and other information specified.

F. Submittals:

1. Provide chain-of-custody certificates certifying that products specified to be made from certified wood comply with forest certification requirements. Include evidence that mill is certified for chain of custody by an FSC-accredited certification body. Include statement indicating costs for each certified wood product.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm experienced in successfully producing architectural woodwork similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the work.

B. Single-Source Responsibility for Fabrication and Installation: Engage a qualified manufacturer to assume undivided responsibility for woodwork specified in this section, including fabrication and installation.

C. Installer Qualifications: Arrange for installation of architectural woodwork by a firm that can demonstrate successful experience in installing architectural woodwork items similar in type and quality to those required for this project.

D. WI Quality Standard: Comply with applicable requirements of "Manual of Millwork" published by Woodwork Institute (WI) unless otherwise indicated. Issue WI Certificates of Compliance certifying that items comply with Wire requirements for WI grade specified.

E. Exterior wood shall comply with the requirements of California Building Code (CBC) Section 701A.3.2 and the requirements of the Wildland-Urban Interface Fire Area designated by the enforcing agency.

1.6 ENVIRONMENTAL QUALITY ASSURANCE

A. Wood Products: Shall originate in forests that are certified well-managed by an agency accredited by the Forest Stewardship Council (FSC), 202.342.0413.

1. FSC-accredited certifying agencies include the following:

a. Smart Wood Program administered by the Rainforest Alliance, 802.434.5491.

b. Forest Conservation Program administered by Scientific Certification Systems, 510.832.1415.
c. For a complete list of internationally accredited agencies, visit www.fscoax.org.

2. Well-managed shall mean forests that are being managed through professionally administered forestry management and logging plans that ensure regeneration of desired species so that timber growth equals or exceeds harvesting rates in both quantity and quality over the long term. Other considerations include protecting rivers and streams from degradation, minimizing damage to the forest when harvesting, promoting biodiversity, operating in concert with the lawful interests of local populations, and maximizing both the yield and value of the forest products.

B. Documentation confirming the FSC-certified status of all wood products shall be submitted for approval prior to fabrication. Products not complying with this requirement will be rejected. Acceptable documentation includes the following:

1. A copy of the wood supplier’s Chain of Custody certificate issued by an FSC-accredited certifying agency and a copy of the supplier’s invoice detailing the quantities of certified wood products supplied for this Project, with the FSC-certified status of each product listed in the individual line-items, or

2. A copy of a letter from a FCS-accredited certifying agency corroborating that the products detailed on the wood supplier’s invoice originate from certified well-managed forests.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect woodwork during transit, delivery, storage, and handling to prevent damage, soilage, and deterioration.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Obtain and comply with woodwork manufacturer's and installer's coordinated advice for optimum temperature and humidity conditions

for woodwork during its storage.

B. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions will permit work to be performed and at least one coat of finish applied without exposure to rain or dampness.

C. Field Measurements: Where woodwork is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before manufacturing woodwork; show recorded measurements on final shop drawings. Coordinate manufacturing schedule with construction progress to avoid delay of work.

1. Where field measurements cannot be made without delaying the work, guarantee dimensions and proceed with manufacture of woodwork without field measurements. Coordinate other construction to ensure that actual dimensions correspond to guaranteed dimensions.

1.8 COORDINATION

A. Coordinate sizes and locations of framing, blocking, reinforcements, and other related items to ensure that exterior woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that comply with requirements of the WI woodworking standard for each type of woodwork and WI quality grade indicated.
B. Redwood Source: Source salvaged redwood from local supplier: Bay Area Redwood (https://www.bayarearedwood.com/). Contact: Nicholas Harvey, CEO (925) 421-0118 nick@bayarearedwood.com.

2.2 INSTALLATION MATERIALS

A. Blocking, Shims and Nailers: Softwood or hardwood lumber, kiln dried to less than 15-percent moisture content.

B. Screws: Material, type, size, and finish required, stainless steel or hot-dip galvanized.
C. Nails: Material, type, size, and finish required for each use, hot-dip galvanized or stainless steel.

D. Anchors: material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous metal or hot-dip galvanized anchors and inserts.

E. Adhesives: Low VOC emitting adhesive. FS MMM-A-125C, Type II, water and mold resistant. For laminated and finger-jointed members, use ASTM D3110, dry

use type. Adhesives shall be certified in accordance with ASTM C557 and shall comply with local VOC regulations.

2.3 FABRICATION GENERAL

A. Wood Moisture Content: Comply with requirements of referenced quality standard for moisture content of lumber in relation to relative humidity conditions existing during time of fabrication and in installation areas.

B. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

1. Edges of solid wood (lumber) members less than 1-inch in nominal thickness: 1/16-inch.

2. Edges of rails and similar members 1-inch or more in nominal thickness: 1/8-inch.

C. Complete fabrication, including assembly, finishing, and hardware application, before shipment to project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

D. Shop-cut openings, to maximum extent possible, to receive hardware, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Smooth edges of cutouts and seal edges with a water-resistant coating suitable for exterior applications.

2.4 PORCH EXTERIOR COLUMNS FOR STAIN FINISH

A. Quality Standard: Comply with WI “Architectural Woodwork Standards” Sections 3 and Section 6.

B. Grade: No. 2 and Better Clear, 19% Max. moisture content.

C. End seal all members.

E. Lumber Species: Redwood Construction Heart [ALT: Western Red Cedar].

F. Fasteners: Fasteners: Galvanized, see structural drawings.

G. Finish: Field-applied semi-transparent stain as specified in Section 06 40 10, Paragraph 2.12.

2.6 PORCH EXTERIOR BEAMS FOR STAIN FINISH

A. Quality Standard: Comply with WI “Architectural Woodwork Standards” Sections

3 and Section 6.

B. Grade: No. 2 and Better Clear, 19% Max. moisture content.

C. End seal all members.

E. Lumber Species: Douglas Fir, fire-retardant treated.

F. Fasteners: Fasteners: Galvanized, see structural drawings.

G. Finish: Field-applied semi-transparent stain as specified in Section 06 40 10, Paragraph 2.12.

2.7 SHADE STRUCTURE COLUMN FACING FOR STAIN FINISH (FUTURE PHASE, N.I.C.).

A. Quality Standard: Comply with WI “Architectural Woodwork Standards” Sections 3 and Section 6.

B. Grade: No. 2 and Better Clear, free of any knots or sapwood, S4S, 19% Max. moisture content.

C. Back prime all members.

E. Lumber Species: Redwood Construction Heart [ALT: Western Red Cedar].

F. Fasteners: Fasteners: Galvanized, see structural drawings.

G. Finish: Field-applied semi-transparent stain as specified in Section 06 40 10, Paragraph 2.12

2.8 SHADE STRUCTURE ROOF SLATS (FUTURE PHASE, N.I.C.)

A. Quality Standard: Comply with WI “Architectural Woodwork Standards” Sections 3 and Section 6.

B. Grade: No. 2 and Better, 19% Max. moisture content.

C. End seal all members.

E. Lumber Species: Redwood Construction Heart [ALT: Western Red Cedar].

F. Fasteners: Galvanized, see structural drawings.

G. Finish: Exposed portions only to get a field-applied semi-transparent stain as specified in Section 06 40 10, Paragraph 2.12.

2.9 RESTROOM AND COURTYARD SCREEN AND GATE FRAMING AND SLATS FOR STAIN FINISH (FUTURE PHASE, N.I.C.)

A. Quality Standard: Comply with WI “Architectural Woodwork Standards” Sections 3 and Section 6.

B. Grade: No. 2 and Better, 19% Max. moisture content.

C. End seal all members.

E. Lumber Species: Redwood Construction Heart [ALT: Western Red Cedar].

F. Fasteners: Galvanized, see structural drawings.

G. Finish: Exposed portions only to get a field-applied semi-transparent stain as specified in Section 06 40 10, Paragraph 2.12.

2.10 BENCH SLATS FOR IPE STAIN FINISH

A. Quality Standard: Comply with WI “Architectural Woodwork Standards” Sections 3 and Section 6.

B. Grade: No. 2 and Better, 19% Max. moisture content.

C. End seal all members w/ DeckWise Ipe hardwood End Grain Seal or Equal.

E. Lumber Species: FSC Ipe [ALT: FSC Teak].

F. Fasteners: Galvanized, see structural drawings.

G. Finish: Exposed portions only to get a field-applied semi-transparent stain as specified in Section 06 40 10, Paragraph 2.13.

2.11 SHOP PRIMING

A. Woodwork for Transparent Finish: Shop seal woodwork for transparent finish with stain, if required, and first coat of finish as specified in Section 06 40 10, Paragraph 2.9.

B. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations.

C. Back priming: Apply one coat of exterior sealer or exterior primer compatible with finish coats to concealed surfaces of woodwork, including back. Apply two coats to items installed over concrete or masonry.

2.12 STAIN FINISH

A. Exterior Wood Semi-Transparent Penetrating Oil Stain Finish

1. TWP 1500 (Color 101 Cedartone), Apply per manufacturer's recommendations.

2. Wood surface must be cleaned, and dry for a minimum of 48 hours before stain can be applied. Temperature must at least 50 degrees and dry weather must be forecasted for the next several days. Apply the stain using a brush, roller, or sprayer. If the wood seems very thirsty, apply two "wet on wet" coats. For a penetrating stain never apply more stain than the wood can absorb. Once the stain has had 10 minutes or so to penetrate into the wood, wipe away or back brush any puddles, drips, or runs.

2.13 IPE STAIN FINISH

A. Exterior Wood Semi-Transparent Penetrating Oil Stain Finish

1. Deckwise Ipe Oil or Equal, Apply per manufacturer's recommendations.

2. Wood surface must be cleaned, and dry for a minimum of 48 hours before stain can be applied. Temperature must at least 50 degrees and dry weather must be forecasted for the next several days. Apply the stain using a brush, roller, or sprayer. If the wood seems very thirsty, apply two "wet on wet" coats. For a penetrating stain never apply more stain than the wood can absorb. Once the stain has had 10 minutes or so to penetrate into the wood, wipe away or back brush any puddles, drips, or runs.

PART 3 - EXECUTION

3.1 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas before installation.

B. Deliver concrete inserts and similar anchoring devices to be built into substrates well in advance of time substrates are to be built.

C. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including back priming and removal of packing.

3.2 INSTALLATION

A. Quality Standard: Install woodwork to comply with WI "Manual of Millwork" for same grade specified in Part 2 of this section for type of woodwork involved.

B. Install woodwork plumb, level, true, and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 1/8 inch in 8'-0" for plumb

and level and with no variations in flushness of adjoining surfaces.

C. Scribe and cut woodwork to fit adjoining work.

D. Install exterior woodwork with cupping to the interior side.

E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation. Use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork.

F. Soffit Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to the greatest extent possible. Stagger joints in adjacent and related members, cope at returns and miter at corners.

G. CLT Sheathing Panels: Install in accordance with manufacturer's instructions. Touch-up all field cut edges before installing. Pre-drill nail holes if required to prevent breakage. Allow space between both ends of sheathing panels that butt against trim for thermal movement; seal joint between panel and trim with exterior grade sealant.

H. Refer to Paragraph 2.9 for final finishing of installed architectural woodwork.

3.3 ADJUSTMENT AND CLEANING

A. Repair damaged and defective woodwork where possible to eliminate defects functionally and visually; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean woodwork on exposed and semi-exposed surfaces.

3.4 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer that ensure that woodwork is without damage or deterioration at time of Substantial Completion.

3.5 WASTE MANAGEMENT

A. Separate the following categories for salvage or re-use on the site:

1. Sheet materials larger than 2-sq. ft.

2. Solid wood trim longer than 16-inches and multiple offcuts of any size larger than 12-inches.

B. Separate the following for recycling. Material shall be placed in source-separated

or comingled recycling bins.

1. Composite wood.

2. Clean dimensional lumber.

C. Separate the following categories for disposal and place in designated areas for hazardous materials:

1. Treated, stained, painted, or contaminated wood.

END OF SECTION 06 04 10

**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 Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 SUMMARY

A. Section Includes: Self-adhesive applied bituminous sheet waterproofing, with sealed membrane terminations and protection board, complete.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

1. Section 06 10 00 - Rough Carpentry.
2. Section 33 46 13 - Foundation Drainage.

1.4 SUBMITTALS

A. Product Data: Submit product data for all products to be used. Include applicator's list of completed installations, and endorsement by materials manufacturer.

B. Qualification Data:

1. Submit membrane manufacturer qualifications.

2. Submit installer qualifications.

C. Manufacturer's Instructions: Submit manufacturer's installation instructions.

D. Closeout Submittals: Submit warranties.

1.5 QUALITY ASSURANCE

A. Membrane Manufacturer Qualifications: Company specializing in manufacturing waterproofing sheet membranes with ten (10) years experience in the field.

B. Applicator Qualifications: Company specializing in application of specified waterproofing with minimum three years experience, and approved by manufacturer.

C. Sole Source: Supply all waterproofing system components and drainage and protection materials by a single-source manufacturer. Use waterproofing

products from the same manufacturer for all blind side and positive side, horizontal and vertical applications

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in labeled packages. Store and handle in strict compliance with manufacturer's instructions. Protect from damage from weather, excessive temperature and construction operations. Remove and dispose of damaged material in accordance with applicable regulations.

1.7 PROJECT CONDITIONS

A. Environmental Requirements: Perform work only when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials used. Proceed with installation only when the substrate construction and preparation work is complete and in condition to receive sheet membrane waterproofing.

B. Do not apply waterproofing during inclement weather or when air temperature is below 40 degrees F (5 degrees C), or is expected to fall below 40 degrees within 24 hours after application.

1.8 WARRANTY

A. Manufacturer: Provide five (5) year manufacturer warranty. Include coverage of materials and installation from failure of system to resist penetration of moisture.

B. Contractor: Provide two (2) year Contractor installation warranty

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Positive Side Vertical Below Grade Waterproofing: Provide as manufactured by one of the following:

1. Grace Construction Products "Bituthene 4000".
2. Polyguard Pipeline Products "Polyguard No. 650".
3. W.R. Meadows "Mel-rol".
4. Or equal.

## 2.2 MATERIALS

A. Positive Side Vertical Below Grade Waterproofing: Minimum 0.060-inch thick rubberized asphalt, polyethylene coated sheet, adhesive backed, and self-sealing.

B. Membrane to have the following properties:

| Property | Test Method | Typical Value |
|---|---|---|
| Color | | Black with white protective coating |
| Thickness | ASTM D3767 Method A | 1.07 mm (0.042 in.) nominal |
| Low Temperature Flexibility | ASTM D1970 | Unaffected at -23°C (-10°F) |
| Elongation | ASTM D412 Modified | 300% minimum |
| Crack Cycling at -23°C | ASTM C836 | Unaffected |
| Tensile Strength, Film | ASTM D412 | 27.6 Mpa (4,000 lbs/sq. in.) minimum |
| Peel Adhesion to Concrete | ASTM D903 Modified | 880 N/m (5.0 lbs/in.) minimum |
| Lap Adhesion | ASTM D1876 Modified | 440 N/m (2.5 lbs/in.) minimum |
| Resistance to Hydrostatic Head | ASTM D5385 Modified | 70 m (231 feet) maximum |
| Puncture Resistance: | ASTM E154 | |
| Vertical Membrane | | 445 N (100 lbs) minimum |
| Horizontal Membrane | | 800 N (180 lbs) minimum |

C. Surface Conditioner (Primer): Water Based Acrylic Primer.

D. Fillet: Manufacturer's standard liquid membrane.

E. Mastic: Manufacturer's standard trowel-on elastomeric mastic.

F. Vertical Protection Board: 1/8-inch thick asphalt-impregnated fiberboard.

G. Protection Board Adhesive: Manufacturer's standard adhesive for adhering protection board.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Verify items which penetrate surfaces to receive waterproofing are rigidly installed.

B. Verify surfaces are free of cracks, depressions, waves, or projections which may be detrimental to successful installation.

C. Do not apply waterproofing to damp, dirty, dusty, or surfaces unacceptable to manufacturer.

## 3.2 PREPARATION

A. Protect adjacent surfaces not designated to receive waterproofing.

B. Prepare and treat substrate according to manufacturer's written instructions. Clean surfaces of foreign matter detrimental to installation of membrane.

C. Vertical Applications: Substrates shall be smooth and sound.

D. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to waterproofing manufacturer's written instructions.

## 3.3 INSTALLATION

A. General: Install membranes in accordance with waterproofing manufacturer's written instructions.

1. Cover inside and outside corners with a strip of membrane 11 inches minimum width.

2. Provide minimum 6 inch wide strip of liquid membrane around penetrations.

B. Vertical Positive Side Applications:

1. Apply surface conditioner (primer) to substrate with a lambswool roller at the rate of 700- 800 square feet per gallon. Allow to dry until tack free. Cover with membrane same day or re-prime.

2. Using a strip of membrane 8 inches wide minimum, cover cracks over 1/16-inch wide and construction joints after they have been properly prepared and sealed.

3. Cover inside and outside corners with a strip of membrane 11 inches minimum width.

4. Provide a minimum 6 inch wide strip of liquid membrane around all penetrations.

5. Lay membrane sheets shingle fashon with 3 inch side laps and 6 inch end laps. Stagger end and side laps.

6. Press firmly into place and roll with a 150 pound linoleum roller cushioned with carpet or foam to eliminate bubbles.

C. Place cover over membrane within 30 days of membrane application.

D. Follow details and manufacturer's recommendations for top edge termination, flashing at penetrations, and stripping and lapping at cracks, joints, and corners.

E. Seal vertical and horizontal terminations with a troweled bead of mastic.

F. Carefully inspect all membrane surfaces and make corrections before covering.

G. Slit ‘fishmouths’ and patch with membrane. Patch tears and inadequately lapped seams. Seal edges of patches with mastic.

3.4 FIELD QUALITY CONTROL

A. Field inspection of membrane application shall be performed by the waterproofing manufacturer's representative. Comply with manufacturer's representative's directions

3.5 PROTECTION OF MEMBRANE

A. Apply adhesive to completed membrane surfaces at the rate of 250-300 square feet per gallon.

B. Immediately adhere approved protection board in accordance with manufacturer's instructions.

C. Ensure that any membrane still left exposed at top of walls is covered with weather-resistant flashings.

END OF SECTION 07 13 26

**SECTION 07 13 90**
**ROOFING UNDERLAYMENT**

PART 1 — GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 SUMMARY

A. This Section specifies self-adhering and mechanically attached sheet membranes used as underlayment and W.R.B. for sloped standing seam metal roofs.
   1. High temperature application, 250F resistance, extended period, AEP Span Underlayment HT.
   2. Heavy Weight Vapor Open Roofing Underlay, 248F resistance, Pro Clima Solitex Mento 5000.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

1. Section 06 10 00 - Rough Carpentry.
2. Section 06 16 43 - Gypsum Sheathing
3. Section 07 41 13 – Standing Seam Metal Roof Panels.

1.4 REFERENCE STANDARDS

Comply with the requirements of the following ASTM standards to the extent referenced in this section.

1. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension.
2. ASTM D461 - Standard Test Methods for Felt.
3. ASTM D 903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.
4. ASTM D1970 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
5. ASTM D3767 - Standard Practice for Rubber—Measurement of Dimensions.
6. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
7. ASTM G90 – EMMAqua test.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with requirements of authorities having jurisdiction and applicable codes at the location of the project.
B. Manufacturer: Minimum 10 years' experience producing roofing underlayment.
C. Installer: Minimum 2 years' experience with installation of similar underlayment.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in unopened factory labeled packages. Protect from damage.
B. Cover materials and store in dry conditions between temperatures of 40 and 90 degrees F (5 and 32 degrees C). Use within one year of date of manufacture. Do not store at elevated temperatures as that will reduce the shelf life of the product.

PART 2 — PRODUCTS

2.1 MANUFACTURER

A. Manufacturer: AEP Span, 2110 Enterprise Blvd. W. Sacramento, CA 95691, Toll Free 800.733.495, www.aepspan.com or Approved Equal.
B. Manufacturer: Pro Clima, Rheintalstrasse 35 – 43 68723 Schwetzingen Germany, Phone +49 (0) 62 02 - 27 82.0 info@proclima.com or Approved Equal.

2.2 MATERIALS

A. Self-Adhering Sheet Membrane Roof Underlayment: Provide AEP Span Underlayment HT by AEP Span, or Equal with the following characteristics:
    1. Material: High Tensile strength, SBS modified rubberized asphalt underlayment.
       Cold applied, self-adhering membrane composed of a high strength polyethylene film coated on one side with a layer of butyl rubber adhesive and interwound with a disposable release sheet. An embossed, slip resistant surface is provided on the polyethylene.
    2. Color: Gray-black.
    3. Membrane Thickness: 40 mil (0.76 mm) ASTM D3767 method A.
    4. Tensile strength, Membrane: 250 psi (1720 kN/m2) ASTM D412 (Die C modified).
    5. Elongation, Membrane: 250% ASTM D412 (Die C modified).
    6. Low Temperature Flexibility: -45F ASTM D1970.

7. Adhesion to Plywood: 35 lbs/ft width ASTM D1970.
8. Permeance (max): 0.02 Perms ASTM D1970.
9. Material Weight Installed (max): 0.22 lb/ft2 (1.1 kg/m2) ASTM D461.
10. Service Temperature: 250 degrees F per ASTM D1204
11. Primer: CCW-702, CCW-702WB, CAV-GRIP, CCW-AWP.
12. Code and Standards Compliance: AEP Span underlayment HT meets the following requirements:
    a. ICC ESR-1677 approval according to AC-48 Acceptance Criteria for Self-Adhered underlayments used as Ice Barriers
    b. Underwriters Laboratories, Inc. R13399 Class A fire classification under fiberglass shingles and Class C under organic felt shingles.
    c. Underwriters Laboratories, Inc. Classified Sheathing Material Fire Resistance Classification Design Numbers P225, P227, P230, P237, P259, P508, P510, P512, P514, P701, P711, P717, P722, P723, P732, P734, P742, P824.

B. Heavy Weight Vapor Open Roofing Underlay at Vapor Diffusion Port: Provide Pro Clima Solitex Mento 5000, or Equal with the following characteristics:

1. Material: Diffusion-open 3-ply roofing underlayment with pore-free, closed-cell monolithic TEEE functional membrane covered by two polypropylene microfiber protection fleeces.
2. Color: Dark grey.
3. Membrane Thickness: 28 ±4 mil (0.70 ± 0.10 mm) EN 1849-2
4. Tensile strength MD/CD: 365 ±25 N/5 cm / 275 ± 25 N/5 cm; 42 ± 3 lb/in / 28 ± 3 lb./in EN 13859 -1 (A)
5. Tensile strength MD/CD aged: 330 ±25 N/5 cm / 245 ± 25 N/5 cm; 38 ± 3 lb/in / 28 ± 3 lb./in EN 13859 -1 (A)
5. Elongation MD/CD: 55 ± 10 % / 65 ± 10 % EN 13859 -1 (A)
6. Elongation MD/CD aged: 30 ± 10 % / 40 ± 10 % EN 13859 -1 (A)

7. Low Temperature Flexibility: -40 °F (-40 °C) EN 1109
8. Water Vapor Permeance: 38 US Perms ASTM E96.
9. Surface weight: 0.7 ± 0.02 oz/ft$^2$ (215 ± 5 g/m$^2$) EN 1849-2
10. Temperature Resistance: -40 °F (-40 °C) to +248 °F (120°C)
11. Code and Standards Compliance: Pro Clima Solitex Mento 5000 meets the following requirements:
    a. IBC – 1404.2 (ASTM E2556 / AC38) PASS
    b. IRC R703 (ASTEM E2556 / AC38) PASS
    c. IECC 5.4.3.1.3 & C402.5.1 (ASTM E2178 < 0.004cfm/ft$^2$) PASS
    d. NBC 2020 – 9.27.3.2 (CAN/CGSB 51.32-M77) PASS

PART 3 — EXECUTION

3.1 EXAMINATION

A. Prior to start of installation, inspect existing conditions to ensure surfaces are suitable for installation of roofing underlayment. Verify flashing has been installed. Starting work indicates installers acceptance of existing conditions.

3.2 INSTALLATION

A. Installation of Roof Underlayment: Install roofing underlayment on sloped surfaces at locations indicated on the Drawings, but not less than at hips, ridges, eaves, valleys, sidewalls and chimneys, and surfaces over interior space within 36 inches (914 mm) from the inside face of the exterior wall. Strictly comply with manufacturer's installation instructions including but not limited to the following:
    1. Schedule installation such that underlayment is covered by roofing within the published exposure limit of the underlayment.
    2. Do not install underlayment on wet or frozen substrates.
    3. Install when surface temperature of substrate is a minimum of 40 degrees F (5 degrees C) and rising.
    4. Remove dust, dirt, loose materials and protrusions from deck surface.
    5. Install membrane on clean, dry, continuous structural deck. Fill voids and damaged or unsupported areas prior to installation.
    6. Prime gypsum board and other porous or dusty surfaces as required to promote initial adhesion. Priming is not required for clean, dry wood, metal or most polyisocyanurate surfaces (poly iso paper facer does require priming).
    7. Install membrane such that all laps shed water. Work from the low point to the high point of the roof at all times. Apply the membrane in valleys before the membrane is applied to the eaves. Following placement along the eaves, continue application of the membrane up the roof. Membrane may be installed either vertically or horizontally after the first horizontal course.
    8. Top laps minimum 3-1/2 inches (89 mm) and end laps minimum 6 inches (152 mm) following lap lines marked on underlayment.
    9. Patch penetrations and damage using manufacturer's recommended methods.

B. Installation of Roof Underlayment at Vapor Diffusion Port: Install roofing underlayment at locations indicated on the Drawings. Strictly comply with the manufacturer's installation instruction including, but not limited to the following:
    1. Schedule installation such that underlayment is covered by roofing within the published exposure limit of the underlayment.
    2. Do not install underlayment on wet or frozen substrates.
    3. Install when surface temperature of substrate is a minimum of 40

degrees F (5 degrees C) and rising.

4. Remove dust, dirt, loose materials and protrusions from deck surface.
5. Install membrane on clean, dry, continuous structural deck. Fill voids and damaged or unsupported areas prior to installation.
6. Install membrane such that all laps shed water. Work from the low point to the high point of the roof at all times. Apply the membrane in valleys before the membrane is applied to the eaves. Following placement along the eaves, continue application of the membrane up the roof. Membrane may be installed either vertically or horizontally after the first horizontal course.
7. Side laps minimum 3-1/2 inches (89 mm) and end laps minimum 6 inches (152 mm) following lap lines marked on underlayment.
8. Patch penetrations and damage using manufacturer’s recommended methods.
9. Use manufacturer's recommended tape and sealing accessories per manufacturer’s installation instructions.

## 3.3 CLEANING AND PROTECTION

A. Protection: Protect from damage during construction operations and installation of roofing materials. Promptly repair any damaged or deteriorated surfaces.
B. Repair minor damage to eliminate all evidence of repair. Remove and replace work which cannot be satisfactorily repaired in the opinion of the State’s Representative.
C. Provide temporary protection to ensure work being without damage or deterioration at time of final acceptance. Remove protective film and reclean as necessary immediately before final acceptance.

END OF SECTION 07 13 90

**SECTION 07 21 00**
**THERMAL INSULATION**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Mineral Wool board insulation for Walls.
2. Mineral Wool batt insulation for Ceilings.
3. Dense Packed Blown Cellulose Insulation for Ceilings

B. Related Sections:

1. Section 07 25 00 - Weather Barriers.
2. Section 07 27 00 – Interior Air and Vapor Control Layer

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
B. Rigid Board Insulation Verification Samples: For each finish product specified, two samples, representing actual product.
    1. Submit 6 by 6 inch (152 mm by 152 mm) samples of each board type required.
    2. Submit samples of each fastener type required.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

B. Manufacturer's Certificates: Manufacturer's certification that materials meet or exceed specification requirements.

C. CALGreen Submittals: Submit product data in accordance with Division 1.

D. Product literature, current Evaluation Report, and installation instructions for specified products and their application.

## 1.5 QUALITY ASSURANCE

A. Mock-Up: If requested, provide a mock-up of materials proposed for use for review of workmanship. Accepted mock-ups may remain in place.
B. Preconstruction Meeting: Convene a minimum of two weeks prior to commencing work of this section. Agenda shall include materials proposed for use, sequence of construction and coordination with installation of adjacent and covering materials.
C. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
D. Upon completion, the installer must provide a completed Attic Card with the installed thickness and R-value claims or other documentation of the installation quality and performance. The installer must also apply attic rulers where appropriate per Code and FTC requirements.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to the job site in original packages, containers, or bundles bearing the brand name and manufacturer's identification.
B. Storage: Store materials in dry locations with adequate ventilation, free from water, and in such a manner to permit easy access for inspection and handling.
C. Handling: Handle using procedures recommended by the manufacturer for materials and personnel.
D. Protection: Protect insulation from physical damage to the bag or the product itself, and from becoming wet, soiled, or covered with ice or snow. Comply with the manufacturer's recommendations for handling, storage, and protection during installation.

## 1.6 WARRANTY

A. Warranty: Provide manufacturer's standard limited warranty against manufacturing defects.

## 1.7 LIMITATIONS

A. SANCTUARY Cellulose Insulation:
    1. Avoid heating the work area with propane or kerosene space heaters. Use electric heaters and ventilation to avoid adding excessive moisture vapor to the building envelope.
    2. Do not install SANCTUARY insulation where it may be exposed to rain or ground water. Do not install SANCTUARY in contact with masonry

walls below grade. In any application where SANCTUARY may be exposed to high humidity, a detailed moisture control design must be used.

3. Do not allow SANCTUARY to contact any surface above 194 F.
4. Keep insulation away from exhaust flues of furnaces, water heaters, space heaters, chimney flues or other heat or combustion producing devices. ASTM C 1015-17 recommends that a minimum of three inches of air space should be maintained between the insulation and heat source. Do not install SANCTUARY around heat or ignition sources or operations such as welding, metal cutting, griding or other potentially flammable situations.
5. SANCTUARY Insulation is not classified as noncombustible according to ASTM E 136-09b.
6. SANTUARY may not be used in thermal insulation applications where there is not an approved coverage chart on the bag. Some applications do not require the use of a thermal insulation coverage chart. SANCTUARY can be used in these applications provided manufacturer's installation instructions and all other applicable Code, fire safety and other requirements are met.

PART 2 - PRODUCTS

A. Product: (Basis of Design) Owens Corning Thermafiber® FireSpan® 90 insulation, 2" Thickness, 48" Width, 72" Length, Foil Faced.
   1. Formaldehyde-Free (FF) Option.
   2. R-Value: 4.3 per inch.
   3. Facing: Unfaced.
   4. Facing: Foil-Faced.
   5. Density: 8.0 pcf (nominal).
   6. Surface Burning Characteristics: Tested in accordance with ASTM E84. Unfaced: Flame Spread 0 and Smoke Developed 0.
   7. Moisture Resistance: Absorption of less than 0.03 percent by volume, when tested in accordance with ASTM C1104.
   8. Corrosion Resistance: Non-corrosive/Passed, when tested in accordance with ASTM C665 for Steel & ASTM C795 for Stress Corrosion Cracking Tendency of Austenitic Stainless Steel.
   9. Fungi resistance: Zero mold growth to ASTM C1338.
   10. Recyclability: Material to be capable of being fully recyclable at end of life with the intention of sending zero waste to landfill.
      a. Fiber Type: Standard fiber; 70% pre-consumer recycled content.
      b. Post-Consumer Recycled Content: 0%.

11. Environmental Product Declaration (EPD): Material must be included on a UL Certified EPD in accordance with EN 15804 and ISO 14025.
    GREENGUARD Gold Certified

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or equal:
   1. Owens Corning.
   2. Rockwool.
   3. Johns Manville.

2.2 VERTICAL WALL MINERAL WOOL BATT INTERIOR INSULATION

A. Product: ROCKWOOL Comfortbatt for Steel Stud; unfaced.
   1. R-Value: R-38,
   2. Density: > 2 lbs/ft³ (>32 kg/m³) nominal.
   3. Surface Burning Characteristics: Tested in accordance with ASTM E84
   a. Unfaced: Flame Spread 0 and Smoke Developed 0
   4. Moisture Resistance: Absorption of less than 0.03 percent by volume, when tested in accordance with ASTM C1104.
   5. Corrosion Resistance: Non-corrosive/Passed, when tested in accordance with ASTM C665 for Steel & ASTM C795 for Stress Corrosion Cracking Tendency of Austenitic Stainless Steel.
   6. Fungi resistance: Zero mold growth to ASTM C1338
   7. Recyclability: Material to be capable of being fully recyclable at end of life with the intention of sending zero waste to landfill.
   8. Environmental Product Declaration (EPD): Material must be included on a UL Certified EPD in accordance with EN 15804 and ISO 14025.
   9. GREENGUARD Gold Certified

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or equal:

   1. Rockwool.
   2. Johns Manville.
   3. Owens Corning.

2.3 CEILING INSULATION – DENSE PACK CELLULOSE INSULATION

A. Product: Greenfiber SANCTUARY DEFENSE Cellulose Insulation
   1. Complies with 16 CFR Parts 460, 500, 1209, and 1404, ASTM C 1149-17, ASTM C 739-21, ASTM C 518-21, ASTM E 970-17, ASTM E 84-20, CAN / ULC S-102.2-10, CAN / ULC S-703-09 Type 1 and Type 2.
   2. Surface Burning Characteristics:
      a. ASTM E 84-20: Flame spread <25, Smoke Developed Index <50

b. CAN / ULC S 102.2: Maximum Flame Spread 90

3. SANCTUARY, when used in fire-resistance rated wall assemblies, are allowed to increase the fire-resistance rating by fifteen (15) minutes per IBC 2021 Table 722.6.2(5) provided the cavity is completely filled with a minimum density of 2.6 pounds per cubic foot.
4. Complies with all building code requirements for cellulose fiber thermal insulation. Provide ICC ESR2021 or CCMC Listings 12911-L and 13162-L as required.
5. Complies with EPA 40 CFR Part 247.12.
6. No asbestos, mineral fibers, or formaldehyde are used in the manufacturing process.
7. Thermal Performance:
   a. ASTM C 518-21, thermal performance varies with density and thickness. See the appropriate product coverage chart to calculate the R-value per inch. All C 518-21 testing is done at a representative thickness of 4”.
   b. CAN / ULC S-703-09, varies depending on whether the product is Type 1 open or closed, or Type 2 open or closed.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or equal:

1. Greenfiber.
2. Nu-Wool
3. Mountain Fiber Insulation.

2.3 ACCESSORIES FOR DENSE PACK CELLULOSE INSULATION

A. Webbing: See Section 07 27 01 Interior Air and Vapor Control for interior air and vapor control layer.
   a. Fabric insulation support netting: Insulweb, or equal may be installed as required.
B. Fasteners: Per manufacturer’s recommendations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which work of this section will be installed. Do not proceed with installation until unsatisfactory conditions have been corrected.
B. Verify adjacent materials are dry and ready to receive insulation.
C. Verify mechanical, plumbing, and electrical services within walls have been inspected.
D. Provide a written report to the architect, builder or general contractor listing conditions that require correction prior to installation.
E. Do not proceed with installation until conditions as identified in 3.1.D have

been corrected.

## 3.2 INSTALLATION, GENERAL

A. Read, understand, and comply with insulation manufacturer's written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to rain at any time.

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

E. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.
F. Wear proper clothing and eye protection.
G. The work shall be coordinated with other trades whose work may be affected by, or have an effect on, the installation, including humidity monitoring system as required.

## 3.3 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Batt & Board Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.

2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.

3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.

4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

5. Tape all seams in faced insulation.

C. Rigid Insulation: Install insulation as shown on Drawings and as recommended by manufacturer for specific roof condition.

1. Install specified insulation in accordance with manufacturer's latest printed instructions and as required by governing codes and State's insurance carrier.

2. Do not leave installed insulation exposed to weather. Cover and waterproof immediately after installation.

3. Seal exposed insulation joints at the end of each day. Remove seal when work resumes.

4. Remove installed insulation that has become wet or damaged and replace with new solid and dry insulation material.

5. Built-Up and Modified Bitumen Systems:
    a. Secure each panel to the roof deck with Factory Mutual approved fasteners and plates (appropriate to the deck type).
    b. Butt edges and stagger joints of adjacent panels.
    c. Multi-layer systems: Adhere subsequent layers with FM approved cold adhesive.
    d. In multi-layer installations, stagger joints in top and bottom layers. Do not align joints in insulation.
    e. Install the roof covering according to the roof manufacturer's specifications.

D. Vapor Retarders:
1. Seal all seams in exterior wall insulation with vapor retarder tape.
2. Application of vapor retarder must be approved by the architect or engineer of record.
3. For continuous vapor barrier, repair all tears in insulation foil-facing with vapor retarder tape.

E. Dense Pack Cellulose Insulation: Install insulation as shown on Drawings and as recommended by manufacturer for specific ceiling condition. See Section 07 27 00 Interior Air and Vapor Control -- for additional installation specifications.

1. Install specified insulation in accordance with manufacturer’s latest printed instructions and as required by governing codes.

2. Fill 100% of each cavity with insulation to the correct density that prevents air movement. Install insulation to 3.5 pcf minimum installed density.
3. Install airtight, rigid, blocking material at all cavity openings that aligns with the pressure boundary and will not fail under dense pack pressures.
4. For breathing protection, use a NIOSH approved N95 or higher disposable or reusable particulate respirator per 29 CFR 1910.134.

## 3.4 PROTECTION

A. Protect installed products 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.

B. Do not leave panels exposed to moisture. Wet panels shall be removed or allowed to completely dry prior to application of vapor barrier and/or roof covering.

C. Repair or replace damaged products before Substantial Completion.

## 3.5 CLEAN UP

A. Remove sprayed material from surfaces not specifically required to be insulated.
B. Broom-clean work areas affected by the work of this section.

END OF SECTION 07 21 00

**SECTION 07 25 00**
**WEATHER BARRIERS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Self-adhering sheet Water Resistive Air Barriers (referenced on plans as W.R.B) at Wall Exterior and Self Adhered Flashing (SAF) at window openings.
2. Misc. Accessory Flashing Products.

B. Related work specified in other sections:

1. Section 06 16 43 Gypsum Sheathing for substrate.

2. Section 07 62 00 Sheet Metal Flashing and Trim.

3. Section 07 92 00 Joint Sealants.

1.3 DEFINITIONS

A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.

B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.

C. Air-Barrier Assembly: The collection of air-barrier materials and accessory materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.

B. Shop Drawings: For air-barrier assemblies.

1. Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.

2. Include details of interfaces with other materials that form part of air barrier.

3. Details shall be project specific beyond those typically published by the product manufacturer showing intended substrates and integrations with adjacent systems.

4. Submit shop drawings to manufacturer for review and approval prior to submitting to State’s Representative.

5. Provide plans and elevations to indicate extent of materials and location of details.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with air barrier.

C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.

D. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity specializing in the installation of air barrier systems with a minimum 5 years documented experience that employs installers and supervisors who are trained and approved by manufacturer.

B. Manufacturer Qualifications: Company specializing in production of waterproofing and air barrier systems with minimum 10 years documented continuous experience in the manufacture of permeable water-resistive air

barrier products and employing experienced in-house technical and field observation personnel qualified to provide expert technical support.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original containers with seals unbroken, wrapped in a polythene sleeve, labeled with manufacturer's name, and product brand name.

B. Remove and replace liquid materials that cannot be applied within their stated shelf life.

C. Protect stored materials from direct sunlight.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air-barrier manufacturer.

1. Protect substrates from environmental conditions that affect air-barrier performance.

2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

1.9 WARRANTY

A. Manufacturer’s Warranty: Provide manufacturer's written material warranty agreeing to replace air barrier membrane materials installed in conformance with manufacturer’s written installation instructions that fail within 10 years from date of Substantial Completion.

B. Installer’s Warranty: Provide installer’s written 2-year warranty upon completion of work. Include removing and reinstalling collateral materials associated with replacement of waterproofing that fails within specified warranty period. Coordinate warranty period with other specification sections.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

## 2.2 PERFORMANCE REQUIREMENTS

A. General: Air barrier shall be capable of performing as a continuous weather barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

## 2.3 SELF-ADHERING SHEET AIR AND WATER BARRIER, PERMEABLE

A. Sheet: self-adhering sheet membrane consisting of a breathable carrier film with a specially designed adhesive, which permits the transfusion of water vapor and provides superior protection against the damaging effects of air and water ingress on building structures.

1. Available Products:

a. Benjamin Obdyke: Hydrogap SA, or equal

2. Physical and Performance Properties:

a. Air Permeance: Less then 0.002 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.

b. Vapor Permeance: Minimum 12 perms; ASTM E 96/E 96M, Water Method.

B. Miscellaneous Accessory Products:

1. Available Products

a. Benjamin Obdyke Misc. Accessory Products, GCP (Grace) Misc. Accessory Products, or equal.

## 2.4 ACCESSORY MATERIALS

A. General: Accessory materials shall be single source and shall be recommended by air-barrier manufacturer to produce a complete air-barrier assembly and shall be compatible with primary air-barrier membrane.

B. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.

C. Self Adhered Flashing (SAF): Benjamin Obdyke Hydroflash GP: 14 mils thick, self-adhering, acrylic adhesive, 120 days exposure rated, <0.1 perms.

D. Self Adhered Flashing (SAF): Benjamin Obdyke Hydroflash UV+: 16 mils thick, self-adhering, acrylic adhesive, 365 days exposure rated, 4 perms.

E. Factory Formed Corners: Benjamin Obdyke Hydrocorners

F. Liquid Applied Flashing: Can be used around entire rough openings. Apply per Manufacturer's recommendations.
    a. Benjamin Obdyke Hydroflash LA Liquid Flashing, or equal.

G. Substrate-Patching Membrane: Manufacturer's standard trowel-grade substrate filler.

H. Adhesive and Tape: Air-barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.

MISC. ACCESSORY PRODUCTS

I. Modified Bituminous Transition Strip: Vapor retarding, 40 mils thick, smooth surfaced, self-adhering; consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick polyethylene film with release liner backing.

J. Foil-Faced Self-Adhered Detail Membrane: 35 mils of self-adhesive rubberized asphalt integrally bonded to 5 mils of aluminum film to provide a minimum 40 mils thick membrane, Grace Perm-a-Barrier Aluminum Flashing.

K. Termination Mastic: Air-barrier manufacturer's standard cold fluid-applied elastomeric liquid; trowel grade. Grace Bituthene Liquid Membrane.

L. Joint Sealant: ASTM C 920, single-component, neutral-curing silicone; Class 100/50 (low modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O. Comply with Section 07 92 00 "Joint Sealants."

M. Self-Adhered Vapor Barrier curb flashing: Vapor retarding self-adhered butyl adhesive flashing tape, Grace Vycor Plus or equal.

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 the Work.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air-barrier application.

B. Mask off adjoining surfaces not covered by air barrier 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. 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 modified bituminous strips and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch.

E. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

F. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.3 INSTALLATION WEATHER BARRIER AT WALLS

A. General: Install modified bituminous sheets and accessory materials according to air-barrier manufacturer's written instructions and according to recommendations in ASTM D 6135.

1. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, modified bituminous air-barrier sheet produced for low- temperature application. Do not install low-temperature sheet if ambient or substrate temperature is higher than 60 deg F.

B. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.

1. Install modified bituminous strips centered over vertical inside corners. Install 3/4-inch fillets of termination mastic on horizontal inside corners.

C. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations with termination mastic and according to ASTM D 6135.

D. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier sheet on same day. Reprime areas exposed for more than 24 hours.

1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

E. Apply and firmly adhere modified bituminous sheets horizontally over area to receive air barrier. Accurately align sheets and maintain uniform 2-1/2-inch-minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure airtight installation.

1. Apply sheets in a shingled manner to shed water without interception by any exposed sheet edges.

2. Roll sheets firmly with a manufacturer approved hand roller to enhance adhesion to substrate.

F. Apply continuous modified bituminous sheets over modified bituminous strips bridging substrate cracks, construction, and contraction joints.

G. Seal top of through-wall flashings to air-barrier sheet with an additional 6-inch- wide, modified bituminous strip.

H. Seal exposed edges of sheet at seams, cuts, penetrations, and terminations not concealed by metal counter-flashings or ending in reglets with compatible sealant.

I. Install air-barrier sheet and accessory materials to form a seal with adjacent construction and to maintain a continuous air barrier.

1. Coordinate air-barrier installation with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.

2. Install modified bituminous strip on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over each substrate.

J. Connect and seal exterior wall air-barrier membrane continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

K. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply modified bituminous transition strip so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of full contact over firm bearing to perimeter frames with not less than 1 inch of full contact.

1. Modified Bituminous Transition Strip: Roll firmly with a manufacturer approved hand roller to enhance adhesion.

L. At end of each working day, seal top edge of air-barrier material to substrate with termination mastic.

M. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

N. Repair punctures, voids, and deficient lapped seams in air barrier. Slit and flatten fishmouths and blisters. Patch with air-barrier sheet extending 6 inches beyond repaired areas in all directions.

O. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.

P. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

## 3.4 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. If exposed to these conditions for more than 30 days, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed membrane according to air-barrier manufacturer's written instructions.

2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed Work, using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07 25 00

**SECTION 07 26 00**
**UNDER-SLAB VAPOR BARRIER**

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 SUMMARY

A. Products supplied under this section:
   1. Vapor barrier and installation accessories for installation under concrete slabs.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS:

1. Section 03 30 00 Cast-in-Place Concrete

1.4 REFERENCES

A. ASTM International:
   1. ASTM E1745-17 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
   2. ASTM E1643-18a Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.

B. Technical Reference - American Concrete Institute (ACI):
   1. ACI 302.2R-06 Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.
   2. ACI 302.1R-15 Guide to Concrete Floor and Slab Construction.

1.5 SUBMITTALS

A. Quality control/assurance:
   1. Summary of test results per paragraph 9.3 of ASTM E1745.
   2. Manufacturer’s samples and literature.
   3. Manufacturer’s installation instructions for placement, seaming, penetration prevention and repair, and perimeter seal per ASTM E1643.
   4. All mandatory ASTM E1745 testing must be performed on a single production roll per ASTM E1745 Section 8.1.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Vapor barrier shall have all of the following qualities:
1. Maintain permeance of less than 0.01 Perms [grains/($ft^2$ · hr · inHg)] as tested in accordance with mandatory conditioning tests per ASTM E1745 Section 7.1 (7.1.1-7.1.5).
2. Other performance criteria:
a. Strength: ASTM E1745 Class A.
b. Thickness: 15 mils minimum
3. Provide third party documentation that all testing was performed on a single production roll per ASTM E1745 Section 8.1

B. Vapor barrier products:
1. Basis of Design: Stego Wrap Vapor Barrier (15-mil) by Stego Industries LLC., (877) 464-7834 www.stegoindustries.com or equal.
2. Substitutions: See Division 1 - Substitution Procedures.

2.2 ACCESSORIES: Stego Industries, LLC or equal.

A. Seams:
1. Stego Tape by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.

B. Sealing Penetrations of Vapor barrier:
1. Stego Mastic by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.
2. Stego Tape by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.

C. Perimeter/edge seal:
1. Stego Crete Claw by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.
2. Stego Term Bar by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.
3. StegoTack Tape (double-sided sealant tape) by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.

D. Penetration Prevention:
1. Beast Foot by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.
2. Beast Form Stake by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.

E. Vapor Barrier-Safe Screed System

1. Beast Screed by Stego Industries, LLC, (877) 464-7834 www.stegoindustries.com.
2. Beast Hook by Stego Industries, LLC, (877) 464-7834 www.stegoindustries.com.

## PART 3 – EXECUTION

### 3.1 PREPARATION

A. Ensure that subsoil is approved by Geotechnical Engineer.
   1. Level and compact base material.

### 3.2 INSTALLATION

A. Install vapor barrier in accordance ASTM E1643.
   1. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the placement whenever possible.
   2. Extend vapor barrier to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise (a) at a point acceptable to the structural engineer or (b) where obstructed by impediments, such as dowels, waterstops, or any other site condition requiring early termination of the vapor barrier. At the point of termination, seal vapor barrier to the foundation wall, grade beam or slab itself.
      a. Seal vapor barrier to the entire perimeter wall or footing/grade beam with double sided StegoTack Tape, or both Stego Term Bar and StegoTack Tape, per manufacturer's instructions. Ensure the concrete is clean and dry prior to adhering tape.
   3. Overlap joints 6 inches and seal with manufacturer's seam tape.
   4. Apply seam tape/Crete Claw to a clean and dry vapor barrier.
   5. Seal all penetrations (including pipes) per manufacturer's instructions.
   6. For interior forming applications, avoid the use of non-permanent stakes driven through vapor barrier. Use Beast Form Stake and Beast Foot as a vapor barrier-safe forming system. Ensure Beast Foot's peel-and-stick adhesive base is fully adhered to the vapor barrier.
   7. If non-permanent stakes must be driven through vapor retarder, repair as recommended by vapor retarder manufacturer.
   8. Use reinforcing bar supports with base sections that eliminate or minimize the potential for puncture of the vapor barrier.

9. Repair damaged areas with vapor barrier material of similar (or better) permeance, puncture and tensile.
10. For vapor barrier-safe concrete screeding applications, install Beast Screed (vapor barrier-safe screed system) per manufacturer's instructions prior to placing concrete.

END OF SECTION 07 26 00

**SECTION 07 27 01**
**INTERIOR AIR AND VAPOR CONTROL**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 SUMMARY

A. Section includes:

1. INTERIOR AIR AND VAPOR CONTROL LAYER, including surface preparation.

B. Related Requirements:

1. Section 07 21 00 Thermal Insulation

1.3 REFERENCES

A. ISO 9972:2006 / EN 13829 -– Determination of air permeability of buildings, Fan pressurization method
B. ASTM E779 – Standard Test Method for Determining Air Leakage Rate by Fan Pressurization
C. ASTM E84 - Standard test method for surface burning characteristics of of building materials.
D. ASTM E2178 - Standard Test method for. Air Permeance of Building Materials
E. AATCC 127 – Hydrostatic pressure test
F. ISO 12572 - Hygrothermal performance of building materials and products
G. EN 1849-2 - Flexible sheets for waterproofing - Determination of thickness and mass per unit area
H. EN 12114 - Thermal performance of buildings - Air permeability of building components and building elements
I. EN 12310-1 - Flexible sheets for waterproofing. Determination of resistance to tearing (nail shank)
J. EN 12311-2 - Flexible sheets for waterproofing. Determination of tensile properties.
I. EN 13859-1 - Flexible sheets for waterproofing - Underlays for discontinuous roofing/(sheathing)
J. EN 1296 - Flexible sheets for waterproofing - Method for artificial ageing by long term exposure to elevated temperature
K. EN 1931: Determination of water vapor transmission properties

## 1.4 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Installation instruction and recommendations.
2. Storage and handling requirements and recommendations.

B. Verification Samples: For each product specified, two samples.

1. Membranes: minimum size 6"x8"
2. Tapes: minimum length 5"
3. Gaskets, adhesive, accessories: one each

## 1.5 QUALITY ASSURANCE

A. Performance target: Minimum acceptable air-tightness level is 1.0 ACH50 or 0.15CFM/sf75 for buildings over 20,000SF

B. Installer Qualifications: Comply with one of the following requirements:

1. The (sub-)contractor installing the interior airtight layer shall have as minimum experience with at least two buildings that were independently tested below 1.0ACH or 0.15CFM/sf75
2. The (sub-)contractor has completed the "Make it tight" training with 475 High Performance Building Supply

C. Due to their superior technical performance and durability, products made by made by Pro Clima in Germany shall be used for the construction of the interior airtight layer. Any substitutions must be approved by the Architect.

D. Mock-Up: Provide a mock-up for evaluation of installation techniques and application workmanship.

1. Prior to installation of airtight layer, mock up airtight layer as follows to verify details and to demonstrate connections to adjoining construction elements, and other termination conditions.
2. Install mockup of airtight layer in location as approved by the Architect.
3. Do not proceed with remaining work until workmanship and application technique are approved by the Architect.
4. Construct typical interior wall, 8 feet wide by 8 feet long, illustrating materials interface and connections (tape, adhesives, gaskets), incorporating specified options including but not limited to the following:
    a. junctions of walls, foundations, ceilings, floors and roof,
    b. corner conditions
    c. window and doorframe connections, and
    d. blow-in insulation seals/battens.

E. Cooperate and coordinate with the State's inspection and (blowerdoor) testing agency. Do not cover (with sheetrock, blocking, mechanical equipment or other elements that would restrict access to the airtight membrane) any

components of the mock up (installed airtight layer membrane or other airtight elements) until it has been inspected, blowerdoor tested and approved.

1.6 PRECONSTRUCTION MEETING

A. Preconstruction Meeting: Convene a meeting with all subcontractors affected by the Work of this Section a minimum of one week prior to commencing work of this section. Agenda shall include materials, details of construction, compatibility of materials, sequencing of construction/installation of membranes, the airtightness goal and emphasize that the success during the blowerdoor test is dependent on the collaboration of all subcontractors.
B. Coordinate Work with other subcontractors (plumbers, electricians, carpenters, HVAC), operations and installation of finish materials to install correct-sized gaskets on pipes, ducts and cable when these elements pass through the interior airtight layer, and to avoid damage to installed materials. Before they commence work on site, provide each effected trade with sufficient gaskets.
C. After meeting, post the following warning in a prominent location at all building entrances and top of each stair – 1/2” letter height minimum for header, 1/4” for all other text

| |
|---|
| **4. AIRTIGHT BUILDING** |
| 5. No drilling, airtight construction: no cutting, airtight membranes |
| 6. Report all penetrations to supervisor |

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
B. Store materials on pallets. in clean and dry areas, not exposed to direct sunlight and in accordance with manufacturer's instructions. Store adhesives and primers at temperatures at or above 40 degrees Fahrenheit (4 degrees Celsius) to facilitate handling.
C. Protect materials during handling and application to prevent damage, puncturing or contamination.

1.7 ENVIRONMENTAL CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) as per manufacturers recommendations. Do not install products under environmental conditions outside manufacturer's absolute limits.
B. Minimize exposure of airtight membranes to direct sunlight. Use blinds or covers over window openings to block direct sunlight to prevent UV damage to membranes, if membranes will not be covered by sheetrock within 2 weeks or use exterior grade products (INTELLO X or SOLITEX line)

C. Minimize exposure to water. If exposure is likely, expected or cannot be avoided, use exterior grade products (INTELLO X or SOLITEX Line).

1.9 WARRANTY

A. Manufacturer's Warranty: Provide manufacturer's written material warranty agreeing to replace air barrier membrane materials installed in conformance with manufacturer's written installation instructions that fail within 10 years from date of Substantial Completion.

B. Installer's Warranty: Provide installer's written 2-year warranty upon completion of work. Include removing and reinstalling collateral materials associated with replacement of waterproofing that fails within specified warranty period. Coordinate warranty period with other specification sections.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Pro Clima/Moll bauökologische Produkte GmbH, 68723 Schwetzingen Germany. Imported by 475 High Performance Building Supply, 334 Douglass street, Brooklyn NY,

A. Tel: 718-622-1600; Email; info@foursevenfive.com; Web: www.foursevenfive.com / www.foursevenfive.ca

B. Substitutions: or approved equal.

2.2 AIRTIGHT LAYER SYSTEMS

A. INTELLO Plus

1. Description: Intelligent vapor retarder (Hydrosafe) made from polyethylene copolymer membrane with polypropylene reinforcement grid
2. Airbarrier/smart vapor retarder is protected with PP cover fleeces on top and bottom
3. Class A rated material per ASTM E84 (Flame spread: 0, SDI:35)
4. Airtight material per ASTM E2178: 0.00005cfm/sf
5. Appearance: Translucent white
6. Weight 0.36 oz/sf ±15 g/m² (110g/m2) EN1849-2
7. Thickness: 16 mils (0.4 mm ±0.1 mm) EN1849-2
8. Perm rating: 13.20 to 0.13 (Sd value from 0.25m to >25m) ISO 12572
9. Temperature exposure limits: -40 to 176 degrees F (-40 to 80C)
10. Tensile Strength (EN13859-1)
    a. 350 N/50 mm MC
    b. 290 N/50 mm DC
11. Elongation (EN13859-1)
    a. 15% (MC)
    b. 15% (DC)
12. Nail Tear Resistance: 200N/200N (MC/DC) EN 13859-1

13. Permeability consistent after artificial age testing: Pass – DIN EN 1296/1931
14. Living Building Challenge Declare label – red list free

B. INTELLO X:
1. Description: High performance vapor variable (Hydrosafe) membrane and temporary WRB for commercial buildings. Made from Polyehylene-Copolymer protected with two robust PP fleex
2. 3 layer material – includes two robust PP protection fleeces that protect smart vapor retarder. Suitable to use as temporary roof or WRB during construction.
3. Class A rated material per ASTM E84 (Flame spread: 0, SDI:105)
4. Airtight material per ASTM E2178: 0.00005cfm/sf
5. Appearance: Translucent white
6. Weight 0.6 oz/sf ±0.5 g/m² (150g/m2) EN1849-2
7. Thickness: 18 mils (0.45 mm ±0.05 mm) EN1849-2
8. Perm rating: 13.20 to 0.13 (Sd value from 0.25m to >25m) ISO 12572
9. Temperature exposure limits: -40 to 176 degrees F (-40 to 80C)
10. Tensile Strength (EN13859-1)
    a. 250 N/50 mm MC
    b. 170 N/50 mm DC
11. Elongation (EN13859-1)
    a. 60% (MC)
    b. 60% (DC)
12. Nail Tear Resistance: 27/27 lbf 120N/120N (MC/DC) EN 13859-1
13. Permeability consistent after artificial age testing: Pass – DIN EN 1296/1931
14. Water column 8.2ft (2.5m) AATCC 127 – DIN EN 20811
15. UV and weather exposure: 2 months

C. DB+
1. Description: Intelligent paper based vapor retarder, recycled paper with PE and a bi-directional fiberglass reinforcement grid.
2. Appearance: light blue
3. Weight 0.6 oz/sf (190 ±10 g/m2) DIN EN 1849-2
4. Thickness: 9 mils (0.23 ±0.1mm) DIN EN 1849-2
5. Perm rating: 8.2 to 0.8 (Sd value from 0.4m to 4m) ISO 12572
6. Temperature exposure limit: up to 104 degrees F
7. Tensile Strength (EN13859-1)
    a. 550 N/50 mm MC
    b. 420 N/50 mm DC
8. Elongation (EN13859-1)
    a. 5% MC
    b. 5% DC
9. Tear Resistance: 70N/70N (MC/DC) EN13859-1
10. Permeability consistent after artificial age testing: Pass – DIN EN 1296/1931

D. Airtight interior tape: TESCON VANA:
    1. Solid Acrylic tape with PP carrying fleece
    2. Perm rate: 8 (sd-value 0.4m) DIN EN1931
    3. Adhesion (ASTM D3330): 4.45Lbs/lin.inch INTELLO, 3.34lbs/lin/inch OSB
    4. Artificial age test: 100 years (per DIN 4108-7)
    5. Living Building Challenge Declare label – red list free
    6. Free of VOCs

E. Airtight interior corner tape: TESCON Profil or TESCON Profect, Solid Acrylic tape with PP carrying fleece and split release paper: Living Building Challenge Declare label – red list free, free of VOCs
F. Airtight window tape: CONTEGA SOLIDO SL(-D): vapor retarding window tape with multiple release papers for specific or blind taped window airsealing.
G. Airtight adhesive: CONTEGA HF (contains VOC's/bio-ethanol) or CONTEGA Classic (VOC free), CONTEGA MULTIBOND (pre-cure adhesive on roll): non-embrittling adhesives for membrane connections to concrete, plywood floors and very rough/split wood.

2.3 ACCESSORIES

A. PRESSFIX tape pressurization tool.
B. Primer: TESCON Primer RP (for brick or concrete):
    1. Acrylic-copolymer based primer
    2. Application Temperature: Above 15 degrees Fahrenheit (-10 degrees Celsius)
    3. VOC free
C. Pipe, duct, cable sealing: ROFLEX and KAFLEX gaskets
    1. EPDM gaskets per specific pipe sizes
    2. Tape with TESCON VANA to airtight layer
D. Outlet sealing (recessed): INSTAABOX / LESSCO boxes
    1. Self sealing airtight outlet box
    2. Tape with TESCON VANA to airtight layer
E. Metal studs: Fastweb strips or cap screws

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates/surfaces have been properly prepared and cleaned from dust, silicones, oils and grease. Before installation, verify substrate is free of splinters, nails or other objects that could puncture membranes.
B. If window or door opening preparation is the responsibility of another installer, do not proceed with unsatisfactory preparation without approval from the architect.

C. If there are unexpected pipes, ducts or wires in the installation area/airtight layer or these penetrations do not have ROFLEX/KAFLEX gaskets around them, do not proceed without approval from the architect.
D. If floor, walls or ledger boards have been built that interfere with the airtight layer and a drawn/planned pre-installed airtight membrane was not installed as per sequencing plan, do not proceed without approval from the Architect.
E. If long term exposure to UV or liquid water is likely or can be expected – USE INTELLO X or SOLITEX membranes only.
F. Acceptance of Conditions: Beginning of installation constitutes acceptance of existing conditions.

3.2 PREPARATION

A. Clean and prepare surfaces to receive air/vapor barrier in accordance with manufacturer's installation guidelines.
B. All surfaces must be clean, smooth and dry and must be clean of oil, dust, and silicone.
C. Batt installation: install membrane immediately after batt insulation is installed in winter.
D. Properly ventilate space or use dehumidifier to prevent high humidity conditions after concrete pours, sheetrock compounding and tile work. Monitor humidity if needed to ensure it stays below 60% relative humidity.

3.3 APPLICATION

A. Coordinate airtight layer/vapor retarder installation with humidity monitoring system as required.
B. Apply airtight layer/vapor retarder in accordance with manufacturer's instructions.
C. Install membranes taut and without creases along the substrate.
D. Overlap subsequent courses of membrane. Use the printed lines on the membrane as a guide.
E. Mechanically fasten as per 475 installation manuals
F. Battens for service cavities for densepacking should be spaced less than 20” o.c. and be perpendicular to the direction of the structure behind. Or other means should be employed to mechanically fix the membrane sufficiently to the substructure to long term support the weight/force exerted by the insulation – please contact 475 for additional means and methods.
E. Tape all overlaps. Use a PRESSFIX tape pressurization tool to ensure there is sufficient back-pressure when applying the pressure sensitive Pro Clima tapes. Make sure that tape joints are not permanently under stress, ie are supported by a batten or by cross taping the taped joint with 12” long pieces of tape every 12”
F. Overlap the membrane a minimum of 2” over dissimilar airtight materials (concrete, plaster).
G. Use CONTEGA HF (for below 0F application) or CONTEGA classic (VOC free) or MULTIBOND to adhere membranes to concrete, brick, plaster or rough OSB. Leave some slack in the membrane to allow for expansion and

contraction between these dissimilar materials. Prime substrates with TESCON Primer RP if necessary.

H. If taping to membrane to porous or unknown substrates, they should be free of oil, silicone and dust. Do an adhesion test when in doubt. Primer recommended for application to brick, concrete, wood fiber insulation board and certain OSB brands.
I. Cut membrane with a utility knife in detail around penetrations.
J. Seal membranes to windows, joist and beams with TESCON Profil or CONTEGA line of airtight window tapes. Follow application guides of specific tapes.
K. Seal all penetrations with gaskets (ROFLEX or KAFLEX) taped with TESCON VANA airtight tape to airtight layer. Air seal around pre-existing penetrations (pipes, ducts or cables) with TESCON VANA tape in step like fashion, avoiding creases in tape.
L. Apply blown in insulation directly after installing interior airtight membranes.
M. Inspect membrane before blowerdoor test and/or dense-packing insulation. Ensure:
    1. each overlap is taped and has been pressurized
    2. staples applied at appropriate intervals
    3. counter battens at recommended distances
    4. tears and punctures repaired with Pro Clima tape
    5. adhesives (CONTEGA HF or classic) have had 48 hours to set up before test.

3.4 TESTING

A. If requested, do a blowerdoor test as soon as the airtight layer is completely installed. During the test search for any detectible leaks with hands, IR or smoke pencils.
B. Document any leaks, and repair with Pro Clima tapes, adhesives and accessories.
C. Repeat test until building complies with project airtightness (ACH50 or CFM/SF75) goal, but at a minimum better than 1.0ACH50 or 0.15CFM/SF75
D. Re-do blowerdoor test if more than 3 holes/penetrations are made following completion of blowerdoor test above, or at the request of the architect.

3.5 PROTECTION

A. Protect installed products until completion of project.
B. Repair tears, punctures or burns (e.g. from sweating copper pipe) and/or replace damaged products before covering materials. Re-do blowerdoor test if more than 3 holes are made or by request of architect.
C. To protect interior airtight layer/membranes, apply service cavity insulation and sheetrock as soon as possible, and not later than specified exposure limit of used materials. Use tarps or other means of blocking UV if exposure times will be exceeded to protect membranes.

3.6 FINAL TEST

A. Blowerdoor test the installed membrane/interior airtight layer when:
    1. All penetrations have been made and sealed.
    2. Sheetrock and other finishes on exterior walls have been installed.
B. Find and repair leaks.
C. Repeat testing and repairs until the project complies with the project airtightness goal.

END OF SECTION 07 27 01

**SECTION 07 41 13**
**STANDING SEAM METAL ROOF PANELS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 SUMMARY

A. Section Includes: Prefinished, prefabricated standing seam roof system with continuous seams in the following applications:
   1. Education Center Roof standing seam metal panels
   2. Future Phase, N.I.C.: Restroom Roof standing seam metal panels

B. Related Requirements:
   1. Section 05 10 00: Structural Metal Framing.
   2. Section 05 50 00: Metal Fabrications.
   3. Section 07 21 00: Thermal Insulation.
   4. Section 07 25 00: Weather Barriers.
   5. Section 07 62 00: Sheet Metal Flashing and Trim
   6. Section 07 92 00: Joint Sealants.

1.3 REFERENCES

A. Reference Standards:
   1. ASCE 7: Minimum Design Loads for Buildings and Other Structures.
   2. ASTM A653: Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy Coated (Galvannealed) by the Hot Dip Process.
   3. ASTM A792: Steel Sheet, 55 % Aluminum Zinc Alloy Coated by the Hot Dip Process.
   4. ASTM C1371: Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
   5. ASTM C1549: Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
   6. ASTM D523: Specular Gloss.
   7. ASTM E1592: Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
   8. ASTM E283: Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
   9. ASTM E331: Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

10. ASTM E1918: Measuring Solar Reflectance of Horizontal and Low Sloped Surfaces in the Field.
11. ASTM E1980: Calculating Solar Reflectance Index of Horizontal and Low Sloped Opaque Surfaces.
12. CRRC-1 Method #1: Measuring Solar Reflectance of a Flat, Opaque, and Heterogeneous Surface Using a Portable Solar Reflectometer.
13. SMACNA Architectural Sheet Metal Manual.
14. UL 580: Standard for Tests for Uplift Resistance of Roof Assemblies
15. US Environmental Protection Agency: Energy Star Reflective Roof Products
16. US Green Building Council (USGBC): Leadership in Energy and Environmental Design (LEED)

1.4 SUBMITTALS

A. Product Data.

B. Shop Drawings:
   1. Indicate thickness and dimensions of parts, fastenings and anchoring methods, details and locations of joints, transitions and other provisions necessary for thermal expansion and contraction.
   2. Indicate locations of field- and factory-applied sealant.

C. Samples:
   1. Submit two samples, 12 inches long by full panel width, showing proposed metal thickness and seam profile.
   2. Submit standard color samples of metal for State Representative’s selection.
   3. Submit Custom color samples 8” x 10” for State Representative’s selection.

D. Manufacturer Qualifications.

E. Installer Qualifications: Submit list of completed projects, with names and contact information for architects and contractors.

F. Test Reports: Indicating compliance of products with project requirements.

G. Warranty Documentation.

H. Insurance Documentation.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. Ten years' experience, minimum, in factory fabrication of metal panels.
   2. Manufacturer shall carry $2,000,000 liability insurance, minimum, for metal panel system.

B. Installer Qualifications:
   1. Three years' experience, minimum, in application of metal roof or wall panels.
   2. Five satisfactory projects with metal panel work of similar scope and complexity to Work of this Project.
   3. Installer must be approved by manufacturer in writing prior to bid. Approval document must be included with project bid.

C. Testing Agency Qualifications: Agency compliant with ISO/IEC Standard 17025, or an accredited independent agency recognized by the International Laboratory Accreditation Cooperation Mutual Recognition Arrangement or ANSI.

D. Mock-Ups:
   1. Roof Visual Mock-Up: Construct mock-up, 1 by 4 feet or larger as required to show at least two pattern repeats, and in same orientation as Roof Panels.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements:
   1. Keep panels and accessory items dry.
   2. Protect against damage and discoloration.
   3. Handle panels with non-marring slings.
   4. Support panels to prevent permanent deformation.
   5. Store panels above ground, with one end elevated for drainage.
   6. Protect panels against standing water and condensation between adjacent surfaces.
   7. If panels become wet, immediately separate sheets, wipe dry with clean cloth, and keep sheets separate for air-drying.
   8. Painted panels shall be shipped with protective plastic sheeting or a strippable film coating between panels. Remove strippable film coating prior to installation. Do not allow strippable film coating to remain on panels in extreme heat, cold, or direct sunlight or other UV source.
   9. Do not allow panels to contact treated lumber.

## 1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer’s standard 25-year performance warranty, stating the following:
   1. Architectural fluorocarbon finish:
      a. Will be free of fading or color change in excess of 5 Hunter delta-E units as determined by ASTM D2244-02.
      b. Will not chalk in excess of numerical rating of 8 when measured in accordance with standard procedures specified in ASTM D4214-98 method D659.

c. Will not peel, crack, chip, or delaminate.
2. Metal substrate will not rupture, fail structurally, or perforate.

B. Installer's Warranty: Warrant panels, flashings, sealants, fasteners and accessories against defective materials and/or workmanship, covering repairs required to maintain roof panels watertight and weatherproof with normal usage for two years following Project Substantial Completion date.
1. Furnish written warranty, signed by installer.

## PART 2 - PRODUCTS

### 2.1 SYSTEM DESCRIPTION

A. Products: Provide the following:
1. Roof Panels: AEP Span, a Division of ASC Profiles, Inc.; Select Seam Narrow Batten, 16” Panels.

B. Substitution Limitations: Substitutions will be considered in accordance with Division 1.

C. Performance Criteria
1. Wind Uplift: As required by ASCE 7 to 20 PSF.
a. Panel system shall be ASTM E1592 tested under the supervision of an ANSI or ISO/IEC accredited laboratory and the laboratory shall issue the test report.
b. Select Seam Narrow Batten UL Construction #397, minimum 22-gauge panels, when installed over 5/8” gypsum sheathing, with roof panel fastener clips spaced 24” on center maximum.
c. Deflection Limits: Withstand wind loads with deflections no greater than 1/180 of the span.
1. Air Infiltration: <0.02 cfm per linear foot of joint when tested in accordance with ASTM E 283 at static test pressure differential of 20.0 psf.
2. Water Penetration Under Static Pressure: No leakage through panel joints when tested in accordance with ASTM E 331 at static test pressure differential of 25.0 psf.
3. Thermal Movements: Accommodate thermal movement without buckling, joint opening, overstressing components, failure of connections, or other detrimental effects, through the following temperature changes:
a. 120 degrees F, ambient.
b. 180 degrees F, material surface.

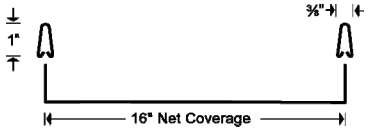
D. Sustainability Characteristics:
1. Recycled Content: 28.9 percent post-consumer recycled content.
2. Energy Performance:
a. Solar reflective index (SRI): Not less than 22 per ASTM E1980.
3. Shipping Distance: Provide panels manufactured at the following factory:

a. Fontana, California 92335

E. Manufacturing Characteristics: Provide panels complying with provisions of Buy American Act 41 U.S. C 10a - 10d.

## 2.2 PANELS

A. Panels: AEP Span, a Division of ASC Profiles, Inc.; Preformed Metal Standing Seam Roofing –Select Seam Narrow Batten.
   1. Material: Steel conforming to ASTM A792.
      a. 22 Gauge: Yield strength 50,000 psi; with aluminum-zinc alloy coating conforming to ASTM A792, Class AZ50.
   2. Panel Width and Pattern:
      a. Roof Panel: Select Seam, Narrow Batten, 16-inch panel width, flat pan.




   3. Panel Rib Height:
      a. Narrow batten cap 1-inch high x 3/8-inch wide

   4. Panel Finish: Provide primer and top finish coat on exposed faces; provide primer and backer coat on concealed faces of panels.
      a. DuraTech® 5000: Polyvinylidine Fluoride, full 70 percent Kynar 500®or Hylar 5000®, consisting of a baked-on 0.15-0.20 mil corrosion resistant primer and a baked-on 0.70-0.80 mil finish coat with a specular gloss of 8 to 15 when tested in accordance with ASTM D523 at 60 degrees.
      b. Panel Color: As selected from manufacturer's full range and Custom Colors.
         a) Roof Panel: AEP Span Cool Slate Gray, [ALT 1 AEP Span Cool Dark Bronze], Alternates. Final color to be approved by State’s Representative.
   5. Seam Sealant: Factory apply high-grade butyl mastic sealant within the confines of narrow batten, designed to seal against adjacent male panel legs.

## 2.3 FRAMING AND SUBSTRATES

A. Secondary Framing: See Section 05 40 00 "Cold-Formed Metal Framing".

B. Sheathing: See Section 06 16 43 "Gypsum Sheathing".

C. Roofing Underlayment: See Section 07 13 90 “Roofing Underlayment”.

## 2.4 CLIPS AND FASTENERS

A. Bearing Plate: 22ga minimum See Metal Construction Association Technical Bulletin "Fastener Selection". Usually retain first option; retain second option if UL Class 90 is required.

A. Fasteners: As recommended by manufacturer for performance indicated.

## 2.5 ACCESSORIES

A. Trims and Flashings: Material, metal thickness, and finish to match panels. Profiles indicated in Drawings.
   1. Provide manufacturer's standard accessories and other items essential to completeness of standing seam roof installation.

B. Panel Penetration Flashings: As recommended by panel manufacturer; designed to provide sufficient movement to prevent creation of points of fixity at penetrations.

C. Sealant for Field Application: High grade non-curing butyl or curing urethane sealant as recommended by panel manufacturer. Do not use sealant containing asphalt. See Section 07 92 00 "Joint Sealants".

## 2.6 FABRICATION

A. Fabrication, General:
   1. Unless otherwise shown on Drawings or specified herein, fabricate panels in continuous lengths and fabricate flashings and accessories in longest practical lengths. Contact AEP Span if panel lengths required over 60 feet.
   2. Panels shall be factory correctively-leveled.

B. Panels:
   1. Provide panels in full length from ridge to eave when possible.
   2. Where single length panels are not practical, provide mated swaged panels for positive joint end laps, shingled to accommodate water run-off (fabricated with overlap in direction of water flow).
   3. Roof panels shall have flush horizontal and vertical surfaces to facilitate sealing at terminations. Panel configurations which create voids and requiring supplemental closure devices shall not be considered acceptable.
   4. Engineer panels to use concealed anchors that permit expansion and contraction, except at eaves, end laps, ridges, valleys, hips and gables.

C. Fabrication Tolerances:
   1. Flat metal surfaces will display waviness commonly referred to as "oil canning". This is caused by steel mill tolerances and is a characteristic, not a defect, of panels manufactured from light gauge metal. Panels are factory

correctively-leveled to minimize the occurrence of “oil canning”. As such, “oil canning” will not be accepted as cause for rejection.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Verification of Conditions: With Installer present.
   1. Examine conditions and substrates on which metal panels are to be installed. Structural support or substrate shall be flat and plumb to avoid panel stresses and distortion.
   2. Prior to starting work, correct defects.

B. Field Measurements:
   1. Coordinate field measurements and fabrication schedule with construction progress.
   2. Field measure prior to fabrication. Show recorded dimensions on shop drawings, including locations of shop-fabricated openings.
   3. If field measurements differ from drawing dimensions, notify Architect prior to fabrication.

C. Substrate Tolerances: Deviations from flat plane shall not exceed the following.
   1. 1/4 inch in 20 feet.
   2. 1/2 inch across building elevation.
   3. 1/8 inch in 5 feet.

### 3.2 PREPARATION

A. Substrate and Underlayment: Install according to approved shop drawings and metal panel manufacturer's recommendations.

### 3.3 INSTALLATION

A. Panels and Trim: Comply with manufacturer's instructions for assembly, installation and erection for weather tight installation.
   1. Install according to approved shop drawings.
   2. Install panels in accordance with manufacturer’s instructions and recommendations. Anchor securely in place using clips and fasteners spaced in accordance with manufacturer’s recommendations for design wind load criteria.
   3. Comply with methods and recommendations of SMACNA Architectural Sheet Metal Manual for flashing configurations required.
   4. Discrepancies between job site conditions and shop drawings shall be brought to the attention of the Architect for resolution.
   5. Cutting and Fitting:
      a. Cut panels neat, square, and true with shearing action cutters. Torch or power saw cutting is prohibited.

b. Openings 6 inches and larger: Shop fabricate and reinforce to maintain original load capacity.
c. Openings less than 6 inches: Field cutting is acceptable.

6. Dissimilar Metals or Materials:
   a. Where panel or trim may come in contact with dissimilar metals or treated lumber, fabricate transition to facilitate drainage and minimize possibility of galvanic action. Galvanic action can cause panels and trim to fail prematurely.
   b. At points of contact with dissimilar metal or treated lumber, coat panel and trim with protective paint or separate materials with a weatherproof underlayment.
   c. Direct contact or run-off from CCA, ACQ, CA, or other treated lumber (outdoor wood) or fire retardant impregnated or treated wood shakes or siding can cause panels and trim to fail prematurely. Avoid contact with these materials.

B. Accessories: Install trims, flashings, and roofing specialties according to Drawings and manufacturer's recommended details.

C. Sealant Installation: Apply according to approved shop drawings and SMACNA Architectural Sheet Metal Manual recommendations.
   1. Provide airtight and waterproof installation.

D. Installation Tolerances: Match dimensional tolerances of substrate.

## 3.4 CLEANING

A. Repairs:
   1. Touch up paint is not required for panels with scratches that do not expose metal.
   2. Panels or flashings with finish damage exposing metal or with substrate damage shall be replaced.

B. Cleaning and Waste Management: See Division 01 for recycling requirements.
   1. At completion of each day’s work and at work completion, sweep panels, flashings, and gutters clean. Do not allow fasteners, cuttings, filings, or scraps to accumulate.
   2. Clean exposed surfaces of work promptly after completion of installation.

## 3.5 PROTECTION

A. Protect Work as required to ensure that roofing will be without damage at Final Completion.

END OF SECTION 07 41 13

**SECTION 07 46 00**
**NON-COMBUSTIBLE SIDING AND TRIM**

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section

1.2 SECTION INCLUDES

A. Poly-ash siding.

B. Poly-ash trim.

1.3 RELATED SECTIONS

A. Section 06 10 00 - Rough Carpentry: Wood stud framing, furring, and sheathing for support of siding.

B. Section 07 62 00 - Flashing and Sheet Metal: Sheet metal flashing, gutters and downspouts.

C. Section 07 92 00 - Joint Sealers: Sealants used in conjunction with siding installation.

D. Section 09 91 00 - Painting: Field painting poly-ash siding with topcoat.

1.4 REFERENCES

A. American Wood Protection Association (AWPA):
   1. AWPA E1 - Standard Method for Laboratory Evaluation to Determine Resistance to Subterranean Termites.
   2. AWPA E10 - Standard Method of Testing Wood Preservatives by Laboratory Soil-Block Cultures.

B. American Society for Testing and Materials (ASTM):
   1. ASTM D570 - Standard Test Method for Water Absorption of Plastics.
   2. ASTM D1037 - Standard Test Method for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials.
   3. ASTM D1622 - Standard Test Method for Apparent Density of Rigid Cellular Plastic.
   4. ASTM D6109 - Standard Test Method for Flexural Properties of Unreinforced and Reinforced Plastic Lumber and Related Products.
   5. ASTM D 6341 - Standard Test Method for Determination of the Linear Coefficient of Thermal Expansion of Plastic Lumber and Plastic Lumber Shapes Between - 30 and 140 degrees F (- 34.4 and 60 degrees C).

6. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

C. California Department of Forestry and Fire Protection (CAL FIRE):
   1. Wildland-Urban Interface (WUI) CA SFM 12.7A-1 - Exterior Wall Siding and Sheathing.

D. Progressive Engineering Inc. (PEI):
   1. PEI Evaluation Service - Report PER-13069.
   2. PEI Evaluation Service - Report PER-14090.

E. International Code Council Evaluation Source
   1. ICC ESR-3597

1.5 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Material descriptions, dimensions, and profiles.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods.

C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

D. Verification Samples: For each finish product specified, two samples, 6 inches (152 mm) long minimum samples of siding and trim in selected finish and color.

E. Manufacturer's Certification: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.

F. Test Reports: Submit manufacturer's test reports from testing performed by qualified, independent testing laboratories.

G. Product Evaluation Reports: Submit manufacturer's product evaluation reports from accredited, evaluation service.

H. Warranty Documentation: Submit manufacturer's standard warranty.

1.6 QUALITY ASSURANCE

A. Single Source: To ensure functional and appearance compatibility, siding and all trim pieces shall be products of single manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store and handle materials in accordance with manufacturer's instructions.

B. Store poly-ash siding on flat, level surface, raised above floor or ground, with adequate support to prevent sagging.

C. Keep poly-ash siding covered and free of dirt, debris, and moisture until installation.

D. Protect materials and finish during storage, handling, and installation to prevent damage.

1.8 WARRANTY

A. Manufacturer's Warranty: Provide manufacturer's standard 20 year warranty for Poly-Ash Siding.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Boral TruExterior Trim and Siding, which is located at: 200 Mansell Court E. Suite 305; Roswell, GA 30076; Toll Free Tel: 888-9BORAL9; Email:request info (info@boraltruexterior.com); Web:www.BoralTruExterior.com

B. Substitutions: or Approved Equal.

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

2.2 POLY-ASH SIDING

A. Poly-Ash Siding: Boral TruExterior siding:
   1. Siding used as exterior wall covering over sheathing on wood stud framing.
   2. Material: Polymeric blend, fly ash, and glass fibers.
   3. Formed in continuous process and milled to give a surface profile.
   4. Profile: Nickel Gap.
   5. Nominal Width: 6 inches.
   6. Nominal Thickness: 3/4 inch.
   7. Length: 16 feet.
   8. Exposed Texture: Woodgrain.
   9. Non-structural material.

B. Listings and Reports:
   1. Cal Fire (WUI), CA SFM 12.7A-1: Listing No. 8140-2134:0103.
   2. Product Evaluation Report: Pei Evaluation Service, Report PER-13069.
   3. ICC Evaluation Service: ICC ESR-3597

C. Recycled Content:
   1. Post-Industrial Recycled Content: Minimum 70 percent, by weight.

D. Properties:
   1. Density, ASTM D 1622: 40 to 50 pcf.
   2. Flexural Strength, ASTM D 6109: Greater than 1,600 psi.
   3. Coefficient of Linear Expansion, ASTM D 6341: Less than 1.40 E-05 in/in/degree F.
   4. Impact Resistance, ASTM D 1037: Greater than 50 inches.

E. Performance:
   1. Fungi Rot, AWPA E10:
      a. Brown Rot: Negligible loss.
      b. White Rot: Negligible loss.
   2. Termite Resistance, AWPA E1: Greater than 9.0 (10 being best).
   3. Water Absorption, ASTM D 570: Less than 1.5 percent.
   4. Surface Burning Characteristics, ASTM E 84:
      a. Flame Spread Index: Less than 35.
      b. Smoke Developed Index: Less than 450.

F. Fasteners:
   1. Minimum 8d by 2-1/2-inch-long stainless steel ring-shank nails.
   2. In accordance with local building code.

## 2.3 POLY-ASH TRIM

A. Poly-Ash Trim: Boral TruExterior Trim:
   1. Material: Polymeric blend, fly ash, and glass fibers.
   2. Reversible with wood grain on one side and a smooth finish on the other.

B. Trim:
   1. Sizes: See Drawings:

| Nominal Size | Actual Size |
|---|---|
| 5/8 x 4 | 5/8" x 3½" |
| 5/8 x 6 | 5/8" x 5½" |
| 5/8 x 8 | 5/8" x 7¼" |
| 5/8 x 10 | 5/8" x 9¼" |
| 5/8 x 12 | 5/8" x 11¼" |
| 1 x 4 | ¾" x 3½" |
| 1 x 5 | ¾" x 4½" |
| 1 x 6 | ¾" x 5½" |

| | |
|---|---|
| 1 x 8 | ¾" x 7¼" |
| 1 x 10 | ¾" x 9¼" |
| 1 x 12 | ¾" x 11¼" |
| 5/4 x 4 | 1" x 3½" |
| 5/4 x 5 | 1" x 4½" |
| **5/4 x 6** | **1" x 5½"** |
| 5/4 x 8 | 1" x 7¼" |
| **5/4 x 10** | **1" x 9¼"** |
| 5/4 x 12 | 1" x 11¼" |
| 2 x 2 | 1½" x 1½" |
| 2 x 4 | 1½" x 3½" |
| 2 x 6 | 1½" x 5½" |
| 2 x 8 | 1½" x 7¼" |
| 2 x 10 | 1½" x 9¼" |
| 2 x 12 | 1½" x 11¼" |

2. Length: 16 feet.
3. Exposed Texture: Smooth.

C. Beadboard:
1. Size: 5/8 x 6, nominal; 5/8 x 5-1/4 inches, actual.
2. Size: 5/8 x 12, nominal; 5/8 x 11-1/2 inches, actual.
3. See Drawings.

Skirt Board:
4. None.

D. Composition:
1. Post-Industrial Recycled Content: Minimum 70 percent, by weight.

E. Physical Properties:
1. Density, ASTM C 1185: 40 to 50 pcf.
2. Water Absorption, ASTM D 570: Less than 1.5 percent.
3. Fungi Rot, AWPA E10:
   a. White Rot: Negligible loss.
   b. Brown Rot: Negligible loss.
4. Termite Resistance, AWPA E1: Greater than 9.0, with 10 being impervious.

F. Mechanical Properties:
   1. Flexural Strength, ASTM C 1185: Greater than 1,600 psi.
   2. Nail Withdrawal, ASTM D 1761: Greater than 40 lbf/in.

G. Thermal Properties:
   1. Coefficient of Linear Expansion, ASTM D 6341, Typical: 1.40E-05 in/in/degree F, tested at minus 30 to 140 degrees F.
   2. Flame Spread, ASTM E 84: Less than 35
   3. Smoke Developed, ASTM E 84: Less than 450.

H. Fasteners:
   1. Type: Nails.
   2. Type: Screws.
   3. Type: As indicated on Drawings.
   4. Size:
   5. Size: As indicated on Drawings.
   6. Finish: Galvanized steel.
   7. Finish: Stainless steel.
   8. Finish: As indicated on Drawings.

2.4 FABRICATION

A. Manufacturing Tolerances:
   1. Width: Plus or minus 1/16 inch.
   2. Thickness: Plus or minus 1/16 inch.
   3. Length: Plus 2 inches, minus 0 inch.
   4. Edge Cut: Plus or minus 2 degrees.

2.5 FINISHES

A. Factory Applied Primer: Manufacturer's standard acrylic based low VOC coating.

B. For finish paint colors and systems see 09 91 00 Painting.

PART 3 EXECUTION

3.1 EXAMINATION

A. Confirm that all critical dimensions are as specified on the drawings. Examine wood framing members to receive poly-ash siding.

B. Notify State’s Representative of conditions that would adversely affect installation. Do not begin installation until unacceptable conditions are corrected.

3.2 PREPARATION

A. Repair substrate flaws or defects before applying siding or soffits.

B. Where necessary, fur surfaces to an even plane and free from obstructions before application.

3.3 INSTALLATION

A. Install poly-ash siding and trim in accordance with manufacturer's instructions at locations indicated on the Drawings.

B. Do not install poly-ash siding or trim in structural or load-bearing applications.

C. Install poly-ash siding and trim plumb, level, square, and true to line.

D. Install exterior poly-ash trim with flush, tight joints.

E. Fastening: Install fasteners in accordance with local building code.
   1. Maximum of 24 inches on center.
   2. Within 2 inches of end of boards.

F. Install siding, soffits, and accessories in accordance with best practice, with all joint members plumb and true.

G. Fill nail and screw holes with acrylic caulk, wood filler, or auto body filler per manufacturer’s recommendations.

H. Painting:
   1. Apply topcoat of exterior paint over factory-applied primer:
      a. Within 150 days of installing poly-ash siding.
      b. As specified in Section 09 91 00.
   2. Ensure poly-ash siding and trim is clean and dry before painting.

3.4 ADJUSTING

A. Repair minor damages to poly-ash siding in accordance with manufacturer's instructions and as approved by State’s Representative.

B. Remove and replace with new material, damaged poly-ash siding that cannot be successfully repaired, as determined by State’s Representative.

3.5 CLEANING AND PROTECTION

A. After application of siding and soffits, clean as necessary to remove all fingerprints and soiled areas.

B. Upon completion of siding application, clean entire area, removing all scrap, packaging, and unused materials related to this work.

C. Protect installed poly-ash siding to ensure that, except for normal weathering,

siding will be without damage or deterioration at time of Substantial Completion.

END OF SECTION 07 46 00

**SECTION 07 62 00**
**SHEET METAL FLASHING & TRIM**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 SECTION INCLUDES

A. Shop- and field-fabricated sheet metal flashing and trim, including:

1. Sheet metal flashing around windows.
2. Wall flashing and expansion joints.
3. Exposed trim/fascia units.
4. Gutters and Downspouts
5. Miscellaneous accessories and flashing as shown or required.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Section 04 22 00 – Concrete Masonry Unit: steel flashings embedded in masonry
B. Section 05 50 00 – Metal Fabrications
C. Section 07 13 90 – Roofing Underlayment
D. Section 07 25 00 – Weather Barriers
E. Section 07 41 13 – Standing Seam Metal Roof Panels
F. Section 07 46 00 – Non-Combustible Siding and Trim
G. Section 07 92 00 – Joint Sealers

1.4 REFERENCES

A. ASTM A 240/A 240M - Standard Specification for Heat Resisting Chromium and Chromium-Nickel Steel Plate, Sheet, and Strip for Pressure Vessels.

B. ASTM A 308 - Standard Specification for Sheet, Terne (Lead-Tin Alloy) Coated by the Hot-Dip Process.

C. SSIUS - Designer Handbook Series; Specialty Steel Industry of the United States (SSIUS).

1. Stainless Steel for Roofing, Flashings, Copings.
2. Design Guidelines for the Selection and Use of Stainless Steel.
3. Specifications for Stainless Steel.
4. Stainless Steel Fabrication.
5.. Finishes for Stainless Steel.
6. Stainless Steel Architectural Facts.

D. SMACNA - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors National Association, Inc.; seventh edition, 2012.

## 1.5 SUBMITTALS

A. Submit in accordance with Division 1.

B. Product Data: Submit manufacturer's technical product data, installation instructions and general recommendations for each specified sheet material and fabricated product.

C. Samples: 12 inch square samples of specified sheet materials to be exposed as finished surfaces.

D. Samples: 12 inch long samples of factory-fabricated products exposed as finished work, including specified factory finish.

E. Shop Drawings: Submit layout, profiles, methods of joining, and anchorage details, including major counterflashings, trim/fascia units, gutters, downspouts, scuppers, and expansion joint systems. Provide layouts at 1/4 inch scale and details at 3 inch scale.

## 1.6 QUALITY ASSURANCE

A. Installer Qualifications: A firm with 5 years of successful experience with installation of flashing and trim similar in type and scope to project requirements.

PART 2 - PRODUCTS

2.1 FLASHING AND TRIM MATERIALS

A. Galvannealed steel sheet : ASTM A 653 G90 twenty [20] gauge GSM – Trim around Window Exteriors and over HSS beams as shown in Material Finish Schedule and Elevations.

1. Finish : Kynar coated - Dark bronze or as selected to match adjacent windows, as approved by State's Representative. Submit (4) color samples for approval by State's Representative.

B. Stainless Steel Sheet: ASTM A 240/A 240M, Type 304, fully annealed, dead soft temper.

1. Thickness: 0.021 inch, 25 gauge, unless otherwise indicated.

2. Thickness: As indicated on drawings.

3. Finish: No.2D (dull) mill rolled sheet finish.

4. Finish: As selected by State's Representative from roofing manufacturer's standards.

C. Stainless Steel Sheet: Terne-coated stainless steel sheet, complying with ASTM A 308, Type 304, fully annealed, dead soft temper.

1. Coating: Coat both sides of stainless steel sheet with terne alloy (80-20 lead/tin) in accordance with sheet metal manufacturer's standard nominal coating weight.

2. Base Metal Thickness: 0.021 inch, 25 gauge, unless otherwise indicated.

3. Base Metal Thickness: As indicated on drawings.

4. Finish: Manufacturer's standard.

D. Solder: Minimum 50-50 tin/lead solder for unexposed joints; minimum 80-20 tin/lead solder for color match at exposed joints. Use only phosphoric acid based flux for soldering stainless steel.

E. Fasteners: Stainless steel, type 300 series, as recommended by sheet manufacturer.

F. Metal Accessories: Stainless steel clips, straps, anchoring devices, and similar accessory units as required for installation of work, non-corrosive, size and gage required for performance.

G. Bituminous Coating: SSPC-Paint 12, solvent-type bituminous mastic, nominally free of sulfur, compounded for 15 mil dry film thickness per coat except as otherwise indicated; inert-type non-corrosive compound, nominally free of sulfur components and other deleterious impurities.

H. Mastic Sealant: Polyisobutylene; non-hardening, non-skinning, non-drying, non-migrating sealant.

I. Elastomeric Sealant: Type recommended for components being sealed and complying with requirements for joint sealants as specified in Section 07 29 00 - Joint Sealants.

J. Epoxy Seam Sealer: 2-part non-corrosive metal seam cementing compound, recommended by sealant manufacturer for exterior/interior non-moving joints including riveted joints.

K. Adhesives: Type recommended for waterproof and weather resistant seaming and adhesive application indicated by manufacturer of stainless steel.

2.2 GUTTERS AND DOWNSPOUTS

A. Gutters: Galvalume steel sheet: ASTM A 653 G90 twenty two [22] gauge (unless otherwise indicated on drawings) GSM half round gutters.

1. Size: 6”

2. Finish: Galvalume, as selected by State’s Representative

3. Provide endcaps, hangers, fasteners, sealant, and anchoring devices to suit project requirements.

B. Downspouts: Galvalume steel sheet: ASTM A 653 G90 twenty two [22] gauge (unless otherwise indicated on drawings) GSM round downspouts

1. Size: 4” diameter

2. Finish: Galvalume, as selected by State's Representative

3. Provide brackets, fasteners, sealant, and anchoring devices to suit project requirements.

## 2.3 ACCESSORY MATERIALS

A. Roofing Felt: Asphalt or coal tar saturated felt weighing not less than 30 lb per 100 square feet.

B. Slip Sheet: 4-lb rosin-sized building paper.

C. Elastic Expansion Joints: Factory-fabricated units of size and profile indicated, with elastic sheet flashing forming the primary joint membrane in a supported bellows arrangement designed to be secured to both sides of expansion joints; underside of bellows insulated with adhesive applied, flexible, closed-cell rubber or plastic not less than 3/8 inch thick.

1. Type: Plain sheet or encapsulated stainless steel flanged edges, for embedment in other construction or nailing to substrates, 4 inches minimum flange width.

2. Type: Stainless steel flanged edges, 3 to 4 inches wide, formed to profiles as indicated to fit curbs and designed for nailing to curb substrate. Provide thickness as indicated and in accordance with manufacturer's standards and recommendations.

3. Looped Bellows Width: 5 to 6 inches, exclusive of flanges.

4. Complete with prefabricated corner units, intersection units and splicing materials.

5. Manufacturers: Provide products that comply with project requirements and are made by one of the following:

   a. Siplast.
   b. Johns Manville.
   c. Sika Emseal.

D. Reglets: Units of type and profile indicated, compatible with stainless steel, non-corrosive.

E. Gutter Guards (Leaf Guards): Stainless steel mesh or fabricated units, hinged for cleaning, with selvaged edges and non-corrosive fasteners. Select materials for compatibility with gutters and downspouts.

F. Conductor-Head Guards: Bee-hive type stainless steel mesh or fabricated units, removable for cleaning, with selvaged edges and non-corrosive fasteners. Select materials for compatibility with gutters and downspouts.

G. Roofing Cement: ASTM D 2822, asphaltic.

## 2.4 METAL FABRICATION

A. Shop-fabricate work to greatest extent possible.

B. Conform to dimensions and profiles indicated. Comply with details shown and with applicable requirements of SMACNA Architectural Sheet Metal Manual and other recognized industry practices.

C. Fabricate for waterproof and weather-resistant performance, with expansion provisions for running work sufficient to permanently prevent leakage, damage, or deterioration of the work.

D. Form work to fit substrate. Comply with material manufacturer's instructions and recommendations for forming material. Form exposed stainless steel work without excessive oil-canning, buckling, and avoidable tool marks, true to line and levels indicated, with exposed edges folded back to form hems.

E. Seams: Fabricate non-moving joints with flat-lock seams. Tin edges to be seamed, form seams, and solder. Rivet joints for additional strength where required.

F. Hooked-Type Joints: Where lapped or bayonet-type expansion provisions in work cannot be used or would not be sufficiently water- or weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant concealed within joints.

G. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standard details.

H. Separations: Provide for separation of metal from different metal types and corrosive substrates by coating concealed surfaces at locations of contact with bituminous coating or other permanent separation as recommended by manufacturer or fabricator.

I. Gutter and Downspout Fabrication:

1. Continuously form seamless gutters to the profiles and sizes specified. Form gutter free from distortion or defects detrimental to appearance or performance. Allow for expansion at corners and joints.

2. Form downspouts of profiles and sizes specified.

3. Field measure conditions prior to fabricating work.

4. Hem exposed edges of material

## PART 3 - EXECUTION

### 3.1 PREPARATION

A. Coordinate work of this section with adjoining work for proper sequencing of each installation to ensure best possible weather resistance and durability of work and protection of materials and finishes.

B. Gutter and Downspout Preparation:

1. Do not begin installation until substrates have been properly prepared.

2. Verify governing dimensions at building.

3. Verify surfaces are ready to receive gutters and downspouts.

4. Clean surfaces thoroughly prior to installation.

5. Clean and repair if necessary any adjoining work on which this work is in any way dependent for its proper installation.

6. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

## 3.2 INSTALLATION

A. Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations and with SMACNA Architectural Sheet Metal Manual.

1. Anchor units of work securely in place by methods indicated, providing for thermal expansion of units; conceal fasteners where possible, and set units true to line and level as indicated.

2. Install work with laps, joints, and seams that will be permanently watertight and weatherproof.

B. Galvanic Action Protection: Isolate different metal types from each other to prevent galvanic action.

C. Underlayment: Where installation is to be directly on cementitious or wood substrate, install slip sheet over a course of roofing felt.

D. Soldering: Tin uncoated stainless steel surfaces for a width of 1-1/2 inches at edges, using solder recommended for stainless steel work. Exception: Where surfaces are terne-coated stainless steel, do not tin edges, but wire brush terne coating before soldering.

E. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.

F. Install reglets to receive counterflashing in manner and by methods indicated. Where shown in concrete, furnish reglets to trades of concrete work for installation. Where shown in masonry, furnish reglets to trades of masonry work for installation.

G. Install counterflashing in reglets, either by snap-in seal arrangement or by soldering in place for anchorage and filling reglet with mastic or elastomeric sealant, as indicated and depending on degree of sealant exposure.

H. Install elastic expansion joints in accordance with manufacturer's recommendations.

1. Where required, provide for movement at joints by forming loops or bellows in width of flashing.

2. Locate cover or filler strips at joints to facilitate complete drainage of water from flashing.

3. Seam adjacent flashing sheets with adhesive, seal and anchor edges in accordance with manufacturer's recommendations.

4. Nail flanges of expansion joint units to curb nailers, at maximum spacing of 6 inches on center.

5. Fabricate seams at joints between units with minimum 3 inch overlap, to form a continuous, waterproof system.

I. Gutters and Downspouts:

1. Install in accordance with manufacturer’s instructions.

2. Install gutters using appropriate hangers to allow normal expansion and contraction.

3. Install gutter hangers using two 1-1/4 inch (32 mm) galvanized screw shank nails and fastened into solid lumber.

4. Provide manufacturer’s standard expansion joints at 50’-0” maximum. Sections of less than 50’-0” shall be roll formed continuous without joints of any kind.

5. Apply bituminous protective backing on surfaces in contact with dissimilar metals.

6. Install sealants where indicated to clean dry surfaces only without skips or voids.

7. Seal all joints watertight

8. Install continuous gutter guards on gutters and conductor-head guards at conductor heads.

## 3.3 CLEANING AND PROTECTION

A. Clean exposed steel surfaces, removing substances that might cause staining, corrosion, or deterioration of finish or that would interfere with uniform oxidation and weathering.

B. Protect flashings, sheet metal work, gutters and downspouts during construction to ensure that work will be without damage or deterioration other than natural weathering at time of Substantial Completion.

END OF SECTION 07 62 00

**SECTION 07 84 00**
**FIRESTOPPING AND SMOKE SEALANTS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Penetrations in fire-resistance-rated walls.
2. Penetrations in horizontal assemblies.
3. Penetrations and joints in smoke barriers.
4. Joints in or between fire-resistance-rated constructions.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

1. Joint Sealants: Section 07 92 00.
2. Gypsum Board: Section 09 29 00.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. CALGreen Submittals: Submit product data in accordance with Division 1.

1. Product Data for CALGreen 5.504.4.1 Adhesives, Sealants, Caulks: Product Data and material safety data sheets (MSDS) for adhesives and sealants used on the project, indicating VOC content of each product used.

C. Product Schedule: For each firestopping system. Include location and design designation of qualified testing and inspecting agency.

1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for firestopping.

1.6 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."

B. Installer Qualifications: A firm experienced in installing firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

C. Fire-Test-Response Characteristics: Firestopping shall comply with the following requirements:

1. Firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install firestopping when ambient or substrate temperatures are outside limits permitted by firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that firestopping is installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate firestopping.

C. Notify State Representative's testing agency at least seven days in advance of firestopping installations; confirm dates and times on day preceding each series of installations.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide the following, or equal:

1. A/D Fire Protection Systems Inc.
2. Grace Construction Products.
3. Hilti, Inc.
4. Johns Manville.
5. 3M Fire Protection Products.

### 2.2 FIRESTOPPING

A. Provide firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping 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.

B. Penetrations in Horizontal Assemblies: Provide penetration firestopping 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: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.

2. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.

E. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

F. Joints in or between Fire-Resistance-Rated Construction: Provide fire-resistive joint systems with ratings determined per ASTM E 1966 or UL 2079:

1. Joints include those installed in or between fire-resistance-rated walls, floor or floor/ceiling assemblies and roofs or roof/ceiling assemblies.

2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.

G. Joints in Smoke Barriers: Provide fire-resistive joint systems with ratings determined per UL 2079.

1. L-Rating: Not exceeding 5.0 cfm/ft of joint at 0.30 inch wg at both ambient and elevated temperatures.

H. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

I. Accessories: Provide components for each firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.

1. CALGreen Requirements: For CALGreen 5.504.4.1, adhesives, sealants and caulks shall comply with local or regional air pollution control or air quality management district rules or SCAQMD Rule 1168 VOC limits, as shown in Tables 5.504.4.1 and 5.504.4.2 in the California Building Code.

2. Permanent forming/damming/backing materials, including the following:

a. Slag-wool-fiber or rock-wool-fiber insulation.

b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.

c. Fire-rated form board.

d. Fillers for sealants.

3. Temporary forming materials.

4. Substrate primers.

5. Collars.

6. Steel sleeves.

2.3 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.

E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a non-shrinking, homogeneous mortar.

H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover

openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

J. 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, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

2.4 MIXING

A. For those products requiring mixing before application, comply with firestopping 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: Clean out openings immediately before installing firestopping 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 firestopping.

2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.

3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

## 3.3 INSTALLATION

A. General: Install firestopping 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 fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.

C. Install fill materials for firestopping by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.

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 firestopping 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 firestopping is without damage or deterioration at time of Substantial Completion.

C. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated firestopping and install new materials to produce systems complying with specified requirements.

END OF SECTION 07 84 00

**SECTION 07 92 00**
**JOINT SEALANTS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Silicone joint sealants.

2. Urethane joint sealants.

3. Latex joint sealants.

B. Related Sections:

1. Section 07 41 13 “Standing Seam Metal Roof Panels” for sealing standing seam metal panels.
2. Section 07 46 00 “Non-Combustible Siding and Trim” for sealing siding and trim joints.
3. Section 09 29 00 "Gypsum Board" for sealing perimeter joints.
4. Section 09 30 00 "Tiling" for sealing tile joints.

1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Material Safety Data Sheets (MSDS): For storage at project site.

C. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured
sealants showing the full range of colors available for each product exposed to view.

D. 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.

E. 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.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

C. Sealant, Waterproofing, and Restoration Institute (SWRI) Validation Certificate: For each sealant specified to be validated by SWRI's Sealant Validation Program.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

E. Preconstruction Field-Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in “Preconstruction Testing” Article.

F. Warranties: Sample of special warranties.

1.5 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 each kind of joint sealant from single source from single manufacturer.

C. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion

and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

D. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Use manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

2. Submit not fewer than eight pieces of each kind of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.

3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.

4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.

5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, 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 approved by Architect.

2. Conduct field tests for each application indicated below:

    a. Each kind of sealant and joint substrate indicated.

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 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

        i. 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.

C. 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.

D. 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.

1.7 PROJECT 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.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.

B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.9 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which 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's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: 10 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 structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.

2. Disintegration of joint substrates from natural 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 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.

C. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

D. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

E. Colors of Exposed Joint Sealants: As selected by State's Representative from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.

1. Products: Subject to compliance with requirements, provide one of the following, or equal:

a. Dow Corning Corporation; 790.
b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.

2. Structural Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT.

a. Products: Provide the following, or equal:
i. Dow Corning Corporation; 795 or 995.

2.3 URETHANE JOINT SEALANTS

A. Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.

1. Products: Subject to compliance with requirements, provide the following, or equal:

a. Sika Corporation, Construction Products Division; Sikaflex - 15LM.
b. Tremco Incorporated; Vulkem 921.

2.4 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Products: Subject to compliance with requirements, provide one of the following, or equal:

a. BASF Building Systems; Sonolac.
b. Pecora Corporation; AC-20+.
c. Tremco Incorporated; Tremflex 834.

2.5 PREFORMED JOINT SEALANTS

A. Preformed Silicone Joint Sealants: Manufacturer's standard sealant consisting of precured low-modulus silicone extrusion, in sizes to fit joint widths indicated, combined with a neutral-curing silicone sealant for bonding extrusions to substrates.

B. Products: Subject to compliance with requirements, provide the following, or equal:

1. Dow Corning Corporation; 123 Silicone Seal.

2. GE Advanced Materials - Silicones; UltraSpan US1100.

2.6 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type B (bicellular material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

1. Provide closed-cell material at all exterior joint applications.

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.

2.7 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: Non-staining, 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 joint-sealant performance.

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. Remove laitance and form-release agents from concrete.

3. 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.

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 where indicated per Figure 8B in ASTM C 1193.

5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.

a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

## 3.4 FIELD QUALITY CONTROL

A. 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 and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 07 92 00

# 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 Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

### 1.2 SUMMARY

A. Section includes hollow-metal work and associated louvers.

### 1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

1. Section 08 71 00 "Door Hardware" for door hardware for hollow-metal doors.

2. Section 09 91 00 “Painting” for finish painting interior hollow metal doors.

### 1.4 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

### 1.5 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.

### 1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.

B. 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.

C. 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, provide products by one of the following, or equal:

1. DKS Steel Door & Frame Systems, Inc.

2. Ceco Door Products; an Assa Abloy Group company.

3. Curries Company; an Assa Abloy Group company.

4. Steelcraft; an Ingersoll-Rand company.

5. Stiles Custom Metal, Inc.

6. Industrial Louvers Inc.

7. Activar CPG Air Louvers.

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 ratingsindicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

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. Commercial Doors and Frames: NAAMM-HMMA 861. At locations indicated in the Door and Frame Schedule.

1. Physical Performance: Level A 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: Metallic-coated, cold-rolled steel sheet, minimum thickness of 0.042 inch.
d. Edge Construction: Continuously welded with no visible seam.
e. Core: Steel stiffened.

3. Frames:

a. Materials: Metallic-coated steel sheet, minimum thickness of 0.067 inch.
b. Construction: Full profile welded.

4. Exposed Finish: Prime. Finish paint in accordance with Section 09 91 00 “Painting”.

## 2.4 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Commercial Doors and Frames: NAAMM-HMMA 861. At locations indicated in the Door and Frame Schedule. Exterior doors shall meet STC ratings shown in the Drawings.

1. Physical Performance: Level A 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: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum G60A60 coating.
d. Edge Construction: Continuously welded with no visible seam.
e. Core: Steel stiffened.

1) Thermal-Rated Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less than 2.1 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.

3. Frames:

a. Materials: Metallic-coated steel sheet, minimum thickness of 0.067 inch, with minimum Gavannealed A90 coating.
b. Construction: Full profile welded.

4. Exposed Finish: Prime. Finish paint in accordance with Section 09 91 00 “Painting” Section 3.07 SCHEDULE – EXTERIOR PAINT SYSTEMS
a. Shop-Primed Ferrous Metal
b. Galvanized Metal

2.5 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.

2. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

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.

2.6 MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of pre-consumer 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. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.

E. 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.

F. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

G. Power-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 hollow-metal frames of type indicated.

H. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.

I. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

J. Glazing: Comply with requirements in Section 088000 "Glazing."

K. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

## 2.7 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. Vertical Edges for Single-Acting Doors: Bevel edges 1/8” in 2”.

2. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets.

3. 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.

4. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

5. 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. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

2. 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.

3. 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.

b. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

4. Head Anchors: Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.

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 non-templated, 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.

F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with mitered hairline joints.

1. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.

2. Provide loose stops and moldings on inside of hollow-metal work.

3. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

## 2.8 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.

## 2.9 LOUVERS

A. Product: Activa Air Louvers “700TL”, or equal as required. Flush mounted louver for transoms. Product includes two rows of inverted split “Y” blades in a 1-13/16 in. frame for flush mounting in hollow metal frames. Material is 18 gauge cold rolled steel. Prime louvers in shop: Gray prime coat only. Finish color to match door color as approved by State’s Representative. Refer to Section 09 91 00 “Paint” for additional finish paint requirements.

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 non-templated, 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 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. Remove temporary braces necessary for installation only after frames have been properly set and secured.

1. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

2. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.

3. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.

    a. Floor anchors may be set with power-actuated fasteners instead of post-installed expansion anchors if so indicated and approved on Shop Drawings.

3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.

4. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.

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: 3/4 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. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.

## 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.

END OF SECTION 08 11 13

**SECTION 08 11 16**
**ALUMINUM DOORS AND FRAMES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Aluminum Doors and Frames.

B. Related Sections:

1. Section 08 53 14 “Fiberglass Windows and Storefronts.”
2. Section 08 71 00 “Door Hardware.”
3. Section 08 80 00 “Glazing.”

1.3 REFERENCES

A. American Architectural Manufacturers Association (AAMA)

B. American Society for Testing and Materials (ASTM)

C. Aluminum Association (AA)

D. National Fenestration Rating Council (NFRC)

1.4 SYSTEM DESCRIPTION

A. General: In addition to requirements shown or specified, comply with:

1. Applicable provisions of AAMA Aluminum Storefront and Entrance Manual for design, materials, fabrication and installation of component parts.

B. Design Requirements: Arcadia MS362T Series Medium Stile Thermal Entrance is a single source package of door, door frame and hardware that is engineered for moderate to high traffic.

C. Performance Requirements: Each assembly tested by a recognized testing

laboratory or agency in accordance with specified test methods.

1. Tested by the dual moment corner joint strength test.
2. Thermal Transmittance (U-factor) shall not be more than 0.45 BTU/hr/ft$^2$/$^o$F per NFRC 100.
3. Condensation Resistance (CR) shall not be less than . (___)when gazed with (___) center of glass U-Factor per NFRC 500.
4. Solar heat gain coefficient of no greater than 0.23 as determined according to NFRC 200.
5. Sound Transmission Class (STC) and Outdoor-Indoor Transmission Class (OITC) in accordance with ASTM E 90.
6. Visual Transmittance of no less than 0.17 per NFRC 200.

## 1.5 QUALITY ASSURANCE

A. Single Source Responsibility:

1. Obtain entrances, storefronts, ribbon walls, window walls, curtain walls, window systems, and finish through one source from a single manufacturer.

## 1.6 SUBMITTALS

A. Finish Color: Provide available Colors Chart for State Representative's review and selection and two color samples of selected color for State Representative's approval.

B. 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.

## 1.7 WARRANTY

A. System shall be warranted against failure and/or deterioration of metals due to manufacturing process for a period of two (2) years g.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Arcadia, Inc. 2301 E Vernon, Vernon, CA. Telephone 323/269-7300, Fax 323/268-7390.

B. Acceptable Products:

1. Arcadia, Inc., MS362HDT Series, Heavy Duty Thermal Door 2".

a. Vertical Stiles: 3 ½ inches.
b. Top Rail: 3 ½ inches.
c. Bottom Rail: 10 ¼ inches.
d. Glazing Stops: Square snap-in type for 1 inch infill.

2. Major portions of the door styles a nominal .1888 inches and glass stops 0.050 inches thick.

C. Requests for substitutions will be considered in accordance with provisions of Division 1.

2.2 MATERIALS AND ACCESSORIES

A. Door members: Extruded 6063-T6 aluminum alloy (ASTM B221-Alloy G.S. 10a T6).

B. Screws, fastening devices, and internal components: Aluminum, stainless steel, or zinc plated steel in accordance with ASTM A-164. Shall be aluminum or steel, providing the steel is properly isolated from aluminum.

C. Glazing Gasket (compression-type design).

2.3 HARDWARE

A. Hardware furnished and installed by the door manufacturer, and include the hardware as selected in the door hardware schedule and in accordance with Section 08 71 00 Door Hardware as well as the following standard hardware.

1. Weatherstripping: Hard-backed poly pile in door and/or frame. Meeting stile of all pair of doors have a double line hard-backed poly-pile astragal.

2.4 FINISH

A. Finish all exposed areas of aluminum and components as indicated.

1. An Architectural Class II or I color anodic coating conforming with AA-M12C22A34/AA-M12C22A44.

a. Anodized finish color shall be Colornodic AB6 Dark Bronze. Anodized color finish to be confirmed by the State's Representative upon review of the manufacturer's color chart and color samples.

2.5 DOOR FABRICATION

A. Stiles and rails shall be tubular sections accurately joined, flush and hairline at corners with heavy concealed reinforcement brackets secured with machine bolts, with optional MIG weld. Exposed screws not permitted.

B. Each door leaf equipped with an adjusting mechanism, located in the top rail near the lock stile.

C. Prepare internal reinforcement for door hardware.

D. Custom hardware templates and physical hardware must be submitted prior to any fabrication.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions and verify substrate conditions are acceptable for product installation.

3.2 INSTALLATION

A. Install in accordance with approved shop drawings and manufacturers installation instructions.

3.3 FIELD QUALITY CONTROL

A. Make all necessary final adjustments to attain normal operation of each door and its mechanical hardware.

END OF SECTION 08 11 16

**SECTION 08 16 00.00**
**FLUSH COMPOSITE DOORS**

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 SECTION INCLUDES

A. Flush Interior Doors at Education Center

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Section 06 10 00 – Rough Carpentry
B. Section 06 40 00 – Architectural Woodwork
C. Section 08 71 00 – Door Hardware
D. Section 09 91 00 – Painting

1.4 REFERENCES

A. Window & Door Manufacturers Association (WDMA):
   1. WDMA TM-7: Cycle Slam.
   2. WDMA TM-8: Hinge Loading.
B. National Fire Protection Association (NFPA):
   1. NFPA 252: Standard Methods of Fire Tests of Door Assemblies.
   2. NFPA 80: Standard Methods for builders' hardware to be used in fire rated swing doors.
C. Underwriters Laboratories, Inc. (UL):
   1. UL10B: Standard for Fire Tests of Door Assemblies (Note: Neutral pressure standard).
   2. UL 10C: Standard for Positive Pressure Fire Tests of Door Assemblies.
   3. GREEN GUARD: CA 01350, Indoor Air Quality (IAQ) Testing
D. Underwriters' Laboratories of Canada (ULC):
   1. CAN4-S104: Standard Method for Fire Tests of Door Assemblies.
E. ASTM International:
   1. ASTM E90 – Laboratory measurement of Airborne Sound Transmission of Building Partitions and Elements.
   2. ASTM E1332 – Standard Classification for Rating Outdoor – Indoor Sound Attenuation.

1.5 DESIGN REQUIREMENTS

A. Fire-Rated Door Assemblies: Fire door assemblies shall meet or exceed fire-protection ratings indicated when tested in accordance with NFPA 252, UL 10B, and UL 10C.

1.6 SUBMITTALS

A. Submit under provisions of Division 1 Submittals.
B. Product Data: Submit door manufacturer current product literature, including installation instruction.
C. Samples: Provide finish samples for all products.
D. Quality Assurance Submittals
   1. Manufacturer Instructions: Provide manufacturer's written installation instructions.
E. Closeout Submittals: Refer to Division 1.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver doors, materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.
B. Store doors as recommended by manufacturer.

1.8 WARRANTY

A. Manufacturer's Standard Warranty: Assemblies will be free from defects in materials and workmanship from the date of manufacture for the time periods indicated below:
   1. Door Slab: Commercial: 5 years**.**
   2. Door Frames: 1 year.
   3. Factory Prefinish: 1 year.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Acceptable Manufacturer: JELD-WEN, Inc.; 2645 Silver Crescent Drive, Charlotte, NC 28273; Toll Free Tel: 800-535-3936; Tel: 541-850-2606; Fax: 541-851-4333; Email: ArchitecturalServices@jeldwen.com; Web: http://www.jeld-wen.com.
B. Substitutions: or approved equal.
C. Requests for substitutions will be considered in accordance with provisions of Division 1.

2.2 PASSAGE DOORS

A. Basis of Design: Doors are based on JELD-WEN®'s Flush Interior Doors.
   1. Flush Doors: Primed Smooth MDF.
      a. Core and Frame
         1) Solid core with Combination wood/MDF frame.
      b. Thickness**:** 1-3/4 inch
         1) Solid Particleboard core with combination wood/MDF frame.
            (a) Thickness**:** 1-3/4 inch
         2) Solid mineral core with mineral composite frame with wood edge banding.
            (a) Thickness: 1-3/4 inch (44.4 mm) with [45-minute] [60-minute] [90-minute] fire rating.
      c. Jambs
         1) Jamb Width: As shown on Drawings
         2) Jamb Type: Rabbeted
         3) Jamb Species: Finger-Jointed Pine.
      d. Finish:
         1) Unfinished Hardwood: As selected by State's Representative**.** Prefinished Factory Pre-Finish Colors: As selected by State's Representative.

A. Hardware: As specified in the Hardware Schedule and Section 08 71 00 Door Hardware.
   1. Prep door for specified hinge and lockset.

2.3 PREHUNG DOORS

A. Profile:
   1. System 01, Single Door.
   2. System 02, Double Door.
B. Jambs:
   1. Jamb Width: As shown on Drawings
   2. Jamb Species: Finger-Jointed Pine.
C. Hinges: See Hardware Schedule.
D. Strike Plate: See Hardware Schedule.
E. Door Flush Bolts/Ball Catch: See Hardware Schedule.

PART 3 - EXECUTION

3.1 GENERAL

A. Install doors in accordance with manufacturer's installation guidelines and recommendations.

## 3.2 EXAMINATION

A. Inspect door prior to installation.
B. Inspect rough opening for compliance with door manufacturer recommendations. Verify rough opening conditions are within recommended tolerances.

## 3.3 PREPARATION

A. Prepare door for installation in accordance with manufacturer's recommendations.
B. Trim bottom of jamb sides to achieve desired distance between door bottom and finished floor height.

## 3.4 PASSAGE MIRRORED AND COMMERCIAL DOOR INSTALLATION

A. Place door unit into opening and level hinge side of jamb. Use shims fastened through jamb and stop to level and temporarily secure in place.
B. Level latch side of jamb. Use shims fastened through jamb and stop to level and temporarily secure in place.
C. Verify spacing between jamb and door is uniform on all sides. Adjust as necessary.
D. Shim top of jamb in center of opening and fasten with nail.
E. Re-check for square, level and even spacing around door. Nail securely in place through stop, jamb, shims and into studs every 12 inches.
F. Set nails.
G. Install trim on both sides using nails every 12 to 16 inches.

## 3.5 SCHEDULES

A. See Door Schedule.

END OF SECTION 08 16 00

**SECTION 08 31 00**
**ACCESS DOORS AND PANELS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 SUMMARY

A. Section Includes: Fire-resistive rated and non-rated access doors, panels, and frames, complete.
   1. Not all access doors are explicitly indicated on Drawings. Provide all access doors required by the various trades and coordinated as to location and size, whether specifically indicated or not.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS:

1. Section 06 10 00 - Rough Carpentry: Wall and ceiling framing.
2. Section 09 91 00 - Painting.
3. Division 22 - Plumbing.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's catalog cuts and product data on each type of access door. Include sizes, types, finishes, scheduled locations, and details of adjoining work. Submit manufacturer's recommended installation instructions. Submit in accordance with Division 1.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Recessed Access Doors in Drywall Substrates:

1. Manufacturer: J. L. Industries "Style WB"; Karp Associates "Type KDW"; Milcor "Style DW"; or equal.

2. Features:

a. Frame: 16-gage steel with an integral galvanized steel drywall bead.

b. Door: 14-gage steel, fitted flush with integral bead.

c. Hinges: Concealed spring hinges permitting 175 degree opening.

d. Lock: Flush screwdriver operated cam locks for all access doors except provide flush key operated cylinder locks for access doors in all public areas.

B. Stainless Steel Access Doors in Ceramic Tile Substrates:

1. Manufacturer: J. L. Industries "Style TMS"; Karp Associates "Type DSC-214M Stainless Steel"; Milcor "Style MS"; or equal.

2. Features:

a. Frame: 16-gage stainless steel with a nominal 1-inch exposed frame flange. Provide galvanized steel anchors appropriate for substrate.

b. Door: 14-gage stainless steel, fitted flush with frame flange. Reinforce access doors over 24 inches wide to prevent sagging.

c. Hinges: Concealed spring hinges permitting 175 degree opening.

d. Lock: Flush key operated stainless steel cylinder locks.

C. Fire Rated Steel Access Doors: UL 1-1/2-hour labeled, "Class B" fire-rated, and as follows:

1. Manufacturer: J. L. Industries "Style FD"; Karp Associates "Type KPR-150 FR"; Milcor "Insulated Fire-Rated Doors"; or equal.

2. Features:

a. Frame: 16-gage steel with a nominal 1-inch frame flange and integral appropriate anchors.

b. Door: 2-inch thick, fabricated of 20-gage steel face sheets, sandwich construction, with a non-combustible insulation core.

c. Hinges: Continuous stainless steel piano type hinge with stainless steel pin for the length of the door. Provide an automatic spring door closer for all doors.

d. Lock: Automatic latching device with operating turn ring and interior latch release. Provide flush key operated cylinder lock in all public areas.

D. Ceiling Access Doors: Aluminum access door, nominal 1'-6" x 1'-6" size, unless otherwise indicated on Drawings.

1. Manufacturer: Milcor "Type CF", Babcock-Davis, or equal.

2. Features:

a. Frame: 1/4-inch thick aluminum extrusions with mitered and welded corners and complete with hanger brackets attached.

b. Cover: 1/8-inch thick aluminum plate mounted to the frame with continuous stainless steel hinge, downward swinging.

c. Latch: Automatic snap latch with removable outside handle.

d. Finish: Primed for field painting under Section 09 91 00.

E. Access Doors in Sound-Rated Construction: Same as fire-rated access doors:

1. Door Panel: Double wall insulated.

2. Insulation: Minimum 1-1/2-inch thick mineral wool.

3. Hinge: Continuous piano hinge.

F. Weatherproof Access Door at Exterior:

1. Manufacturer: Cierra Products "Style C-XT"; Larsen’s "Type L-XT"; Nystrom "ST Series"; or equal.

2. Features:

a. Frame: Minimum 0.060-inch thick extruded aluminum.

b. Door: 20-gage galvanized steel.

c. Hinges: Continuous stainless steel piano type hinge.

d. Lock: Key-operated handle on outside.

e. Insulation: 2-inch thick fiberglass.

2.2 FABRICATION

A. General: Furnish each access door assembly manufactured as an integral unit, complete with all parts and ready for installation.

B. Fabricate steel access doors and frames of continuous welded steel construction, unless otherwise indicated. Weld, fill, and grind joints smooth with adjacent surfaces to assure flush and square unit.

C. Furnish attachment devices and fasteners of type required to secure access panels to types of support shown.

D. Furnish all access doors and panels keyed alike.

2.3 FINISH

A. Galvanized Steel Doors: Manufacturer's standard prime paint.

B. Stainless Steel Doors: Buffed #4 satin finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which work of this section will be installed. Verify rough openings for doors and frames are correctly sized and located.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install drywall access doors flush with the contiguous surfaces.

B. Install stainless steel access doors after surrounding tile work is completed; set flange tight against the face of tile.

C. Install frames plumb and level in floor, wall and ceiling openings.

D. Position to provide convenient access to concealed work requiring access. Coordinate installation with work of other trades.

E. Secure rigidly in place in accordance with manufacturer's instructions.

3.3 ADJUST AND CLEAN

A. Adjust hardware and panels after installation for proper operation.

B. Remove and replace panels or frames which are warped, bowed or otherwise damaged.

END OF SECTION 08 31 00

**SECTION 08 53 14**
**FIBERGLASS WINDOWS AND STOREFRONTS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 SUMMARY

A. Section includes Education Center Windows and Storefront Entrances.

   a. High quality, commercial grade, thermally efficient 4½" fiberglass windows.

B. Related Sections:

   1. Section 07 25 00 "Weather Barriers."
   2. Section 07 62 00 "Sheet Metal Flashing & Trim."
   3. Section 07 92 00 "Joint Sealants."
   4. Section 08 11 14 "Aluminum Doors and Frames"
   5. Section 08 80 00 "Glazing."

1.3 REFERENCES

A. American Architectural Manufacturers Association (AAMA)

B. American Society for Testing and Materials (ASTM)

C. FGIA: Fenestration & Glazing Industry Alliance; www.fgiaonline.org.

D. NFRC: National Fenestration Rating Council; www.nfrc.org.

E. Reference Standards:

   1. AAMA 625-20: Voluntary Specification, Performance Requirements and Test Procedures for Superior Performance Organic Coatings on Fiber Reinforced Thermoset Profiles

   2. AAMA/WDMA/CSA 101/ I.S.2/A440-17: North American Fenestration Standard/Specification for windows, doors, and skylights

   3. ASTM C920-18(24): Standard Specification for Elastomeric Joint Sealants

4. ASTM E283/E283M-19: Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
5. ASTM B117-19: Standard Practice for Operating Salt Spray (Fog) Apparatus
6. ASTM E331-00(23): Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
7. ASTM E1105-15(23): Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference
8. ISO 14025:2016: Environmental labels and declarations - Type III environmental declarations - Principles and procedures
9. ISO 14044:2006 : Environmental management - Life cycle assessment- Requirements and guidelines
10. ISO 21930:2017: Sustainable in buildings and civil engineering works -Core rules for environmental product declarations of construction products and services
11. SFM 12-7A-2: California Referenced Standards Code – Exterior Windows State Fire Marshal Standard

1.4 SYSTEM DESCRIPTION

A. Furnish labor, materials and other services to complete the fabrication of new fiberglass windows and storefront systems, including all materials required for the supply and installation of the units in the manner, direction and performance shown on the design drawings and specified herein.

B. Fiberglass window and door framing to incorporate a drained and vented system with complete air, vapor and moisture seals, allowing water entering the framing to drain to the exterior.

C. Fiberglass inswing windows and doors to be interior glazed complete with a continuous silicone heel bead from the IGU to the sash frame. Note: Exterior glazed products do not require a continuous silicone heel bead.

D. Fiberglass windows, sliding doors and inswing doors to incorporate a concealed hinge system with a continuous interior air seal, uninterrupted by any hardware. Fiberglass outswing door standard hinge is an exposed hinge system.

E. Drawings and specifications for work of this section are based upon fiberglass windows and doors manufactured by Cascadia Windows Ltd. #101 – 5350B 275 Street, Langley, BC, Canada (web: www.cascadiawindows.com).

## 1.5 TESTING AND PERFORMANCE

A. Environmental Product Declaration (EPD):

1. Type III EPD utilizing the 2023 Product Category Rules.
2. Meet the ISO 14044, 2930:2017, and 14025:2006 standards.
3. Third-party reviewed and verified.

B. Air Tightness:

1. Laboratory Testing

a. Air infiltration and exfiltration rates at a static air pressure differential of 1.6 psf (75 Pa) when tested in accordance with AAMA/WDMA/CSA 101/I.S.2/A440 and ASTM E283 to be not more than:
   1. Fixed Windows (interior or exterior glazed): 0.00 cfm/ft² (0.00 L/s.m²).
   2. Inward opening hopper-type windows: 0.03 cfm/ft² (0.13 L/s.m²).
   3. Inward opening tilt & turn-type (dual action) windows: 0.00 cfm/ft² (0.00 L/s.m²).
   4. Outward opening casement-type windows: 0.01 cfm/ft² (0.06 L/s.m²).
   5. Outward opening awning-type windows: 0.00 cfm/ft² (0.01 L/s.m²).
   6. Outswing doors (single or double sash): 0.04 cfm/ft² (0.21 L/s.m²).
   7. Inswing doors (single or double sash): 0.02 cfm/ft² (0.09 L/s.m²).
   8. Sliding doors (single or double sash): 0.01 cfm/ft² (0.07 L/s.m²).

C. Water Penetration Resistance:

1. Laboratory Testing for windows and doors.

a. There shall be no water infiltration at a static air pressure differential as follows when tested in accordance with AAMA 101 and ASTM E331.
b. Water penetration resistance test pressure:15 psf (720 Pa).

2. Field Testing:

a. No water infiltration at a cyclic static air pressure difference at 12 psf (575 Pa) when tested in accordance with AAMA 101 and ASTM E1105.

D. Structural Requirements & Performance/Design Criteria:

1. Performance Grade (PG) and Class of all windows and doors shall be tested to AAMA/WDMA/CSA 101/I.S.2/A440:

a. For fixed windows, CW-95. or higher.

b. For operable window (inward or outward) CW-45 or higher.

c. For swing doors (inswing or outswing), CW-35 or higher.

d. For sliding doors (single sash), CW-PG45.

2. Components and cladding design wind pressure (DP) for the project of: ASD calculation method shall be used for the design of mullions, reinforcing, and other spanning members.

a. Design glass according to AAMA/WDMA/CSA 101/I.S.2/A440.

b. Design fiberglass according to AAMA/WDMA/CSA 101/I.S.2/A440.

c. Design glazing and spanning window frame members, including any required reinforcing, in accordance with AAMA/WDMA/CSA 101/I.S.2/A440. There shall be no deflection in excess of L/175 of the span of any framing member.

d. Allow for deflection of building structure. Ensure no structural loads are imposed on window assemblies. In lieu of other specific requirements the minimum requirements are as specified by the structural engineer.

E. Thermal Requirements

1. The Thermal Transmittance U-Value shall be certified in accordance with the National Fenestration Rating Council (NFRC).

a. Overall U-values, utilizing a 1” (25mm) nominal double glazed insulated glass unit, incorporating one soft coat metallic Low-E coating:

1. Fixed windows = 0.24 (BTU/ hr*ft2*°F) / 1.38 (W/m2*k)

2. Tilt & Turn windows = 0.24 (BTU/ hr*ft2*°F) / 1.36 (W/m2*k)
3. Hopper windows = 0.24 (BTU/ hr*ft2*°F) / 1.37 (W/m2*k)
4. Casement = 0.24 (BTU/ hr*ft2*°F) / 1.36 (W/m2*k)
5. Awning = 0.24 (BTU/ hr*ft2*°F) / 1.37 (W/m2*k)
6. Inswing and outswing doors= 0.23 (BTU/ hr*ft2*°F) / 1.28 (W/m2*k).
7. Sliding door = 0.23 (BTU/ hr*ft2*°F) / 1.30 (W/m2*k).

*Note: U-values above are based on NFRC certified values using 6mm with LowE 366 on surface #2 – 13mm airspace with argon fill – 6mm.

b. Ensure Solar Heat Gain Co-efficient (SHGC) certified in accordance with NFRC.

c. Overall SHGC, utilizing a 25 mm (1") nominal double glazed insulated glass unit, incorporating 1 soft coat metallic Low 'E' coating:

1. Fixed windows: 0.22
2. Awning: 0.16
3. Casement: 0.16
4. Tilt & Turn windows: 0.20
5. Hopper windows: 0.16

d. Ensure Visible Transmittance (VT) is certified in accordance with NFRC.

e. Overall VT, utilizing a 25 mm (1") nominal double glazed insulated glass unit, incorporating 1 soft coat metallic Low 'E' coating:

1. Fixed windows: 0.52
2. Awning: 0.35
3. Casement: 0.35
4. Tilt & Turn windows: 0.45
5. Hopper windows: 0.35

F. Wildfire Resistance:

1. Provide successful indicative test report for window product line, when tested in general conformance with SFM 12-7A-2.

2. Provide window frame types and components that conform to the recommended types within the FireSmart Canada Builder's Checklist, which includes fiberglass and metal. Vinyl/PVC materials are not acceptable.

1.6 SUBMTTALS

A. Finish Color: Provide available Colors Chart for State's Representative review and selection and two color samples of selected color for State's Representative Approval.

B. Shop Drawings:

1. Submit Shop Drawings of fiberglass windows, components and accessories in accordance with Division 01.

2. Indicate window locations, frame types and sizes. Include details showing window profiles (head, jamb, sill, coupler and mullions), interface with adjacent wall assemblies, including air/vapor barrier continuity. Indicate frame finish color, glazing types and any accessories. Clearly indicate materials used for every component on Shop Drawings.

3. Submit Shop Drawings showing where anchors and shims are placed, type of anchors, shim thicknesses, widths, number of fasteners and edge clearances for fasteners.
4. Coordinate with Structural Drawings for deflection criteria.

1.7 CLOSEOUT SUBMITTALS

A. Operational and Maintenance Data: Provide data for maintenance and cleaning in accordance with instructions under General Conditions.

1.8 QUALITY ASSURANCE

A. Insulating Glass Unit Fabricators: Ensure insulating glass unit fabricators have membership and certification in the FGIA. Ensure FGIA members participate in the certification program and successfully pass a Compliance Audit within the last 6 months.
B. Installers: Provide work of this Section executed by competent installers with minimum 5 years' experience in the application of Products, systems and assemblies specified and with approval and training of the Product manufacturers.

1.9 DELIVERY, STORAGE AND HANDLING

A. Delivery and Acceptance Requirements: Transport materials to site storage in a manner to prevent in-transit damage. These measures include, but are not limited to, crating, polyethylene wrapping system, etc.

B. Storage and Handling Requirements:

1. Store in a dry, protected area on site, in original undamaged containers with manufacturer's labels and seals intact.

2. Handle Products with care in accordance with manufacturer's published recommendations.

3. Remove damaged or unsatisfactory materials from site and replace with new materials to satisfaction of Architect at no cost to Owner.

4. Comply with unpacking procedures as recommended by window manufacturers.

1.10 WARRANTY

A. Provide manufacturers standard express limited warranty on fiberglass frame components for a period of 20 years for workmanship and materials.

B. Provide manufacturers standard express limited warranty on integral hardware for a period of 10 years for workmanship and materials.

C. Provide manufacturers standard express warranty for the insulated glass units to cover premature hermetic seal failure (condensation between the lites at normal service

temperatures) appearing within a period of 10 years from the date of substantial completion.

D. Provide data for maintenance and cleaning in accordance with instructions under General Conditions.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Acceptable Manufacturers: Cascadia Windows and Doors, Langley, BC, Canada.

B. Acceptable Products:

1. Universal Series™ Fixed, Operable Windows and Doors.

a. Provide **"Wildfire Resistant – Plus"** variant of fiberglass window product line, which is to include fire-retardant fiberglass resin. Fabricate all window types to include all components and accessories as tested in successful indicative test to SFM 12-7A-2. Glazing shall include a minimum of two 6mm thick panes, with the interior pane to be tempered. Exterior pane tempered where required to meet other performance or safety criteria. This minimum glazing criteria shall take precedence to other glazing specifications if this criterion is more stringent. Insect screen mesh shall be aluminum.

2.2 MATERIALS AND ACCESSORIES

A. All frame and sash profiles are made from Pultruded Fiberglass.

1. Pultrusions shall be manufactured with clamp-action equipment. No surface texture from rollers is permitted.

2. Glass content average for pultruded profiles: 55% or more.

C. Fasteners:

1. Fasteners shall be 300 series stainless steel, 400 series stainless steel, or Leland Industries DT2000 coated of sufficient size and quantity to perform their intended function.

2. Fastener corrosion resistance shall be: 2000 hours minimum, when tested in accordance with ASTM B117.

D. Glazing tape: Black, closed cell copolymer, polyethylene foam coated with an acrylic adhesive. All upward facing exterior horizontal joints to have an additional cap bead of neutral cure silicone.

E. Internal Frame Sealant: Non-sag type, 1 component, pre-pigmented, neutral cure elastomeric silicone sealant conforming to ASTM C920, Type S, Grade NS, Class 25, Use NT, G and A. Supply “DOWSIL™ 1199 Silicone Glazing Sealant” by The Dow Chemical Company.

F. Exterior Sealant: Non-sag type, 1 component medium-modulus, pre-pigmented, elastomeric silicone sealant conforming to ASTM C920, Type S, Grade NS, Class 50, Use NT, G, M, A and O. Supply “DOWSIL™ 795 Silicone Building Sealant” by The Dow Chemical Company.

G. Insulated Glazing Units: Insulated glazing unit certified by FGIA. Glass thickness shall be in accordance with applicable Building Codes, but not less than 4mm. Ensure insulated glass units are 90% argon filled or air filled if capillary tubes are required and utilize soft coat metallic Low ‘E’ coating(s). Edge construction consists of a primary seal of polyisobutylene; a tubular low conductivity stainless steel spacer-bar with sealed corners, filled with desiccant; and a secondary seal of neutral cure silicone. Performance requirements indicated in this section are for center-of-glass.

1. Acceptable Low-E coated, insulated glazing units (double glazed):

a. See Section 08 80 00 Glazing for Glazing specifications.

1. Solar and thermal performance equal to Cardinal LowE 366, on #2 surface, argon filled. Center-of-Glass performance: U-0.24 (BTU/ hr*ft2*°F) / USI-1.36 (W/m2*k), SHGC 0.27, VT 63%.

2. Tempered glass in insulated glazing units:

a. Where required by local building code or bylaw, and additionally as indicated in the construction documents.

E. Hardware

1. All hardware to be supplied by a single manufacturer:

a. Approved manufacturer: Roto Frank of America. Roto Fasco Canada, Inc.; www.rotonorthamerica.com.
b. Casement and Awning Windows: “Roto Sil Level 6” corrosion resistant finish on hinge components and stainless steel multi-point lock bar, stainless steel locking keepers and stainless steel rotary crack operator with folding handle.
c. Tilt & Turn and Hopper Windows: “Roto Sil Level 6” nano corrosion resistant finish, multi-point locking hardware.
d. Inswing and Outswing doors: RotoSil nano corrosion resistant finish, multi-point locking hardware, and exposed hinges for swing-only doors.
e. Hardware finish: Color to be selected from supplier’s standard range.

F. Finish

1. Two-component waterborne polyurethane, meeting the requirements of AAMA-625, permitted product: “Hydro Tuff Urethane” by BlueRiver Coatings; www.bluerivercoatings.com.

a. Interior Frame Finish: Architect to choose from manufacturer’s standard color range.

b. Exterior Frame Finish: Architect to choose from manufacturer’s standard color range.

G. Glazing Stop

1. Provide manufacturer pultruded fiberglass glazing stops for 1” (25 mm) and 1-3/4” (45 mm) nominal insulated glass units, and aluminum glazing stops for 1-1/4” (32 mm) nominal insulated glass units, louvres, spandrel glass, and aluminum composite metal panels

2. Lock-in, screw-less type.

3. No PVC materials shall be used for glazing stop or related accessories.

H. Fabrication:

1. Fabricate framing from pultrusions of size and shape shown on Shop Drawings.

2. Ensure framing joints are accurately machined, assembled and sealed to provide neat weather-tight connections.

3. Provide interior heel bead at interior glazed units as required for rain screen system.

4. Ensure glazing pockets are vented, pressure equalized and drained to exterior.

5. Ensure manufactured factory sealed insulating glass units are in accordance with FGIA's "IGMAC Certification Program Manual".

I. Accessories:

1. Simulated Divided Lites. See Drawings.

2. Bird Friendly Glass, see Drawings, see Section 08 80 00 Glazing.

2.4 SYSTEM FABRICATION

A. Continuous sub-sill and diverters shall be provided to collect water infiltration and divert from the interior of the system.

B. Framing members shall be internally reinforced and secured at head and sill as necessary for structural performance requirements, for hardware attachment, and as indicated.

C. Fasteners shall be so located as to ensure concealment from view in the final assembly.

PART 3 – EXECUTION

3.1 EXAMINATIONS

A. Verification of Conditions: Verify actual site dimensions and location of adjacent materials prior to commencing work. Notify Architect in writing of any conditions which would be detrimental to the installation.

B. Evaluation and Assessment: Commencement of work implies acceptance of previously completed work.

3.2 FABRICATION

A. Fabricate framing from pultrusions of size and shape shown on Shop Drawings.

B. Ensure framing joints are accurately machined, assembled and sealed to provide neat weather-tight connections.

C. Provide interior heel bead at interior glazed units as required for rain screen system.

D. Ensure glazing pockets are vented, pressure equalized and drained to exterior.

E. Ensure manufactured factory sealed insulating glass units are in accordance with FGIA's "IGMAC Certification Program Manual".

3.2 INSTALLATION

A. Assemble and install window units according to manufacturer's instructions and approved Shop Drawings.

B. Set window framing in its correct location, level, square and plumb and at proper elevations and alignment with other work.

C. Erection Tolerances: Maintain required clearance to allow for movement and thermal expansion and contraction.

D. Sealant: Seal joints at interior and exterior joints between fiberglass window framing and adjacent work of others in accordance with window manufacturer's recommendations.

E. Windows shall be installed, glazed and adjusted by experienced personnel in accordance with the manufacturer's instructions and approved shop drawings.

F. All items in this section shall be set level, square, plumb and at proper elevations and in alignment with other work.

3.3 FIELD QUALITY CONTROL

A. Site Tests and Inspections:

1. No water infiltration at a cyclic static air pressure difference at 15 psf (720 Pa) when tested in accordance with AAMA/WDMA/CSA 101/I.S.2/A440 and ASTM E1105.

2. Air tightness field test to Fixed for fixed window and A3 for operable windows when tested in accordance with AAMA/WDMA/CSA 101/I.S.2/A440.

B. Test the storefront for water leaks in accordance with AAMA 501.2. Conduct test in the presence of the Architect. Correct deficiencies observed as a result of this test.

C. Non-Conforming Work: Replace damaged work which cannot be satisfactorily repaired, restored or cleaned, to satisfaction of Architect at no cost to Owner.

3.4 ADJUSTING

A. Adjust operable windows to operate smoothly and fit tightly when closed and locked.

B. Adjust hardware to operate smoothly with proper tension and gasket engagement. Lubricate as required and per window manufacturer's recommendations.

3.5 PROTECTION AND CLEANING

A. Windows shall be isolated and protected from concrete, mortar, plaster and other Building materials during and after installation until acceptance by the General Contractor. Thereafter, it shall be the responsibility of the General Contractor to maintain protection and provide final cleaning.

END OF SECTION 08 53 14

**SECTION 08 62 00**
**UNIT SKYLIGHTS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 SECTION INCLUDES

A. Fixed curb mount unit skylight with formed curb counterflashing for mounting on roof pre-fabricated roof curbs for flat, low-slope, and steep-slope roofing applications.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Section 06 10 00 "Rough Carpentry" for site-built wood roof curbs for unit skylights.

B. Section 07 41 13 “Standing Seam Metal Roof Panels” for roofing surrounding skylights.

C. Section 07 13 90 “Roofing Underlayment” for roofing underlayment surrounding skylights.

D. Section 07 62 00 “Sheet Metal Flashing & Trim” for flashing and roofing terminations at unit skylight curbs.

E. Section 07 92 00 "Joint Sealants."

1.4 REFERENCE STANDARDS

A. General: Applicable edition of references cited in this Section is current edition published on date of issue of Project specifications, unless otherwise required by building code in force.

B. American Architectural Manufacturers Association (www.aama.net), Window & Door Manufacturers Association (www.wdma.com), Canadian Standards Association (www.csagroup.org/us/en/services)
   1. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/ Specification for Windows, Doors, and Skylights (NAFS)
   2. CSA A440S1-09 – Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440

3. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems
4. AAMA 2603 – Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum and Panels

C. ASTM International: www.astm.org:
1. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
2. ASTM E 108 - Standard Test Methods for Fire Tests of Roof Coverings
3. ASTM E 283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
4. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
5. ASTM E 408 - Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques
6. ASTM E 1886 - Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials
7. ASTM E 1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes

D. Code of Federal Regulations:
1. 29 CFR 1910.23 (e) (8) - Occupational Safety and Health Standards for Walking-Working Surfaces to Guard Floor and Wall Openings and Holes

E. Illuminating Engineering Society of North America (IESNA): www.ies.org:
1. IESNA – The Lighting Handbook.

F. National Fenestration Rating Council: www.nfrccommunity.org:
1. NFRC 100 - Procedure for Determining Fenestration Product U-factors
2. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence

G. National Fire Protection Association: www.nfpa.org:
1. NFPA 70 - National Electrical Code

1.5 COORDINATION

A. Coordinate dimensions, locations, and details of skylight curbs specified in Section 06 10 00 "Rough Carpentry" with unit skylight ECL Curb Mount

flashings. Verify requirements for metal roofing system terminations with manufacturer installation recommendations.

B. Coordinate unit skylight interior termination locations with structural layout, ceiling grid layouts, and other ceiling-mounted items.

1.6 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site prior to delivery of unit skylight and installation of roof deck.

1.7 ACTION SUBMITTALS

A. Product Data: For unit skylights. Include standard construction details, product performance characteristics, and material descriptions, dimensions of individual components and profiles, and finishes.
1. Include test reports of qualified independent testing agency or third party certificates verifying compliance with performance requirements.

B. Shop Drawings: For unit skylight work. Include plans, elevations, sections, details, and connections to supporting structure and other adjoining work.
1. Lighting photometric study indicating compliance with performance requirements in accordance with IESNA. Include layout, spacing criteria and foot-candle report.

1.8 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.9 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data.

1.10 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer listed in this Section with minimum 30 years' experience in the US manufacturing similar products in successful use on similar projects and able to provide unit skylights meeting requirements.

B.
1. Approval of Manufacturers and Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:
a. Completed and signed Substitution Request form.
b. Product data, including photometric data and independent test data indicating compliance with requirements.
c. Sample product warranty.

1.11 WARRANTY

A. Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of unit skylights that fail in materials or workmanship under normal use within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Deterioration of metals, metal finishes, dome, and other materials beyond normal weathering.
      b. Breakage of glazing.
   2. Warranty Period:
      a. Unit Skylight and Flashing Product Warranty: 10 years from date of purchase.
      b. Unit Skylight and Flashing Installation “No Leak” Warranty: 10 years from date of purchase.
      c. Hail Breakage Warranty for Skylight Glass: 10 years from the date of purchase on all insulated glass units using laminated glass.
      d. Insulating Glass Seal Failure Warranty: 20 years from date of purchase.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide products of VELUX America Inc., Greenwood, SC 29648; www.VELUXusa.com; (800) 878-3589, specifications@veluxusa.com or Approved Equal.

B. Substitutions: As permitted under Instructions to Bidders and Division 1 - Substitution Procedures.

C. Source Limitations: Obtain unit skylights through single source from single manufacturer.

2.2 Fixed Curb Mounted (FCM) Unit Skylights

A. System Description: Fixed curb mounted unit skylight with a roll-formed aluminum frame counter-flashing joined by corner keys, an interior condensation drainage gasket, an insulated glass unit, structural sealant, mounting fasteners, flashing and accessories, as required to meet installation and performance requirements indicated. FCM skylights shall be suitable for installation on roof curbs ranging from 0 degrees up to 60 degrees from horizontal.
   1. Basis of Design: VELUX America, Inc, Model FCM Fixed Curb Mount Skylight. See Plans, window schedule for sizes.

B. Aluminum Frame Counter-flashing: Maintenance-free, roll-formed aluminum, 15 gauge, 0.06 inch (1.5 mm) thick with neutral grey Kynar® 500 polyvinylidene

fluoride resin finish. Counter-flashing frames joined with neutral grey corner keys constructed from injection molded Acrylonitrile Styrene Acrylate (ASA)-Luran.

1. Unit Sizes: as indicated on Drawings – window schedule.

C. Condensation Drainage Gasket: Factory applied black thermoplastic rubber gasket mounted around the entire interior aluminum frame assembly providing a thermal break weather seal and drainage for interior condensation.

D. Insulated Glass Unit: Factory assembled with low emissivity exterior pane and clear interior pane separated by a stainless steel spacer sealing the space between panes with 95% argon gas.

1. Exterior Pane: 0.125 inch (3mm) thick tempered glass with Bird Friendly (Threat. Factor ≤ 25) S1 treatment (2”x2” etched dots), Neat® exterior coating, and interior surface coated with three layers of low emissivity silver (LoE$^3$) coating LoE$^3$ 366.

2. Interior Pane:
   a. Impact Laminated for wind-borne debris regions, Two clear 0.090 inch (2.3 mm) heat-strengthened panes with a 0.090 inch (2.3 mm) white Sentryglasplus® interlayer sandwiched together.

E. Structural Sealant: Factory applied silicone sealant, black color, bonding the glass pane to the aluminum frame and suitable for external exposure.

F. Mounting Fasteners: #8 x 1.75 inch (44 mm) stainless steel, black zinc coated, self-drilling screws provided with skylight. [12] field installed screws secures skylight to site built curb as indicated in manufacturer’s installation instructions.

2.3 Flashings

A. High Profile Flashing: Roll formed aluminum, neutral grey finish to match metal roofing color, factory engineered and fabricated seams, consisting of head flashing, sill flashing, side gutter pieces, counter flashing and adhesive underlayment suitable for use with 4 inch (100 mm) and 6 inch (150 mm) curbs on roof pitches 14 to 60 degrees from horizontal.

1. Basis of Design: VELUX America, Inc, ECL Step Flashing for Metal Roof.
2. Size: As required for skylight sizes indicated.
3. Material:
   a. Head flashing 23 gauge (0.57 mm) thick aluminum with polyester lacquer finish.
   b. Sill flashing 22 gauge (0.65 mm) thick aluminum with Kynar 500 finish and 9 inch (229 mm) pleated apron.
   c. Side gutter pieces 23 gauge (0.57 mm) thick aluminum with polyester lacquer finish.

d. Counter-flashing 23 gauge (0.57 mm) thick with 4 inch (100 mm) curb counter flashing, aluminum with polyester lacquer finish.
e. Adhesive underlayment: 12 inches (305 mm) width x 21 feet (6.4 m) length x 0.03 inch (0.8 mm) thickness, SBS modified bitumen with white polyethylene backing sheet.

2.4 PERFORMANCE REQUIREMENTS

A. Unit Skylight Standard, FCM 4646 or smaller unit with tempered Lo-E 366 coated exterior glass pane and interior pane as follows:
AAMA/WDMA/CSA 101/I.S.2/A440 (NAFS-17):
1. Design Pressure (DP):
   a. [Standard Laminated with 0.030 inch (0.76 mm) Interlayer: DP = +175/-120 psf (+8.38/-5.75 kPa)]
   b. [Impact Laminated with 0.090 inch (2.3 mm) PVB Interlayer: DP = +125/-80 psf (+5.9/-3.83 kPa)]

2. Water Test Pressure: 15 psf with no leakage at 5 gallons per minute spray rate.
3. Air Leakage Rate: 0.030 cfm/ft$^2$ maximum.
4. Canadian Air Infiltration/Exfiltration Rating: Fixed. (0.2 L/s/m$^2$ maximum).

B. Unit Skylight Standard, 2270 size and smaller unit with tempered exterior glass pane and standard laminated interior pane with 0.030 inch (0.76 mm) interlayer.. AAMA/WDMA/CSA 101/I.S.2/A440 (NAFS-17 or previous):
1. Design Pressure (DP): +200/-100 psf (+9.58/-4.79 kPa).
2. Water Test Pressure: 15 psf (0.72 kPa) with no leakage at 5 gallons per minute spray rate.
3. Air Leakage Rate: 0.030 cfm/ft2 maximum
4. Canadian Air Infiltration/Exfiltration Rating: Fixed. (0.2 L/s/m$^2$ maximum).

C. Unit Skylight Standard, 4672 size and smaller unit with tempered exterior glass pane and standard laminated interior pane with 0.030 inch (0.76 mm) interlayer. AAMA/WDMA/CSA 101/I.S.2/A440 (NAFS-17 or previous):
1. Design Pressure (DP): +70/-80 psf (+3.35/-3.83 kPa).
2. Water Test Pressure: 15 psf (0.72 kPa) with no leakage at 5 gallons per minute spray rate.
3. Air Leakage Rate: 0.030 cfm/ft2 maximum
4. Canadian Air Infiltration/Exfiltration Rating: Fixed (0.2 L/s/m2 maximum).

D. Daylighting: Provide daylighting photometric performance comparable to basis of design product at layout indicated, based upon daylighting profile of March 21, 9:00 am local time, at Project location by simulation in accordance with IESNA guidelines.

E. Air Infiltration: Maximum air leakage through tested size of 0.030 cfm/sq. ft. of fixed area as determined according to ASTM E 283 at a static-air-pressure differential of 1.57 lbf/sq. ft.

F. Water Penetration under Static Pressure: No evidence of water penetration through unit when tested according to ASTM E 331 at a static-air-pressure differential of 15 lbf/sq. ft.

G. Windborne-Debris Resistance:
1. Wind Zone 4 or Less: Provide unit skylights capable of resisting impact from windborne debris, based on the pass/fail criteria as determined from testing glazed representative of those specified, according to ASTM E 1886 and ASTM E 1996. Missile Level C, Wind Zone 4 requirements, and +50/-50 psf cycle pressure minimum.

H. Fire Ratings for Roof Assemblies with Fire Classifications: Unit skylight tested in accordance with ASTM E 108 and listed as passing Burning Brand test with target classification of Class B.

I. Energy Performance ratings for any size fixed curb mounted unit skylight with tempered Lo-E 366 coated exterior glass pane and interior pane as follows:
1. Thermal Transmittance: NRFC 100 maximum U-factor:
a. Triple pane: 0.38 Btu/hr*ft2*deg F (2.18 W/m2*deg C).

2. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum SHGC for LoE3 366
a. $LoE^3$ – 366 exterior pane with tempered clear middle pane and interior clear standard laminated using 0.030 inch (0.76 mm) Interlayer: 0.25

3. Visible Transmittance (Vt): NFRC 200 maximum Vt:
a. $LoE^3$ – 366 exterior pane with tempered clear middle pane and interior clear standard laminated using 0.030 inch (0.76 mm) Interlayer: 0.57
1. Provide glazing unit with measured haze value of greater than 90% as required.

J. Fall Protection Standard Compliance: 29 CFR 1910.23: Passed for all laminated fixed curb mount unit skylights.

## 2.5 MATERIALS

A. Aluminum Sheet: Flat sheet complying with ASTM B 209/B 209M.

B. Joint Sealants: As specified in Section 07 92 00 "Joint Sealants."

C. Mastic Sealants: Polyisobutylene; nonhardening, non-skinning, nondrying, nonmigrating sealant.

2.6 FINISHES

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.

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. Proceed with unit skylight installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install unit skylights in accordance with manufacturer's written instructions and approved shop drawings. Coordinate installation of units with installation of substrates, air and vapor retarders, roof insulation, roofing membrane, and flashing as required to ensure that each element of the Work performs properly and that finished installation is weather tight.
   1. Anchor unit skylights securely to supporting substrates.
   2. Install unit skylights on curbs specified in another section with tops of curbs parallel to finished roof slope.

B. Where metal surfaces of unit skylights will contact incompatible metal or corrosive substrates, including preservative-treated wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation recommended in writing by unit skylight manufacturer.

C. For custom flashings, install unit skylight curb counter-flashing to produce weatherproof seal with curb and overlap with roofing system termination at top of curb.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Contractor shall engage testing agency to perform tests and inspections.

1. Test for water leaks according to AAMA 501.2 after installation and curing of sealants but prior to installation of interior finishes.
2. Perform test for total area of each unit skylight.

B. Work will be considered defective if it does not pass tests and inspections.

C. Additional testing and inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

D. Prepare test and inspection reports.

3.4 CLEANING AND PROTECTION

A. Clean exposed unit skylight surfaces according to manufacturer's written instructions. Touch up damaged metal coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

B. Replace glazing that has been damaged during construction period.

C. Protect unit skylight surfaces from contact with contaminating substances resulting from construction operations.

END OF SECTION 08 62 00

**SECTION 08 71 00**
**DOOR HARDWARE**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. All necessary door hardware to complete the Project, except those items specifically mentioned to be furnished by other Sections.

2. Wherever items of door hardware are not definitely specified but are required for proper completion and/or operation of doors, or a hardware item may no longer be available, furnish hardware in type, quality, and finish suitable for the service required and comparable to that specified for similar conditions, and notify the State's Representative immediately.

B. Products Supplied But Not Installed Under This Section: Furnish templates to Sections 08 11 13 and Section 08 11 16 for door and frame preparation.

C. Related Sections:
1. Section 05 50 00 – Metal Fabrications
2. Section 08 11 13 – Hollow Metal Doors and Frames
3. Section 08 11 16 – Aluminum Doors and Frames
4. Section 08 16 00 – Flush Composite Doors
4. Section 08 53 14 Fiberglass Windows and Storefront
5. Division 26 - Electrical: Power supply to electric hardware devices

1.3 SUBMITTALS

A. Hardware Schedule: Submit a complete schedule of door hardware for review. Reference items clearly to groups specified, door-type designations shown, location, and other pertinent data. Verify suitability, function, thickness of members, or other factors affecting appropriate selection. List manufacturer's names or suitable abbreviation to facilitate reviewing, opposite each item scheduled.

1. List only readily obtainable hardware that appears in current catalogs. Do not deliver hardware until schedule has been accepted by the State's Representative.

2. After the hardware schedule is accepted by the State's Representative, provide one copy of the accepted hardware schedule to each trade whose work may be affected.

B. Product Data: Submit catalog cuts and product data on each different type of hardware included in hardware schedule. Indicate locations and mounting heights of each type of hardware. Submit manufacturer's parts lists, templates, and installation instructions.

C. Samples: Prior to delivery of any hardware to the site, submit one sample of each class or type of hardware to the Architect for final review. Affix labels to fully identify manufacturer, class or type, and location on the Project. After review, accepted samples may be obtained from the State's Representative for installation on the Project, providing such samples are picked up within seven days of notification of acceptance.

D. Operation and Maintenance Data: Submit operation and maintenance data. Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

## 1.4 QUALITY ASSURANCE

A. Supplier Qualifications: Company experienced and specializing in supplying commercial door hardware. The hardware supplier shall employ a member of the Door Hardware Institute (DHI) who is a Certified Architectural Hardware Consultant (AHC) to prepare the hardware schedule submittal and be available for consultation with the State Representative and Architect. Upon completion of the building, check the installation and disclose any misapplication of hardware.

B. Installer Qualifications: Experienced installer who has completed installations similar in material, design, and extent to that required for this Project and with a record of successful in-service performance.

C. Regulatory Requirements:

1. Fire-Rated Door Assemblies: Comply with 2019 California Building Code and NFPA 80 for requirements applicable to fire-rated doors and frames, tested according to NFPA 252. Provide fire-labeled hardware at fire-rated openings.

2. Egress Doors: Comply with CBC Section 1010 and applicable requirements of NFPA 101 "Life Safety Code".

3. Electrified Door Hardware: Comply with CBC Section 1010; provide hardware listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction

4. Accessibility: Comply with CBC Section 11B and Americans with Disabilities Act (ADA), "2010 ADA Standards for Accessible Design".

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver hardware with items packed separately, complete and ready for installation with necessary fittings, trim, fasteners, and accessories. Mark packages clearly for identification in accordance with Hardware Schedule. Deliver hardware so that work may progress without delay or interruption.

B. Package all items of hardware and each lockset, latchset, exit device, and door control/closer in its individual package marked with manufacturer's name, type number, and name of item. Furnish each item complete with necessary fastenings, wrenches, spanners, installation instructions, and templates. Indelibly, legibly, and carefully mark each package with an item number corresponding to the door number and hardware group number as indicated on the opening schedule, the approved door Hardware Schedule, and the Drawings and details.

C. Protect hardware from damage before, during, and after installation.

1.6 COORDINATION

A. Coordinate work of this Section with other directly affected Sections involving manufacturer of any internal reinforcement for door hardware.

B. Manufacture all hardware to template. Provide templates and, if necessary, the physical hardware to fabricator of doors and frames in ample time to facilitate the work.

C. Coordinate electrical and security requirements of hardware items with related sections.

1.7 WARRANTY

A. Provide extended warranty for the following hardware items in accordance with requirements of Division 1. Warrant that hardware shall be free of defects in material and workmanship and that it will not deteriorate excessively or otherwise fail to perform as required.

1. Hinges: Life of building.
2. Door Closers: Ten years.
3. Locks: Five years.

1.8 MAINTENANCE MATERIALS

A. Provide special wrenches and tools applicable to each different or special hardware component.

B. Provide maintenance tools and accessories supplied by hardware component manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. General: Numbers in Hardware Schedule refer to those of the first named manufacturer below. Equivalent products by the other named manufacturers are also acceptable.

B. Butt Hinges: Arcadia, Stanley, Hager, Lawrence, McKinney.

C. Locksets and Latchsets: Schlage (SCH), BEST, Arcadia,

D. Cylinders: BEST, Lock Core

E. Exit Devices: Von Duprin (VON), Precision Hardware Inc.

F. Overhead Closers: LCN, Dorma, Norton.

G. Manual and Automatic Flush Bolts: Ives (IVE), Trimco, Door Controls Inc.

H. Stops: Ives (IVE), Trimco, Rockwood.

I. Overhead Holders/Stops: Glynn-Johnson (GLY), Rixson, Rockwood.

J. Gasketing and Thresholds: Pemko (PEM), NGP, Reese.

K. Protection Plates and Push/Pull Plates: Ives (IVE), Trimco, Rockwood.

2.2 HINGES

A. Standard: Meeting ANSI A156.1, Grade 1.

B. Type: Butt hinges of the five-knuckle non-rising removable pin with button tip and plug, fully-mortised, minimum of two bearings, stainless steel pins, and as follows:

1. Fire-Rated Doors: Steel hinges with steel pins, minimum of two ball bearings, and plated to match required finish.

2. Outswinging Doors to the Exterior: Stainless steel or non-ferrous material, with nonremovable pins (NRP) of the setscrew type.

C. Hinge Size:

1. Doors 1-3/4" thick and up to 37" wide: 4-1/2 x 4-1/2 inch butt hinges provided with at least two ball bearings or life-span bearings.

2. Doors over 1-3/4" thick or over 37" wide: 4-1/2 x 4-1/2 inch extra-heavy duty butt hinges provided with at least four ball bearings.

3. Butt hinges for doors thicker than noted above or with unusual trim conditions which would interfere with the full opening of the door shall be provided with hinges of sufficient size to adequately support the door weight and of sufficient width to clear adjacent trim.

D. Number of Hinges Per Door Leaf:

1. Doors up to 60 Inches High: Two hinges per door leaf.

2. Doors up to 90 Inches High: Three hinges per door leaf.

3. Doors over 90 Inches High: Three hinges plus one additional butt hinge for each additional 30 inches in height over 90 inches, or fraction thereof.

2.3 LOCKSETS, LATCHSETS, AND CYLINDERS

A. Standards:

1. Cylindrical Locks: Meeting ANSI A156.2, Series 4000, Grade 1.
2. Mortise Locks: Meeting ANSI A156.13, Grade 1.
3. Deadbolt Locks: Meeting ANSI A156.5, Grade 1.

B. Lock Type: Where locksets or latchsets are scheduled, provide scheduled lockset with BEST E-series Mortise Cylinder and cores, with backsets per door manufacturer’s recommendation unless otherwise noted. Provide all locks from the same manufacturer. Contractor shall verify compatibility of lockset and cylinder.

C. Strikes: Provide each lockset, latchset, and deadlock with a strike and a strike box. Provide standard type strikes with extended lips where required to protect adjacent trim from being marred by latch bolt. Verify cutout types provided in metal frames.

D. Construction Cylinders: Provide construction keying for cylinders as required and keys for use during construction. State Representative will remove construction cores and return to Contractor.

2.4 DOOR CLOSERS

A. Standards: Meeting ANSI A156.4, Grade 1.

B. Type: Rack and pinion construction, steel spring, fully hydraulic action, non-handed, cast iron or cast aluminum body, non-gumming, non-freezing hydraulic fluid requiring no seasonal adjustment for temperature.

C. Closer Force: Capable of having spring force increased by 50 percent by adjustment without removing from the door, and effecting a maximum operating pressure on the door as follows:

1. Interior Doors: 4.75 lbf.
2. Exterior Accessible Doors: 4.75 lbf..
3. Exterior Non-Accessible Doors: 8.25 lbf.
4. Fire-Rated Doors: 14.75 lbf.

D. Overhead Surface-Mounted Closers:

1. Out-swinging Doors to the Exterior: Parallel arm closers, with the closer mounted on the inside of the door.

2. In-swinging Doors into Rooms: Mount closers on the room side on the door. Corner brackets are not permitted. Supply drop plates where required.

E. Features: Positive back-check action near the outer limit of the opening cycle, located to protect door, frame, trim, and hardware; separate adjustments for latch speed, general speed, and back check; hydraulic regulation by tamperproof, noncritical screw valves adjustable only with a hex wrench. Where specified, provide with hold-open arm and built-in positive stop.

2.5 EXIT DEVICES (PANIC HARDWARE)

A. Standards: Meeting ANSI A156.3, Grade 1; as required to fulfill all requirements of NFPA 80 "Fire Doors and Windows", NFPA 101 "Life Safety Code", and UL.

B. Single Doors: Rim-type exit devices, typical, unless otherwise scheduled.

C. Pairs of Doors: Wherever possible, provide pairs of doors with two concealed vertical rod devices to avoid use of an astragal and coordinator. Provide coordinators where astragals are required.

D. Outside Trim and Levers: Compatible with other door hardware in style and finish.

2.6 FLUSH BOLTS

A. Standards:

1. Manual Flush Bolts: Meeting ANSI A156.16, Grade 1.

2. Automatic Flush Bolts and Coordinators: Meeting ANSI A156.3.

B. Flush Bolts: Provide at top and bottom edge of the inactive leaf of pairs of doors. Provide bottom rod with 12 inch long operating rod and top rod of sufficient length so that operating lever is less than six feet above the floor.

C. Dustproof Strikes: Provide for bottom bolts, of type required for appropriate finish floor condition.

D. Coordinators: Flat bar type with head filler, mounted to the head frame on top of the metal stop, unless otherwise scheduled. Provide a carry bar at each pair of doors equipped with overlapping astragal. Coordinators to be mechanically operated, and capable of holding the active door of a pair open until the inactive leaf has preceded it in the closing cycle.

2.7 AUXILIARY HARDWARE

A. Standards: Meeting ANSI A156.16.

B. Door Stops: Floor type or wall bumper type as scheduled. Provide each door leaf with a stop of proper size and height to prevent door from hitting wall or fixed objects. Built-in stops in door closers and overhead stops, where called for, shall satisfy this requirement.

1. Wall Stops: No visible fasteners.

2. Floor Stops: Of height required by floor conditions, fastened by means of machine screws and expansion anchors.

C. Silencers: Gray rubber, non-marring configuration for metal or wood doors. Provide each doorwith a pressed-metal frame with tamper resistant rubber silencers. Provide each single door with three silencers, each pair of doors with four. Omit at doors to receive gasketing.

2.8 THRESHOLDS, DOOR BOTTOMS, AND GASKETING

A. Provide as scheduled and detailed. Install with countersunk, flat-head screws, of same material and finish as item being attached at all applied thresholds, door bottoms, stops, and door gasketing.

B. Fire-Rated Doors: Provide UL-listed smoke seals on three sides of door frames at head and jambs.

C. Threshold Height: Maximum 1/2 inch. Bevel raised thresholds with a slope of not more than 1:2.

2.9 DOOR PLATES

A. Standards: Meeting ANSI A156.6.

B. Protection Plates: Stainless steel, with all edges beveled. Provide as scheduled and detailed.

1. Thickness: Minimum of 0.050-inch.

2. Width: Protection plates shall be 1-1/2-inch less than door width at single doors, 1-inch less than leaf width at pairs of doors. Mop plates shall extend the full width of the door.

3. Height: Kickplates shall be 10 inches high; mop plates shall be 6 inches high.

C. Combination Push-Pull Plates: Minimum 0.050-inch thick, stainless steel, beveled edges.

D. Install plates using countersunk spanner-type stainless steel #6 oval head screws.

## 2.10 KEYS AND KEYING

A. Keying: Meet with State Representative to determine final keying requirements. Key and masterkey locks as directed by State Representative to the State Representative's existing system.

B. Core Type: Small Format Interchangeable Core (SFIC) system for Best style small format keyway.

C. Number of Keys, to be confirmed by State Representative:

1. Grand Master Key (Opens every door): 4 keys

2. Keyed Alike Sub-master Key (Opens office, janitor closet and public restroom doors): 8 keys

3. Keyed Different Individual Key (Opens individual rooms): 3 keys per door.

4. Each Door: 3 keys.

D. Identification: Emboss face of each cylinder plug and key with minimum 3-digit visual key control system. Stamp all keys "DO NOT DUPLICATE".

E. State Representative will remove construction cylinders and install permanent cylinders.

F. Provide a construction keying system for Contractor's and/or State Representative’s use as required during construction. Retain construction keys and inserts and turn over to the State Representative upon completion of construction.

## 2.11 FINISHES

A. Typical Hardware:

1. Typical Interior Locations: See hardware groups schedule.

2. Exterior Locations, Unheated Spaces Exposed to the Weather, and Where Scheduled: BHMA 630 (US32D) - satin stainless steel, unless otherwise noted.

B. Exposed Overhead Door Closers: BHMA 689 - spray lacquer aluminum color, unless otherwise noted.

C. Thresholds: BHMA 719 - mill finish extruded aluminum.

D. Weatherstripping and Gasketing: BHMA 628 (US28), clear anodized aluminum, unless otherwise noted.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine doors, frames, and other surfaces to receive door hardware and report all defects which might adversely affect the installation or function of the hardware. Do not begin installation until unsatisfactory conditions have been resolved.

B. Coordinate and be responsible for the proper fabrication of all work or material to receive hardware. No extra cost will be allowed because of changes or corrections necessary to facilitate the proper installation and operation of the hardware.

### 3.2 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and requirements of ANSI/NFPA 80, and DHI. Use templates provided by hardware item manufacturer.

B. Accessibility: Conform to CCR Title 24 and ADA requirements for positioning and installing hardware.

C. Hardware Attachments: Provide with all necessary screws, bolts, and other devices or fastenings of suitable size and type to secure the hardware in position for heavy use and long life as recommended by the manufacturer, harmonizing as to material and finish. Secure to concrete with expansion sleeve anchors; plastic or "Rawl" plugs not acceptable. Provide fullthreaded "Phillips" head screws of sufficient length to firmly engage backing, finished to match hardware. Install closers on hollow metal doors with through-bolts.

D. Thresholds: Set in bead of sealant.

E. Keying:

1. Coordinate with the State Representative the changeover to permanent cores at completion of project.

2. State Representative will remove construction plugs and will return plugs to Contractor.

## 3.3 MAINTENANCE RELATED ITEMS

A. Furnish one set of installation and adjusting tools and one set of maintenance manuals for locksets, exit devices, door controls/ closers, and floor hinges to the State Representative.

## 3.4 ADJUSTMENTS AND INSPECTION

A. Closers: Regulate and adjust to comply with fire and accessibility requirements prior to final inspection.

B. During the installation of hardware a periodic inspection shall be made by the Contractor in company with a representative of the State and the hardware supplier or his agent. Any hardware improperly installed shall be removed and reinstalled at the Contractor's expense. At completion of the work a final inspection shall be made by the above parties. Make any and all adjustments recommended by any of the above parties.

## 3.5 HARDWARE SCHEDULE

A. General: The accompanying Hardware Schedule is furnished for whatever guidance and assistance it may afford the Contractor but shall not necessarily be considered as entirely inclusive.

B. Examine the Drawings and the Specifications to determine the extent, quality, and function of hardware required. Furnish all necessary architectural finish hardware to complete the work.

C. Should any door or item be inadvertently omitted from the scheduled hardware, provide such door or item with the same hardware as required for similar purposes. Should it be determined that the hardware scheduled is not suitable due to detail or size of member, provide hardware of proper size, type and function, similar in operation and equivalent to that specified.

D. Whether listed or not, provide latching lockset, door closer, and smoke gasketing at fire-labeled doors.

END OF SECTION 08 71 00

**SECTION 08 80 00**
**GLAZING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 SUMMARY

A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Windows.
2. Doors, Glazed Entrances, Storefronts.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

1. Section 08 11 16 Aluminum Doors and Frames
2. Section 08 53 14 Fiberglass Windows and Storefronts

1.4 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit.

D. Sealed Insulating Glass Unit Surface Designations:

Surface 1 – Exterior surface of the outer glass lite.
Surface 2 – Interspace surface of the outer glass lite.
Surface 3 – Interspace surface of the inner glass lite.
Surface 4 – Interior surface of the inner glass lite.

## 1.5 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and windand impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure ofsealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Delegated Design: Design glass, including comprehensive engineering analysis according to ASTM E 1300 by a qualified professional engineer, using the following design criteria:

1. Design Wind Pressures: As indicated on Drawings.
2. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.
   a. Wind Design Data: As indicated on Drawings.
3. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.
4. Thickness of Patterned Glass: Base design of patterned glass on thickness at thinnest part of the glass.
5. Maximum Lateral Deflection: For glass supported on all four edges, limit center- of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
6. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

## 1.6 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.

1. Testing will not be required if data are submitted based on previous testing of current sealant products and glazing materials matching those

submitted.

2. Use ASTM C 1087 to determine whether priming and other specific joint- preparation techniques are required to obtain rapid, optimum adhesion of glazingsealants to glass, tape sealants, gaskets, and glazing channel substrates.
3. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.7 ACTION SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Glass Samples: For each type of glass product other than clear monolithic visionglass; 12 inches square.

1. Tinted glass.
2. Patterned glass.
3. Coated glass.
4. Fire-resistive glazing products.
5. Insulating glass.

C. Glazing Accessory Samples: For [gaskets] [sealants] [and] [colored spacers], in 12- inch lengths. [Install sealant Samples between two strips of material representative in color of the adjoining framing system.]

D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

E. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation. Professional Engineer shall be licensed in the State of California.

1.8 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installers and manufacturers of insulating-glass units with sputter-coated, low-e coatings.

B. Product Certificates: For glass and glazing products, from manufacturer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for coated glass and insulating glass.

1. For glazing sealants, provide test reports based on testing current sealantformulations within previous 36-month period.

D. Preconstruction adhesion and compatibility test report.

E. Warranties: Sample of special warranties.

1.9 QUALITY ASSURANCE

A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.

B.

C. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

D. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

E. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

F. Source Limitations for Glass: Obtain coated float glass, laminated glass, and insulatingglass from single source from single manufacturer for each glass type.

G. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

H. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA's "Glazing Manual."
2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."
3. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

I. Safety Glazing Labeling: Where safety glazing labeling is indicated,

permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

J. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, directexposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.11 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40deg F.

1.12 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form inwhich laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is definedas defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning

laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: 5 years from date of Substantial Completion.

C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Basis of Design: Contract Documents are based on products named below to establish a standard of quality. Other available manufacturers with products having equivalent characteristics may be considered provided deviations are minor and design concept expressed in Contract Documents is not changed, as approved by State’s Representative.

1. Acceptable Manufacturer: Vitro Architectural Glass; Glass Technology Center, 400 Guys Run Rd., Cheswick, PA 15024. ASD. Toll Free Tel: (855) 887-6457. Fax: (800) 367-2986. Web: http://www.vitroglazings.com.

a. Product: AviProtek E Pattern 217 Starphire Solarban 72 VT Low E glass or equal.

B. Requests for substitutions will be considered in accordance with provisions of Division 1.

### 2.2 GLASS TYPES

A. GLAZING UNITS

1. Education Center Windows and Storefront Assemblies: 1” Insulating Glass

Unit (IGU) with ¼" (6 mm) clear LoE tempered outer lite with Bird Friendly (Threat. Factor ≤ 25) S1 treatment (2"x2" etched dots) – ½" air filled inner space – ¼" tempered inner lite with S4 LoE coating.

2. Storefront Entry Doors: 1" Insulating Glass Unit (IGU) with ¼" (6 mm) clear LoE tempered outer lite with Bird Friendly (Threat. Factor ≤ 25) S1 treatment (2"x2" etched dots) – ½" air filled inner space – ¼" tempered inner lite with S4 LoE coating.

2.3 GLASS PRODUCTS, GENERAL

A. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

B. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

C. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.

1. Minimum Glass Thickness for Exterior Lites: Not less than ¼" (6.0 mm).
2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.

D. Strength: Where annealed float glass is indicated, provide annealed float glass, heat strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

E. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites ¼" (6.0 mm) thick
2. For laminated-glass lites, properties are based on products of construction indicated.
3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.

6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

## 2.4 GLASS PRODUCTS

A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3 unless otherwise indicated.

B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (Fully Tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

C. Pyrolytic-Coated, Low-Maintenance Glass: Clear float glass with a coating on first surface having both photocatalytic and hydrophilic properties that act to loosen dirt and to cause water to sheet evenly over the glass instead of beading.

D. Other types to be determined.

## 2.5 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.

1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
2. Spacer: Manufacturer's standard spacer material and construction.
3. Interspace: Argon gas filled.
4. Desiccant: Molecular sieve or silica gel, or a blend of both.

## 2.6 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:

1. Neoprene complying with ASTM C 864.
2. EPDM complying with ASTM C 864.
3. Silicone complying with ASTM C 1115.
4. Thermoplastic polyolefin rubber complying with ASTM C 1115.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned neoprene, EPDM, silicone, or thermoplastic polyolefin rubber gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.

## 2.7 GLAZING SEALANTS

A. General:
1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Sealants used inside the weatherproofing system, shall have a VOC content of not more than 250 g/L when calculated according to 40 CFR 59, Subpart D (EPAMethod 24).
4. Sealants used inside the weatherproofing system shall 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. Colors of Exposed Glazing Sealants: To match window/door frame finish, TYP. As indicated by manufacturer's designations or selected by State’s Representative from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with 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 the following, or equal:

a. Dow Corning Corporation; 790.

b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.

## 2.8 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solidselastomeric tape; non-staining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturersfor application indicated; and complying with

ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

## 2.9 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

G. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

## 2.10 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliancewith the following:

1. Manufacturing and installation tolerances, including those for size, squareness,and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately beforeglazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

### 3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated,including those in referenced glazing publications.

B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with

referenced glazingpublications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches.

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealantor gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

## 3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work towardcenters of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securelyin place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

## 3.6 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depthof installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wettingor bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

## 3.7 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contactwith glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writingby glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 08 80 00

**SECTION 08 90 00**
**LOUVERS & VENTS**

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.1 SECTION INCLUDES

A. Extruded Aluminum Drainable Louvers for Education Center Intake and Exhaust.
B. Future Phase, N.I.C: Galvanized Steel Vulcan Fire and Ember Safe Foundation and Gable Vents for the Restroom Storage rooms and Restroom Roof.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete
B. Section 04 22 00 – Unit Masonry
C. Section 06 10 00 – Rough Carpentry
D. Section 07 46 00 – Non-Combustible Siding and Trim
E. Section 07 62 00 – Sheet Metal Flashing and Trim
F. Section 07 92 00 – Joint Sealants
G. Section 09 91 00 – Painting

1.3 REFERENCES

A. AAMA 2604 – High Performance Organic Coatings on Architectural Extrusions and Panels.
B. AAMA 2605 – High Performance Organic Coatings on Architectural Extrusions and Panels.
C. AMCA 500-L – Test Methods for Louvers.
D. AMCA 511 – Certified Ratings Program for Air Control Devices.
E. ASCE 7 – Minimum Design Loads for Buildings and Other Structures
F. ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
G. ASTM B221 – Standard Specifications for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
H. ASTM D822 – Standard Practice for Filtered Open-Flame Carbon-Arc Exposure of Paint and Related Coatings.
I. ASTM D4214 – Standard Test Method for Evaluating the Degree of Chalking of Exterior Paint Films.

J. ASTM D2244 – Standard Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
K. ASTM E330 – Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights, and Curtain Walls by Uniform Static Air Pressure Difference.
L. Living Building Challenge – Red List Chemicals

1.4 SUBMITTALS

A. Submit under provisions of Division 1 Submittals.
B. Product Data: For each product to be used, including:
    1. Manufacturer's product data including performance data.
    2. Installation Instructions
    3. Maintenance and Operations Manuals
    4. Health Product Declarations (HPDs) and Declare Labels
C. Shop Drawings
    1. Submit shop drawings indicating materials, construction, dimensions, accessories, and installation details.
D. Samples
    1. Submit color chip sample for units with factory-applied paint or anodized coating.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications:

    1. The manufacturer shall have implemented the management of quality objectives, continual improvement, and monitoring of customer satisfaction to assure that customer needs and expectations are met.
    2. Manufacturer shall have International Living Future (ILFI) Just Label or equivalent.

B. Production Qualifications:

    1. Louvers shall be licensed to bear AMCA Certified Ratings Seal. Ratings based on tests and procedures performed in accordance with AMCA 511 and comply with AMCA Certified Ratings Program. AMCA Certified Ratings Seal applies to air performance and water penetration ratings.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly indicating manufacturer and material.
B. Storage: Store materials in a dry area indoors, protected from damage and in accordance with manufacturer's instructions.

C. Handling: Protect materials and finishes during handling and installation to prevent damage.
D. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

## 1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by the manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
B. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

## 1.8 WARRANTY

A. Manufacturer shall provide a standard limited warranty for louver systems for a period of 1 year from date of installation, no more than 18 months after shipment from manufacturing plant. When notified in writing from the State Representative of a manufacturing defect, manufacturer shall promptly correct deficiencies without cost to the State Representative.
B. Manufacturer shall provide 20 year limited warranty for fluoropolymer-based finish on aluminum substrates.
    1. Finish Coating shall not peel, blister, chip, crack, or check.
    2. Chalking, fading, or erosion of finish when measured by the following tests:
        a. Finish coating shall not chalk in excess of 8 numerical ratings when measured in accordance with ASTM D4214.
        b. Finish coating shall not change color or fade in excess of 5 NBS units as determined by ASTM D2244 and ASTM D822
        c. Finish coating shall not erode at a rate in excess of .01 mils/year confirmed by Florida test samples.

# PART 2 PRODUCTS

## 2.1 MANUFACTURER

A. Louvers:
    1. Industrial Louvers Inc. (ILI) - Contact: 511 South 7th Street, Delano, MN 55328; Telephone: (763) 972-2981; https://www.industriallouvers.com/request-for-quote/ OR EQUAL.
    2. Other Available Manufacturers – subject to compliance with requirements stated within.

a. Activar Air Louvers – Contact: 6285 Randolph St, Commerce CA 90040, (800) 554-6077, sales@activarcpg.com

B. Future Phase, N.I.C.: Ember and Flame Resistant Vents:
1. Vulcan Vent. 3495 Swetzer Rd #100, Loomis, CA 95650. Telephone: (916) 652-7424. info@vulcanvents.com

2.2 EXTRUDED ALUMINUM WEATHER RESISTANT LOUVERS

A. Fabrication
1. Model: 458XP
2. Frame
a. Frame Depth: 4 inches (101.6 mm)
b. Material: Extruded aluminum, 6063-T6
c. Wall Thickness: 0.081 inch (2.1 mm), nominal
3. Blades
a. Style: Drainable
b. Material: Extruded aluminum, 6063-T6
c. Wall Thickness: 0.081 inch (2.1 mm), nominal
d. Angle: 35/45 degrees
e. Centers: 3.875 inches (98.4 mm), nominal

B. Performance Data
1. Performance Ratings: Product must be licensed to bear the AMCA Certified Ratings Seal for water and Air Performance.
a. Based on testing 48 inches by 48 inches (1219 mm by 1219 mm) size unit in accordance with AMCA 500-L
2. Free Area: 52.5% (8.41 sq.ft.)
3. Water Penetration: Maximum of .01 ounces at an air flow of 976 FPM
4. Static Pressure Loss: Not more than .15 inch of water gauge at an air flow of 962 FPM free area velocity.

2.2.1 FUTURE PHASE, N.I.C.: FLAME AND EMBER RESISTANT FOUNDATION VENTS

A. Fabrication
1. Model: VFS814FF
2. Frame and Flange:
a. Model Size: 13-1/2” x 7-1/2”
b. Material: G90 Galvanized Steel – 26 GA
3. Mesh and Core
a. Intumescent Core: 5 mm Hexagonal Matrix – Aluminum with intumescent coating
b. Ember Mesh: 14 Mesh – 304 Stainless Steel (faces interior)
c. Pest Screen: Galvanized Steel Screen – 1/8” (Faces exterior)

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2.3 FUTURE PHASE, N.I.C.: FLAME AND EMBER RESISTANT GABLE VENTS

A. Fabrication
    1. Model: VG1424FC
    2. Frame and Flange:
        a. Model Size: 13-5/8” x 24-1/2”
        b. Material: G90 Galvanized Steel – 26 GA
        c. Flange Type: Fiber Cement
        d. NFVA: 115 sq. in.
    3. Mesh and Core
        a. Intumescent Core: 5 mm Hexagonal Matrix – Aluminum with intumescent coating
        b. Ember Mesh: 14 Mesh – 304 Stainless Steel (faces interior)

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## 2.5 LOUVER AND VENT ACCESSORIES

A. Exterior Aluminum Sill: Provide sill flashing of same material and finish as louvers where indicated on the drawings.
B. Louver Screens: Provide framed removable, re-wire-able screens for exterior louvers.
    1. Bird Screen
        a. Stainless Steel: Stainless Steel, ½ in by 16 ga. (12.7 mm x 1.6 mm), welded
    2. Insect Screen
        a. 18 x 18 mesh stainless steel 0.009 inch (0.23 mm) diameter wire.
C. Blank Off Panels
    2. Non-Insulated Blank Off Panels factory installed with removable screws and foam tape gaskets:
        a. 0.080 inch (2 mm) aluminum sheet
    3. Insulated Blank Off Panels factory installed with removable screws and foam tape gaskets:
        a. 1 inch (25 mm) thick and to be faced on both sides with 0.032 inch (0.81 mm) thick aluminum sheet. Panels to be fabricated with rigid fiberboard core having an R-Value of 4. Panel perimeter frame to be a 0.063 inch (1.6 mm) thick extruded aluminum Z shape. Panels to be finished to match louvers on one side only.
        b. 2 inch (51 mm) thick and to be faced on both sides with 0.032 inch (0.81 mm) thick aluminum sheet. Panels to be fabricated with rigid fiberboard core having an R-Value of 8. Panel perimeter frame to be a 0.063 inch (1.6 mm) thick extruded aluminum Z shape. Panels to be finished to match louvers on one side only.

## 2.6 FABRICATION

A. Fabrication Requirements
    1. Performance: Fabricate as required for optimum performance with respect to water penetration, strength, durability, and appearance.

2. Size: Fabricate louvers in walls to meet dimensions indicated on Contract Documents.
4. Field Measurement: Verify size, location, and placement of louvers before fabrication.
5. Shop Assembly:
   a. Fabricate to minimize field adjustments, splicing, mechanical joints and field assembly of units.
   b. Preassemble units in shop to greatest extent possible and disassemble as necessary for shipping and handling.
   c. Clearly mark units for reassemble and coordinated installation.
6. Accessories: Include supports, anchorages and accessories required for complete assembly.
7. Vertical Mullions: Provide vertical mullions of type and spacing indicated but not further apart than recommended by the manufacturer.
8. Horizontal Mullions: Provide horizontal mullions at horizontal joints between louver units except where continuous vertical assemblies are indicated.
9. Connections: Join frame and blade members to one another by mechanical fastener, except where field bolted connections between frame members are made necessary by size of louvers.
10. Spacing: Maintain equal blade spacing to produce uniform appearance.

2.7 FINISHES (FACTORY)

A. General: Comply with NAAMM “Metal Finishes Manual” for finish designations and application recommendations, except as otherwise indicated. Apply finishes in factory. Protect finishes on exposed surfaces prior to shipment. Remove scratches and blemishes from exposed surfaces that will be visible after completing finishing process. Provide color as indicated or, if not otherwise indicated, as selected by State’s Representative.
B. Standard mill finish.
C. Prime Coat:
   1. Apply alkyd prime coat following chemical cleaning and pretreatment.
   2. Primer preparation for field painting
D. Color Anodize
   1. Class I Bronze Anodize
      a. Dark
      b. Comply with Aluminum Association AA-C2242 or AA-C2244.
      c. Apply finish following chemical etching and pretreatment
      d. Minimum thickness: 0.7 mils (0.018mm).

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean opening thoroughly prior to installation
B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install louvers at locations as indicated on the drawings and in accordance with the manufacturer's instructions.
B. Install louvers plumb, level, in plane of wall, and in alignment with adjacent work.
C. Install joint sealants as specified in Section 07 92 00.

3.4 CLEANING

A. Clean louver surface in accordance with manufacturer's instructions.
B. Touch-up paint, repair or replace damaged products before Substantial Completion.

END OF SECTION 08 90 00

**SECTION 09 28 13**
**CEMENTITIOUS BACKING BOARDS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Water-resistant cementitious Backerboard for ceramic wall tile.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

1. Section 06 10 00 Rough Carpentry.
2. Section 09 30 00 Tiling.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. CALGreen Submittals: Submit product data in accordance with Division 1.

1. Product Data for CALGreen 5.504.4.1 Adhesives, Sealants, Caulks: Product Data and material safety data sheets (MSDS) for adhesives and sealants used on the project, indicating VOC content of each product used.

1.5 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.

1.6 QUALITY ASSURANCE

A. Standards: Comply with the following applicable standards unless otherwise specified herein:

1. CBC—"California Building Code," Latest Edition and all applicable local Building Codes.

2. Classification: Cementitious Backer Units: ANSI A118.9, ASTM A108.11 and ASTM C 1325

3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

1.7 FIELD CONDITIONS

A. Do not install panels that are wet, those that are moisture damaged, and those that are 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. For CALGreen 5.504.4.1, adhesives, sealants and caulks shall comply with local or regional air pollution control or air quality management district rules or SCAQMD Rule1168 VOC limits, as shown in Tables 5.504.4.1 and 5.504.4.2 in the California Building Code.

2.2 CEMENTITIOUS BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 MANUFACTURER/PRODUCTS

A. Manufacturers: Subject to compliance with requirements, provide the following, or equal:

1. National Gypsum Company, PermaBASE®Cement Board.
2. USG Corporation, DUROCK Cement Board with EdgeGuard.
3. James Hardie Industries, Hardie Panel Cement Board.

B. Cement Backerboard Panel Physical Characteristics

1. Core: Cementitious, water-durable.
2. Surface: Fiberglass mesh on front and back
3. Edges: EdgeGuard or equal.
4. Long Edges: Tapered
5. Overall Thickness: 1/2 inch
6. Panel complies with requirements of ASTM C 1325 and ANSI A118.9
7. Density: 72 lbs. Per cu. ft.
8. Water Absorption: Not greater than 8% when tested for 24 hours in accordance with ASTM C 473.

C. Underlayment Physical Characteristics

1. Core: Cementitious, water-durable
2. Surface: Fiberglass mesh on front and back
3. Edges: EdgeGuard or equal.
4. Long Edges: Tapered
5. Overall Thickness: 1/4 inch
6. Panel complies with requirements of ASTM C 1325 and ANSI A118.9
7. Density: 72 lbs per cu. ft.
8. Water Absorption: Not greater than 8% when tested for 24 hours in accordance with ASTM C 4734.

D. Liquid Waterproofing and Crack Isolation Membrane [USG or Equal]

1. Permeance rating (0.38 perms at 20 mils dry thickness) of any liquid waterproofing membrane when tested to ASTM E96 Procedure E.

2.4 FASTENERS

A. 316 Stainless Steel fasteners shall be approved by State's Representative and Cement Board Manufacturer for use near corrosive Marine Environment.

B. Screws (#10-16 Hi-Lo) or Equal.

1. Wafer head, 316 stainless steel, corrosion-resistant
2. Overall Length: 1 5/8 inch [41 mm]
3. For use with wood framing and complying with ASTM C 1002.

C. Screws (#8-18, #10-16 Drill Point) or Equal.

1. Wafer head, 316 stainless steel, corrosion-resistant
2. Overall Length: 1 5/8 inch [41 mm]
3. For use with 20 to 14 ga. Steel framing and complying with ASTM C 1002.

D. Nails (1-1/2 in. [38 mm] 316 stainless steel roofing nails).

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Cement Board: Mold-resistant tape.

2. Tile Backer Panels: As recommended by panel manufacturer.

D. Joint Compound for Tile Backer Panels:

1. Cementitious Backer Units: As recommended by backer unit manufacturer.

2. Water-Resistant Cementitious Backer Board: Use setting-type taping compound and setting-type, sandable topping compound.

2.6 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering cement board panels to continuous substrate.

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. 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.

E. Acoustical Joint 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. Products: Subject to compliance with requirements, provide the following, or equal:

a. Pecora Corporation; AC-20 FTR.

b. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.

c. USG Corporation; SHEETROCK Acoustical Sealant.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

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 INSTALLATION

A. Install in accordance with manufacturer recommendations and ANSI A108.11. Refer to USG Durock® Brand Cement Board System Guide (SA932) for complete installation information – or Equal.

B. For steel framing less than 0.0329 inch thick, attach sheathing to comply with ASTM C 1002.

C. Cement board should be cut to size with a knife and straight edge. A power saw should be used only if it is equipped with a dust-collection device. Installer should wear NIOSH/MSHA approved dust mask.

D. For wall application, fasten Cement Board panels to framing with specified fasteners. Drive fasteners into field of panels first, working toward ends and edges. Hold panels in firm contact with framing while driving fasteners. Space fasteners maximum 8 in. (203 mm) O.C. [U.O.N.] for walls, 6 in. (152 mm) O.C. [U.O.N.] for ceilings, with perimeter fasteners at least 3/8 in. (10 mm) and less than 5/8 in. (16 mm) from ends and edges. Drive nails and screws so bottoms of heads are flush with panel surface to ensure firm panel contact with framing. Do not overdrive fasteners.

E. 316 Stainless Steel fasteners shall be approved by State's Representative and Cement Board Manufacturer for use near corrosive marine Environment.

F. Prefill joints with tile-setting mortar or adhesive and then immediately embed Tile Backer Tape and level joints.

3.3 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with manufacturer recommendations

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 cement 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 cement panels.

F. Cover both faces of support framing with cement 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 cement panels around ducts, pipes, and conduits.

3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut cement panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

G. Isolate perimeter of cement board applied to non-load-bearing partitions at structural abutments, except floors. 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 recommendations 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 cement panels unless blankets are readily installed after panels have been installed on one side.

3.4 APPLYING INTERIOR CEMENT BOARD

A. Single-Layer Application:

1. On ceilings, apply cement panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.

2. On partitions/walls, apply cement 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-furring members, apply cement panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.

4. Fastening Methods: Apply cement panels to supports with approved 316 stainless steel drill screws.

B. Laminating to Substrate: Where cement panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of cement board), comply with cement board manufacturer's written

recommendations and temporarily brace or fasten cement panels until fastening adhesive has set.

3.5 FINISHING CEMENT BOARD

A. General: Treat cement board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare cement 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 cement board joints, except for trim products specifically indicated as not intended to receive tape.

D. Cement 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.

3. Level 3: Where indicated on Drawings.

4. 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 09 91 00 "Painting."

E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

F. Apply Liquid Waterproofing and Crack Isolation Membrane per manufacturer’s recommendations.

3.6 PROTECTION

A. Protect adjacent surfaces from finishing compound and promptly remove from floors and other non-cement board surfaces. Repair surfaces stained, marred, or otherwise damaged during finishing 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 28 13

**SECTION 09 29 00**
**GYPSUM BOARD**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Gypsum Board exterior soffits for painted gypsum board finish and Gypsum Board interior walls and ceilings.

B. Related Requirements:

1. Section 06 10 00 Rough Carpentry.
2. Section 09 91 00 Painting.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. CALGreen Submittals: Submit product data in accordance with Division 1.

1. Product Data for CALGreen 5.504.4.1 Adhesives, Sealants, Caulks: Product Data and material safety data sheets (MSDS) for adhesives and sealants used on the project, indicating VOC content of each product used.

C. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.

1.4 QUALITY ASSURANCE

A. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Install mockups for the following:
    a. Each level of gypsum board finish indicated for use in exposed locations.

2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.

3. Simulate finished lighting conditions for review of mockups.

4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 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.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are 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. For CALGreen 5.504.4.1, adhesives, sealants and caulks shall comply with local or regional air pollution control or air quality management district rules or SCAQMD Rule 1168 VOC limits, as shown in Tables 5.504.4.1 and 5.504.4.2 in the California Building Code.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 GYPSUM BOARD

A. Manufacturers: Subject to compliance with requirements, provide the following, or equal:

1. USG Corporation

2. American Gypsum.

3. CertainTeed Corp.

4. Georgia-Pacific Gypsum LLC.

5. National Gypsum Company.

B. Interior Gypsum Wall & Ceiling Board: USG SHEETROCK Mold Tough VHI FireCode X Core Panels, or Equal: ASTM C 1396/C 1396M. Meets ASTM C1629, level 3 (highest) for hard and soft-body impact or equal.

1. Locations: Interior walls and ceilings.

2. Thickness: 5/8 inch Type X fire resistance.

3. Long Edges: Tapered or USG SW tapered or Equal.

4. Mold Resistant.

5. Higher resistance to abrasion and impacts per ASTM C1629.

C. Exterior Eave Gypsum Ceiling / Soffit Boards and Restroom walls: USG SHEETROCK Glass-Mat Mold Tough VHI FireCode X Panels, or Equal: ASTM C 1396/C 1396M.

1. Locations: Exterior ceilings and soffits, interior walls in locations subject to moisture (restroom ceilings and walls and sink area walls).

2. Thickness: 5/8 inch Type X fire resistance.

3. Long Edges: Tapered or USG SW tapered or Equal.

4. Fiberglass faced to shed water, Mold Resistant.

5. Higher resistance to abrasion and impacts per ASTM C1629.

## 2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.

2. Shapes:

a. Corner Trim.

b. Bullnose bead.

c. LC-Bead: J-shaped; exposed long flange receives joint compound.

d. L-Bead: L-shaped; exposed long flange receives joint compound.

e. U-Bead: J-shaped; exposed short flange does not receive joint compound.

f. Expansion (control) joint.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Manufacturers: Subject to compliance with requirements, provide the following, or equal:

a. Fry Reglet Corp.

b. Gordon, Inc.

c. Pittcon Industries.

2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.

3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Mold-resistant tape.
2. Exterior Gypsum Board: 4” Mold-resistant tape.

C. Joint Compound for Interior/Exterior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.

2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.

a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use setting-type, sandable topping compound.

4. Finish Coat: For third coat, use setting-type, sandable topping compound.

5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound

2.6 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

D. 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.

E. Acoustical Joint 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. Products: Subject to compliance with requirements, provide the following, or equal:

a. Pecora Corporation; AC-20 FTR.

b. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.

c. USG Corporation; SHEETROCK Acoustical Sealant.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

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, except floors. 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 recommendations 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 GYPSUM BOARD

A. 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-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.

B. 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-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 and face layers separately to supports with screws.

C. 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 recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 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. Interior Trim: Install in the following locations:

1. Corner Trim: Use at all outside horizontal and vertical corners unless otherwise indicated.

2. Bullnose Bead: Use at outside corners, only where indicated on plans.

3. LC-Bead: Use at exposed panel edges.

4. L-Bead: Use where indicated.

5. U-Bead: Use at exposed panel edges.

C. Aluminum Trim: Install in locations indicated on Drawings.

3.5 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 4” 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.

3. Level 3: Where indicated on Drawings.

4. 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 09 91 00 Painting.

5. Level 5: Where indicated on Drawings.

a. Primer and its application to surfaces are specified in Section 09 91 00 Painting."

E. Restroom back wall and ceiling (9.10) Apply exterior primer, basecoat and paint finish suitable for exterior use, more intensive cleaning and high humidity. See Section 09 91 00 Painting.

3.6 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 00**
**TILING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Ceramic tile at Education Center Sink area walls.

B. Related Sections:

1. Section 03 30 00 - Cast-in-Place Concrete.
2. Section 07 62 00 - Sheet Metal Flashing and Trim
3. Section 07 92 00 - Joint Sealants.
4. Section 09 28 13 - Cementitious Backer Boards.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's product data in accordance with Division 1 on all materials and accessories.

1. Product Data for CALGreen 5.504.4.1 Adhesives, Sealants, Caulks: Product Data and material safety data sheets (MSDS) for adhesives and sealants used on the project, indicating VOC content of each product used.

2. Submit data per CALGreen 5.504.4.1 for waterproofing membranes and adhesives, including printed statement of VOC content.

3. Submit data per CALGreen 5.504.4.1 for tile setting adhesives and grout, including printed statement of VOC content.

B. Samples:

1. Tile: Submit tile color samples for selection by State’s Representative. After colors have been selected, submit three sample tile panels for each type, pattern, and color of tile selected. For 4-1/4-inch or larger tiles, submit a minimum of four tiles per panel; for ceramic mosaic tiles, submit tile panel a minimum of 8 inches square. Adhere tiles to

hardboard or plywood panel, with the specified grout color filled into joints.

2. Grout: Submit grout color samples for selection by State's Representative.

C. Qualification Data: Submit for installer.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, supply sources, and other information as required to identify materials used. Include mix proportions for mortar and source of aggregates.

1. Neither receipt of list nor approval of mockups constitutes approval of deviations from the Contract Documents contained in mockups unless State's Representative approves such deviations in writing.

C. Material Test Reports:

1. Sealant Compatibility and Adhesion Test Report: From sealant manufacturer indicating that sealants will not stain or damage tile. Include interpretation of test results and recommendations for primers and substrate preparation needed for adhesion.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Experienced, who has completed tile installations similar in material, design, and extent to that required for this Project, and with a record of successful performance.

B. Standards:

1. Tile: Certified by Tile Council of North America (TCNA) to meet or exceed ANSI A137.1 Standard Grade requirements.

2. Slip Resistance: Tile static coefficient of friction, wet or dry, to be a minimum of 0.6 for walking surfaces and a minimum of 0.8 for ramps, when tested in accordance with ASTM C1028.

3. Tile Setting Adhesive and Grout: Meet South Coast Air Quality Management District (SCAQMD) Rule 1168.

3. Installation Standard: Comply with the "Handbook for Ceramic Tile Installation" published by TCA for installation methods specified, unless otherwise shown or specified.

C. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build mockups for typical interior wall in sizes approximately 30 inches long by 30 inches high by full thickness, including face and backup wythes and accessories.
   a. Include a sealant-filled joint at least 16 inches long in mockup.

2. Protect accepted mockups from the elements with weather-resistant membrane.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless State's Representative specifically approvessuch 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.

1.6 EXTRA MATERIALS

A. Submit to the City upon completion of work extra tiles, and trim for future repair and maintenance work. Submit not less than 2 percent additional tiles and ten trim pieces for each type and color installed. Package the extra materials in a cardboard box suitable for storage. Clearly label and identify the contents in the box.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Ceramic Tile at at Education Center Sink / Lab area walls:

1. Manufacturer: Emser Tile, DalTile, or Other approved by State Representative.

2. Wall Tile: ceramic tiles, glazed finish; colors to be selected by State's Representative.

   ALT 1: Emser Tile, Souvenir 1"x6" Stacked Form, 12" x 12" Mesh, Color Belem

ALT 2: Emser Tile, Souvenir 1”x6” Stacked Form, 12” x 12” Mesh, Color Faro
ALT 3: As selected by State’s Representative.

B. Trim: Matching stops, returns, surface bullnoses, trimmers, and other shapes required to produce a complete and finish installation. Trim shall match the tile in size, color, and finish, unless otherwise shown or specified.

C. Grout:

1. Manufacturer: Custom Building Products, Bostik Hydroment, Mapei, or equal.

2. Wall Grout: ANSI A118.6 latex portland cement grout, unsanded.

a. Color: To be selected by State’s Representative from the manufacturer’s standard range.

2.2 ACCESSORY MATERIALS

A. Mortar Bed Mix: ANSI A108.1; bond coat consisting of portland cement paste on a mortar bed that is still workable, or latex portland cement mortar on a cured bed.

1. Portland Cement: ASTM C150, Type I

2. Sand: ASTM C144.

3. Lime: ASTM C206.

B. Metal Lath: ASTM C847, except steel need not be copper bearing and may be painted.

C. Thinset Mortar at Wall Tile: ANSI A118.4 - Latex portland cement mortar, thinset.

D. Tile Backerboard: Refer to Section 09 28 13 - Cementitious Backer Boards.

E. Edge Protection and Divider Strips: Stainless steel, height to align with tile thickness, 1/8-inch wide top edge, bottom edge designed for anchorage in tile setting bed; Schluter Systems Inc., Or Equal. State’s Representative to select material finish from manufacturer’s standards.

1. Schluter – SCHIENE
    a. Description: L-shaped profile with 1/8” (3.2 mm) top section and vertical wall section that together form the visible surface,

integrated trapezoid-perforated anchoring leg, and integrated grout joint spacer.
b. Anchoring Leg: provide with straight anchoring leg
c. Material and Finish: EV4A – Stainless Steel Type 316 L – V4A.
d. Height: as required.

F. Joint Sealants: Mildew-resistant silicone type at bathrooms, polyurethane self-leveling type at floors, as specified in Section 07 92 00 Joint Sealants.

G. Grout Sealer: Low VOC sealer, specifically designed for sealing tile grout joints; Miracle Sealants Company "511 H2O Plus - Water Base Penetrating Sealer", or equal.

## 2.3 TILE CLEANERS

A. Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar and grout stains, efflorescence, and other new construction stains from tile surfaces without discoloring or damaging tile surfaces; expressly approved for intended use by cleaner manufacturer and tile producer.

1. Manufacturers: Subject to compliance with requirements, provide the following, Or Equal:
   a. Prosoco, Inc.

## 2.4 TILE SEALER

A. Product: Miracle Sealants Co. “511 Impregnator”, or equal. Natural look penetrating sealer.

## 2.5 MORTAR 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. Mixing Pointing Mortar: Thoroughly mix cementitious and aggregate materials together before adding water. Then mix again, adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for one to two hours. Add remaining water in small portions until mortar reaches required consistency. Use mortar within 30 minutes of final mixing; do not retemper or use partially hardened material.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine surfaces indicated to receive tile, with Installer present, to determine that they are satisfactory and in compliance with requirements for installation tolerances and other conditions affecting performance of tile.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Tile Backerboard:

1. Install in accordance with ANSI A108.11.

2. Fasten to studs with corrosion-resistant fasteners, spaced at maximum 8 inches on center. At horizontal and vertical joints, corners of panels, and junctions with dissimilar materials, provide gap of 1/8-inch to 3/16-inch, and completely fill with dry-set or portland cement mortar.

3. Cover joints and corners with 2-inch wide fiberglass mesh tape embedded in skim coat of portland cement mortar.

B. Prior to setting tile, apply sealant around all pipes and conduits penetrating tile substrate surfaces using specified sealant.

C. Clean dirty or stained tile surfaces by removing soil, stains, and foreign materials before setting. Clean tile by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.

### 3.3 INSTALLATION - TILE

A. Installation Methods: Comply with the following TCNA installation methods:

1. Thinset Walls on Concrete Masonry Units (CMU): W202,

2. Thinset Walls on Backerboard: W243; ANSI A108.5, thinset method, latex portland-cement mortar bond coat. See Section 09 28 13 Cementitious Backer Boards.

3. Expansion Joints: EJ171.

B. General: Do not use units with chips, cracks, voids, stains, or other defects which could be visible in the finished work.

C. Contiguous Work: Provide drain and cleanout openings as shown. Close up openings in tile work after other work is in place. Use materials and set to match surrounding tile.

D. Preparation of Substrate: Clean substrate to remove dirt, dust, debris, and loose particles.

E. Installing Tile:

1. Lay out tile units with fields centered; avoid use of units less than one-half size. Unless otherwise noted, align units square, parallel, and straight. Joint widths shall be the same in each area, approximately 1/16-inch, unless otherwise shown or specified.

2. When cutting is required, grind edges smooth. Accurately cut units around work of other trades so that edges of tile will be completely covered; terminate tile at centerlines of doors, unless otherwise shown or specified.

3. Firmly embed units in setting material and bring finished surfaces to true planes. Make inside corners square and outside corners bullnose.

F. Grouting:

1. Grout joints in accordance with ANSI A108.10.

2. Perform grouting as soon as possible after initial set of setting bed. Force grout into joints, strike flush, and tool slightly concave. Wet joint surfaces, if dry, prior to grouting.

3. Provide means to prevent grout staining the exposed face of tile and pavers.

G. Sealant: Seal intersection of interior wall tile and dissimilar materials with silicone sealant. Clean all joints free of loose mortar, dirt, and debris. Neatly tool all sealants.

H. Expansion Joints: Provide expansion joints in width to match grout-joint width, and seal with polyurethane sealant in color to match grout. Provide expansion joint between intersection of wall and at construction pour joints.

3.4 CLEAN, CURE AND PROTECT

A. Clean tile and adjacent surfaces of adhesive and grout as work progresses. Upon completion, thoroughly clean tile surfaces in manner not to affect glazing.

B. Curing: Provide proper temperature and humidity conditions for curing the work. Damp-cure cement grouts for not less than 72 hours. Add dampness as required, and cover with non-staining membrane.

C. Grout Joints: Seal tile joints with grout sealer in accordance with manufacturer's written recommendations.

D. Protect tile work from damage until final acceptance of entire Project.

END OF SECTION 09 30 00

**SECTION 09 54 26**
**LINEAR ACOUSTIC WOOD CEILING PANELS**

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Linear wood Ceiling Panels
   2. Trim and accessories

1.3 RELATED WORK IN OTHER SECTIONS:

A. Division 23 – Mechanical for work to be coordinated with ceiling
B. Division 26 – Electrical for light fixture coordination

1.4 REFERENCES

A. ASTM International (ASTM)

   1. ASTM A641/A641M-19 – Standard Specification for Zinc Coated (Galvanized) Carbon Steel Wire.
   2. ASTM C423-22 – Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
   3. ASTM C635/C635M-22 – Standard Specifications for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.
   4. ASTM C 636/C636M-19 – Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
   5. ASTM E84-21a – Standard Test Method for Surface Burning Characteristics of Building Materials.
   6. ASTM E 580/E580M-22 – Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions.
   7. ASTM E 1264-22 – Standard Classification of Acoustic Ceiling Products.

B. Architectural Woodwork Manufacturers Association of Canada (AWMAC)

   1. AWI/AWMAC – Architectural Woodwork Quality Standards Illustrated, current edition.

C. Ceiling and Interiors Systems Construction Association (CISCA)

   1. CISCA – Ceiling Systems Handbook, current edition.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturers other than those listed in Paragraph 2.1 are required to submit for approval prior to bidding per Section One.

B. Installer Qualifications: Engage an experienced Installer, approved by wood ceiling manufacturer, who has completed panel ceilings similar in species, design, and extent to that indicated for this Project and with a record of successful in-service performance.

C. Inspection: All work must pass inspection and approval of the State's Representative, as well as the local codes and regulations or authorities having jurisdiction.

D. Single-Source Responsibility for Wood Ceiling System: Obtain each type of Linear Wood Ceiling Panels from a single fabricator, with in-house Shop Drawing capabilities, in-house assembly and finishing capabilities, and with resources to provide products of consistent quality in appearance and physical properties without delaying the project.

E. Single-Source Responsibility for Suspension System: Obtain each type of suspension system from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying project.

F. Pre-Installation Conference: Conduct conference at Project site to comply with requirements of Division 1.

1.6 SUBMITTALS

A. General: Submit each item in this Section according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data: For each type of product specified.
C. Samples: For verification of each type of exposed finish required, prepared on samples of size indicated below. Where finishes involve normal color and texture variations, include sample sets showing the range of variations expected

   1. 12” x 16” samples of each panel type, pattern, and color.

## 1.7 SHOP DRAWINGS & COORDINATION WITH OTHER TRADES

A. Shop Drawings: Provide Shop Drawings/Coordination Drawings for all ceilings, which should include RCP and product details. Coordinate Linear Wood ceiling panels layout and installation of wood panels and suspension system components with other construction elements that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system components, partition assemblies and all perimeter conditions.

## 1.8 PROJECT CONDITIONS

A. Space Enclosure and Environmental Limitations: Do not install wood panel ceilings until spaces are enclosed and weatherproof, wet-work in spaces is completed and dry, work above ceilings is complete, and ambient temperature and humidity conditions are being maintained at the levels indicated for Project when occupied for its intended use.

## 1.9 DELIVERY, STORAGE, AND HANDLING

A. Delivery & Unloading: Coordinate crate sizes, weights, unloading options, and delivery schedule with manufacturer prior to fabrication. Deliver wood panels and suspension system components to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other mistreatment.

B. Acclimatization: Before installing wood panels, permit them to reach room temperature and a stabilized moisture content (at least 72 hours) per AWI standards.

C. Handling: Handle Linear Wood Ceiling Panels carefully to avoid chipping edges or damaging units in any way.

D. Protection

1. Personnel: Follow good safety and industrial hygiene practices during handling and installing of all products and systems, with personnel to take necessary precautions and wear appropriate protective equipment as needed. Read related literature for important information on products before installation. Contractor to be solely responsible for all personal safety issues during and subsequent to installation; architect, specifier, State, and manufacturer will rely on contractor's performance in such regard.

2. Existing completed work: Protect completed work above suspension system from damage during installation of suspension system components.

1.10 EXTRA MATERIAL/WARRANTIES

A. Extra Materials: Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.

1. Linear Wood Ceiling Panels: Furnish quantity of full-size units equal to 2.0 percent of amount installed.
2. Suspension System Components: Furnish quantity of each component equal to 2.0 percent of amount installed.

B. Warranties: Provide owner with a (1) year warranty for material and workmanship on all installed products.

1. Manufacturers: All materials, wood ceiling and grid, shall be warranted for (1) one year for material and workmanship.
2. Installer: All work shall be warranted for (1) year from final acceptance of completed work

PART 2 – PRODUCTS

2.1 LINEAR WOOD CEILING PANELS

A. General: The following manufacturer is basis of design:

1. LINEA Ceiling & Wall Systems

2320 Peardonville Road, Abbotsford, BC, Canada, V2T 6J8
Ph. 1-604-776-2265 / Website: www.LineaCeilings.com / Email: Sales@LineaCeilings.com

B. Or equal, as prior approved by State's Representative.

C. Substitution: or approved equal.

2.2 LINEAR WOOD PANELS

A. Product: LINEA PLANK

LINEA Ceiling & Wall Systems. (www.LineaCeilings.com):

| | |
|---|---|
| Species/Grain: | Douglas Fir VG |
| Core: | Particleboard |
| Edge: | Square w/ matching edge band |
| Panel Size(s): | Standard 1' wide x 8' or 10' long (less 1" for reveal) |
| Blade Thickness: | 3/4" for Solid Hardwoods and Veneers |
| Module Size(s): | 6" (5-1/4" + 3/4" Reveal), |
| Face Texture: | Smooth |
| Color: | Natural Stain |
| Finish: | Clear, Matte Sheen; Interior Grade |
| Fire Rating: | Class A |
| Assembly: | PET Acoustic Felt. Color to be selected from (3) samples from manufacturer's standard range:<br>i. ALT1: Charcoal<br>ii. ALT 2: Eclipse<br>iii. ALT 3: Granite |
| Fabric Backer: | None |
| Installation: | Direct screw to grid and/or wood furring |

2.3 ACCESSORIES

A. Matching perimeter trim to be supplied by wood ceiling manufacturer.
B. Touch-up Paint: Type and color to match acoustic wood panels
C. Optional Wood Backer clips, if required for installation

2.4 FINISH

A. Factory Finishing: Panel shall be factory-finished with manufacturer's standard lacquer products per color selection by State's Representative.

B. Due to the nature of real wood (variation in grain, texture and color) the finished product may range from light to dark affecting the look of the panels.

## PART 3 – EXECUTION

### 3.1 EXAMINATON

A. General: Examine substrates and structural framing to which ceilings attach or abut, with installer present, for compliance with requirements specified in this and other sections that affect ceiling installation and anchorage. Do not proceed with installation until unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.
B. Layout: Measure each ceiling area and establish the layout of Linear Wood Ceiling Panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders and conform to the layout shown on reflected ceiling plans in accordance with wood ceiling manufacturer’s approved Shop Drawings.

### 3.3 INSTALLATION

A. General: Install LINEA PLANK to comply with manufacturer's instructions and CISCA "Ceiling Systems Handbook."

### 3.4 CLEANING

A. General: Clean exposed wood surfaces of wood ceiling panels. Comply with manufacturer’s instructions for cleaning and touchup of minor finish damage. Remove and replace wood ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage

### 3.5 INSPECTION

A. When LINEA Ceiling & Wall Systems wood ceiling panels have been completely installed, the owner and/or the owner’s representative shall inspect all finished surfaces of the wood ceiling system to validate that the work has been completed in compliance with these specifications. Any defect in meeting installation

specifications shall be corrected by the installing contractor at no additional cost to the owner and/or LINEA Ceiling & Wall Systems.

END OF SECTION 09 54 26

**SECTION 09 61 19**
**CONCRETE FLOOR STAIN AND SEAL**

## PART 1 GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

### 1.2 SUMMARY

A. Section includes: Provide a complete stained and sealed concrete floor system for the Education Center floor that meets the requirements for specific use indicated in the contract documents. Include all applicable substrate testing, surface preparation, and detail work.

### 1.3 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete
B. Section 03 35 00 -- Cast-In-Place Concrete Finishing

### 1.4 SUBMITTALS

A. Submit under provisions of Division 1.
B. Product Data: Submit manufacturer's product data sheets on each product and system to be used including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements.
   3. Installation methods.
   4. Maintenance requirements.
C. Selection Samples: For each system specified, provide two samples, representing manufacturer's full range of colors.

### 1.5 QUALITY ASSURANCE

A. All materials used on the stained concrete floor system shall be manufactured and provided by a single manufacturer to ensure compatibility and proper bonding.
B. Use adequate numbers of skilled workmen thoroughly trained and experienced in the necessary crafts and completely familiar with the specified requirements and methods needed for proper performance of the work of this section.

C. Contractor shall have a minimum of 3 years experience installing concrete floor coatings similar to that which is required for this project and who is acceptable to the manufacturer.
   1. Applicator shall designate a single individual as project foreman who shall be on site at all times during installation.
   2. Contractor must show and have QCA Qualified Contractor/Applicator paperwork from the manufacturer of the coating system.

D. Convene a pre-application meeting before the start of application of coating system. Require attendance of parties directly affecting work of this section, including: State's Representative, Architect, contractor, applicator, and authorized representative of the coating system manufacturer and interfacing trades. Review the following:
   1. Drawings and specifications affecting work of this section.
   2. Protection of adjacent surfaces.
   3. Surface preparation and substrate conditions.
   4. Application.
   5. Field quality control.
   6. Cleaning.
   7. Protection of coating system.
   8. Repair of coating system.
   9. Coordination with other work.

## 1.6 DELIVERY, STORAGE & HANDLING

A. Delivery: Materials shall be delivered to the job site in sealed, undamaged containers. Each container shall be clearly marked with manufacturer's label showing type of material, color, and lot number.
B. Storage: Store all materials in a clean, dry place with a temperature range in accordance with manufacturer's instructions
C. Handling: Handle products carefully to avoid damage to the containers. Read all labels and Material Safety Data Sheets prior to use.

## 1.7 PROJECT SITE CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within the limits recommended by the manufacturer.
B. All concrete should be tested for moisture before applying a seamless coating. If moisture emissions exceed 5 lbs/1000 square feet (ASTM F1869) or if the relative humidity (RH) exceeds 75% (ASTM F2170), contact the manufacturer before application.
C. Concrete must be at least 2500 psi.
D. Concrete must be cured for a minimum of 28 days before coating is applied
E. Schedule coating work to avoid excessive dust and airborne contaminates. Protect work areas from excessive dust and airborne contaminates during coating application.
F. Before any work is started, the applicator shall examine all surfaces for any deficiencies. Should any deficiencies exist, the architect, State's

Representative or general contractor shall be notified in writing and any corrections necessary shall be made.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

A. Acceptable manufacturer: Westcoat Specialty Coatings; 4007 Lockridge Street, San Diego, CA 92102. Telephone 800-250-4519. Fax 619-262-8606. Website: www.westcoat.com or equal.

### 2.2 MATERIALS

A. As basis of design Westcoat Nano Stain Grind and Seal System or Equal. A process of grinding interior concrete and applying nano, water-based stain and sealer.

### 2.3 COMPONENTS

A. Nano Stain Grind and Seal System: Nano, water-based concrete stain and seal or equal.
1. Stain: SC-37 Nano Stain 400 to 800 square feet per gallon.
2. Topcoat Seal or Finish Coat: EC-95F Polyurethane Sealer (Clear, Matte) 300-500 square feet per gallon.

B. Color: Provide Westcoat Nano Stain color chart for review and field samples for State's Representative's Review and final color approval in the following colors:
1. Almond.
2. Oyster.
3. Oak.

### 2.4 LOCATION

A. Provide at the following locations:
1. Education Center Building floor.

### 2.5 SUBSTITUTIONS

A. Substitutions per Division 1 of the Project Specifications and subject to compliance with this Section's technical specifications.

### 2.6 ACCESSORIES

A. Supplemental Materials:
1. Patching materials shall be TC-29 Concrete Patch

2. Concrete repairs can be made with TC-23 Mortar Mix as needed.
3. Optional aggregate shall be CA-30 Small Safe Grip, CA-31 Large Safe Grip, or other sand designed to meet the State Representatives skid resistance requirements.

B. Optional Topcoats:

1. EC-11 Water Based Epoxy may be used IN LIEU of SC-65G Gloss when a two-component, chemical resistant, medium gloss and medium durability epoxy is required.
2. EC-32 High Build Clear Epoxy Topcoat may be used IN LIEU of the SC-65G Gloss when a two-component, 100% solids, high-build, chemical resistant epoxy is required.
. SC-65SG WB Semi-Gloss Polyurethane may be used IN LIEU of SC-65G Gloss. It may also be applied over the EC-11 or EC-32 when a low odor, solvent free, mar and chemical/UV resistant semi-gloss finish is required.
3. SC-65F WB Flat Polyurethane may be applied OVER the EC-11, EC-32, SC-65G Gloss or SC-65SG Semi- Gloss when a low odor, solvent free, mar and chemical/UV resistant flat finish is required.
4. EC-95G Gloss Polyurethane may be used IN LIEU of the SC-32G Gloss. It may also be applied over the EC-32 when a chemical/UV resistant, solvent-based gloss finish is required.
5. EC-95F Flat Polyurethane may be applied OVER the EC-32 or EC-95G when a chemical/UV resistant, solvent-based flat finish is required.

## PART 3 EXECUTION

### 3.1 EXAMINATION

A. Verification of Conditions.

1. Inspect all surfaces to receive stained concrete flooring. Concrete must be clean, dry and free of grease, paint, oil, dust, curing agents, laitance or any foreign material that will prevent proper adhesion.
2. Before starting work, report in writing to the authority having jurisdiction any unsatisfactory conditions.

### 3.2 SURFACE PREPARATION

A. Prepare surfaces using methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
B. Create a surface profile by mechanically diamond grinding the surface with 60-80 grit tools to achieve a clean uniform surface. Additional tooling or passes may required.
C. Sweep and vacuum surfaces entirely prior to installation.
D. Rout and clean moving cracks and joints: patch with manufacturer’s recommended concrete patch material.

E. Repair any non-moving surface deviations with manufacturer's recommended patching material.

## 3.3 INSTALLATION

A. Install coatings in accordance with manufacturer's instructions.
B. Mix multi-component materials in accordance with manufacturer's instructions.
C. Use application equipment, tools, and techniques in accordance with manufacturer's instructions.
D. Uniformly apply coatings at spread rates and in number of coats to achieve specified coverage rates recommended by the manufacturer.
E. Broadcast aggregates in accordance with the specified system and manufacturer's instructions.
F. Adhere to all limitations, instructions, and cautions for stained concrete floor coating as stated in the manufacturer's published literature.

## 3.4 FIELD QUALITY CONTROL

A. Verify coatings and other materials are as specified.
B. Verify coverages of the system as work progresses. Areas found not to meet the required coverage rates shall receive additional material until specified coverage is attained.
C. Manufacturer's representative shall provide technical assistance and guidance for surface preparation and application of coating systems.

## 3.5 PROTECTION AND CLEAN-UP

A. Installation areas must be kept free from traffic and other trades during the application procedure and cure time.
B. Protect finished surfaces of coating system from damage during construction.
C. Touch-up, repair or replace damaged flooring system after substantial completion.
D. Clean area and remove all debris upon completion of work. Dispose of empty containers properly according to current Local, State and Federal regulations.

## 3.6 MAINTENANCE

A. Contractor shall provide to State Representative, maintenance and cleaning instructions for the floor system upon completion of work. State Representative is required to clean and maintain the surfaces to maintain manufacture's warranty.

END OF SECTION 09 61 19

# SECTION 09 67 23
# RESINOUS FLOORING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

### 1.2 SUMMARY

A. Section Includes:

1. Provide a complete epoxy floor system for concrete surfaces that meet the requirements for specific use indicated in the contract documents. Include all applicable substrate testing, surface preparation, and detail work. Provide at the following locations:
   a. Future Phase, N.I.C.: Restroom

2. Patching compound for floor preparation and slope.

B. Related Sections:

1. Section 03 30 00 "Cast-In-Place Concrete" for concrete subfloor for resinous flooring systems.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's technical data, Available Color Charts, application instructions, and recommendations for each resinous flooring component required.

B. CALGreen Submittals: Submit product data in accordance with Division 1.

1. Product Data for CALGreen 5.504.4.3 Paints and Coatings: Product data and material safety data sheets (MSDS) for paints and coatings used on the interiorof the building indicating VOC content of each product used.

C. Samples for Initial Selection: For each type of exposed finish color and sheen

as required for approval by State's Representative.

D. Samples for Verification: For each resinous flooring system required, 6 inches square, applied to a rigid backing by Installer for this Project.

## 1.4 INFORMATIONAL SUBMITTALS

A. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

B. Material Certificates: For each resinous flooring component, from manufacturer.

C. Material Test Reports: For each resinous flooring system.

## 1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For resinous flooring to include in maintenance manuals.

## 1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of flooring systems required for this Project. Retain subparagraph below with requirements for Installer certificates in "Informational Submittals" Article.

1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.

2. Use adequate numbers of skilled workmen thoroughly trained and experienced inthe necessary crafts and completely familiar with the specified requirements and methods needed for proper performance of the work of this section.

B. Source Limitations: Obtain primary resinous flooring materials, including primers,resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturerof primary materials.

C. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Apply full-thickness mockups on 48-inch- square floor area selected by State's Representative.

    a. Include 48-inch length of integral cove base with inside corner.

2. Simulate finished lighting conditions for State's Representative review of mockups.

3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.7 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.

## 1.8 PROJECT 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 not less than 24 hours after application unless manufacturer recommends a longer period.

D. Concrete shall be tested for moisture before applying seamless coating. Water vapor transmission upwards through on-grade concrete slabs may result in loosening of epoxy floors or improper curing of epoxy materials. If moisture emissions exceed 5 pounds per 1,000 square feet contact the manufacturer before application.

E. Concrete must be at least 2500 psi and feel like 30 or 50 grit sandpaper.

F. Concrete must be cured for a minimum of 28 days before coating is applied.

G. Schedule coating work to avoid excessive dust and airborne contaminates. Protect work areas from excessive dust and airborne contaminates during coating application.

H. Before any work is started, the applicator shall examine all surfaces for any deficiencies. Should any deficiencies exist, the State Representative shall be notified in writing and any corrections necessary shall be made.

1.9 WARRANTY

A. A written warranty from the manufacturer against defects of materials for a period of 1 (one) year

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Westcoat Specialty Coatings; 770 Gateway Center Drive, San Diego, CA 92102. Telephone 800-250-4519. Fax 619-262-8606. Web Site: www.westcoat.com.

B. Other Manufacturers: Alternatively provide equal products by one of the following:
   1. Crown Polymers.
   2. Crossfield Products Corp.
   3. Or Equal

2.2 Substitutions per Division 1 of the Project Specifications and subject to compliance with this Section's technical specifications.

2.3 CALGREEN REQUIREMENT

A. Architectural paints and coatings shall comply with Table 5.504.4.3, unless more stringent local limits apply. This requirement applies to floor coatings.

2.4 INDUSTRIAL RESINOUS FLOORING

A. Resinous Flooring: Abrasion-, impact- and chemical-resistant, industrial-aggregate- filled, resin-based, monolithic floor surfacing designed to produce a seamless floor and integral cove base.

B. System Characteristics:

   1. Westcoat DUBRO Quartz [ALT: Standard] Epoxy System: Thin Film EC-32 (ALT: EC-34) with CA-31 Large Safe Grip. 100% solids double

broadcast epoxy floor coating system with quartz [ALT: silica] sand broadcasted into the clearbase coat and sealed with clear epoxy. [Note: Price for DUBRO Quartz Epoxy System]

2. Color and Pattern: Provide field samples to be approved by State's Representative
   a. Option 1: Granite (104)
   b. Option 2: Sandstone (109)
   c. [ALT: Option 3: Pewter Grey with silica sand and EC-34 Epoxy]
   d. Provide Westcoat range of available color charts for State's Representative's selection.

3. Wearing Surface: Textured for slip resistance.

4. Overall System Thickness: 1/8 inch.

5. Provide at the following locations:
   a. Men's and Women's Restrooms with Speed Cove Epoxy Coated base.

C. Components

1. Resin: Thin Film: 100% Solids Double Quartz Broadcast Epoxy.

2. Formulation Description: 100 percent solids.

3. Application Method: Troweled or screeded.

   a. Primer: EC-15 Epoxy Moisture Vapor Barrier Primer 250-300 square feet per gallon.

   b. Base Coat: EC-32 Clear [ALT: EC-34 Standard] Epoxy Topcoat 125-150 square feet per gallon.

   c. Broadcast TC-65 Quartz Sand aggregate 100 square feet per 50 pounds.

   d. Second Coat: EC-32 Clear [ALT: EC-34 Standard] Epoxy Topcoat 75-100 square feet per gallon

   e. Broadcast TC-65 Quartz Sand aggregate 100 square feet per 50 pounds

   f. Top Coat: EC-32 Clear [ALT: EC-34 Standard] Epoxy Topcoat 100-150 square feet per gallon.

g. Second Topcoat: Sealing or finish coat:
   1. Resin: EC-95F Polyurethane Topcoat.
   2. Formulation Description: 100 percent solids.
   3. Type: Clear.
   4. Finish: Matte.
   5. Coverage- 200-400 sf per gallon.

4. Aggregates: Washed and kiln dried 30-mesh colored quartz [ALT: silca] sand (sourced locally), broadcast to refusal.

D. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:

1. Compressive Strength: 6871 per ASTM C 579.

2. Tensile Strength: 1572 per ASTM C 307.

3. Flexural Modulus of Elasticity: 882,882 per ASTM C 580.

4. Impact Resistance: No chipping, cracking, or delamination and not more than 1/16-inch permanent indentation per MIL-D-3134.

5. Resistance to Elevated Temperature: No slip or flow of more than 1/16 inch per MIL-D-3134.

6. Flammability: Self-extinguishing per ASTM D 635.

7. Hardness: 70 Shore D per ASTM D 2240.

2.4 PATCHING AND SLOPE COMPOUND (Only needed if floors do not slope to drain)

A. Westcoat TC Slope & Patch System and WP-82: acrylic cement and cement modifier including:

1. Primer: Type recommended by manufacturer for substrate and body coats indicated.

2. Patch cement.

3. Cement Modifier.

## 2.6 ACCESSORIES

A. Waterproofing Membrane: Type recommended by manufacturer for substrate and primer and body coats indicated.

B. Seam tape for crack repair.

## 2.7 PRECAST COVE BASE SYSTEM (6.01)

A. Product: Speed Cove Precast Cove Base System (4” tall), or equal. Provide manufacturer’s recommended adhesive. Provide Wire Tape, or equal, to maintain a crisp line between resinous flooring and wall surface above.

# PART 3 - EXECUTION

## 3.1 PREPARATION

A. General: 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 othercontaminants incompatible with resinous flooring.

1. Roughen concrete substrates as follows:

    a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
    b. Comply with ASTM C 811 requirements unless manufacturer's written instructions are more stringent.

2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written instructions.

3. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.

    a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application of resinous flooring only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. of slab area in 24 hours.

b. Perform plastic sheet test, ASTM D 4263. Proceed with application only after testing indicates absence of moisture in substrates.
c. Perform relative humidity test using in situ probes, ASTM F 2170. Proceedwith installation only after substrates have a maximum 75 percent relative humidity level measurement.

4. 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.

D. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.

E. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.

## 3.1 APPLICATION

A. Install precast cove base system and coatings in accordance with manufacturer’sinstructions.

B. General: 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 resinousflooring 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. At substrate expansion and isolation joints, comply with resinous flooringmanufacturer's written instructions.

C. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

D. Prepare substrates with patch and slope compound where required for positive drainage to floor drains. Mix and install per manufacturer’s written instructions.

E. Apply waterproofing membrane, where indicated, in manufacturer's recommended thickness.

1. Apply waterproofing membrane to integral cove base substrates.

F. 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.

1. Integral Cove Base: Varies, 4 inches nominal as indicated on drawings.

G. Apply troweled or screeded body coats in thickness indicated for flooring system. Handor power trowel and grout to fill voids. When cured, remove trowel marks and roughness using method recommended by manufacturer.

H. Apply grout coat, of type recommended by resinous flooring manufacturer, to fill voidsin surface of final body coat and to produce wearing surface indicated.

I. Apply topcoats in number indicated for flooring system and at spreading rates recommended in writing by manufacturer.

## 3.2 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 80 00**
**PINNABLE DISPLAY BOARD**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pinnable Display Board for Education Center Interior Display Areas.

B. Related Requirements:

1. Section 09 91 00 -- Painting.
2. Section 09 29 00 – Gypsum Board

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. CALGreen Submittals: Submit product data in accordance with Division 1.

1. Product Data for CALGreen 5.504.4.1 Adhesives, Sealants, Caulks: Product Data and material safety data sheets (MSDS) for adhesives and sealants used on the project, indicating VOC content of each product used.

C. Samples: Submit one 8 inch x 8 inch sample of the specified material with the specified painted finish for the State Representative’s review.

D. Quality assurance/control submittals:

1. Manufacturer’s installation instructions

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Minimum 10 years experience in producing sound-deadening boards of the type specified herein.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original packages.

B. Inspect the materials upon delivery to assure that specified products have been received.

C. Report damages material immediately to the delivering carrier and note such damage on the carrier's freight bill of lading.

D. Store materials in a dry place, indoors, on raised platform protected from weather damage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable manufacturer: Homasote Company, 932 Lower Ferry Road, West Trenton, N.J. 08628. Telephone: 800-257-9491 or 609-883-3300, Sales Department, Ext. 1500, Technical Support, Ext. 1332, Fax 609-883-3497. Web site: www.homasote.com. For a local Homasote Company sales rep call the Sales Department, Ext. 1500.

B. Requests for substitutions will be considered in accordance with provisions of Division 1.
1. Substitutions: or approved equal.

C. Provide all sound-deadening boards from a single manufacturer.

2.2 MATERIALS

A. Sound-deadening boards: Homasote PINnacle, physical properties as follows:
1. Thickness: ½ inch.
2. Density: 34-40 pcf.
3. Tensile strength: 400-700 psi.
4. Hardness (Janka Ball): 275 lbs.

5. Water absorption by volume; ASTMC 209:
    a) 2 hours immersion: 7 percent maximum.
6. Expansion, 50 to 90 percent relative humidity: 0.30 percent.
7. R-value: ½ inch .85.
8. Flame spread: Class III (or A).
9. Noise reduction coefficient: 0.20.

2.3 ACCESSORIES

A. Adhesive: APA AFC-01 approved.

B. Angular thread nails: length as required to penetrate a minimum of ¾ inch into wall studs.

C. Screws:
    1. Coarse thread drywall type wood screw, length as required to penetrate ¾ inch into wall studs.

2.4 FINISH

A. Painted finish to match interior gypsum board walls: See Section 09 91 00 – Painting.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates upon which work will be installed.

B. Verify framing member spacing complies with manufacturer's requirements depending on substrates and installation methods.

C. Verify environmental conditions are, and will continue to be, maintained in accordance with manufacturer's recommendations.

D. Coordinate with responsible entity to perform corrective work on unsatisfactory substrates or conditions.

E. Starting work by installer is acceptance of substrates and environmental conditions.

3.2 PREPARATION

A. Follow manufacturer's instructions by separating and allowing PINnacle to be exposed to environmental temperature and humidity conditions for not less than 24 hours before start of installation.

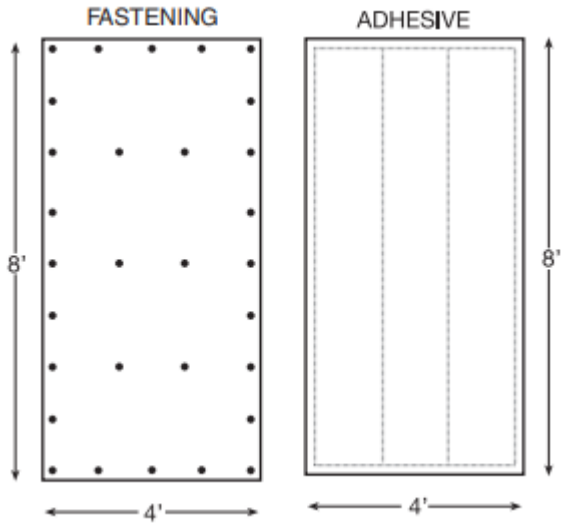
B. PINnacle panels must be installed in a clean, dry condition. DO NOT INSTALL WET PANELS. It is essential to make every effort to prevent water from ponding on installed panels. PINnacle panels must be thoroughly dry prior to closing in the structure.

3.3 INSTALLATION

A. Follow manufacturer's instructions for cutting and installation of PINnacle.

B. Over prefinished walls.

1. Apply 4 by 8 foot (1.219 x 2.438m) panels on approved wall.
2. Using approved APA subfloor adhesive meeting APA-AFG-01 specifications, apply a 3/8 inch bead of adhesive. Holding back 3/4 inch from panel edges at 16" centers within the field as shown in the "fastening and adhesive pattern.




3. Allow 1/8 inch (3.1mm) space at panel joints, and 1/4 inch (6.4mm) space along walls and partitions.
4. Use proper length ring shank nails or screws to penetrate wall stud 3/4 inch minimum (19mm). Follow nailing pattern in diagram.
5. If applying PINnacle panels to adhesive and framing, apply hand pressure where adhesive is located to insure positive contact; screw or nail panels at maximum 24" centers along edges and 24" centers along all intermediate framing. Screws or nails should be of sufficient length to penetrate 3/4" into framing. Position screws or nails 3/8" from edge panels. Finishing screws may be used and left exposed.
6. If omitting adhesive, panels must be nailed or screwed 6 inch o.c. along panel edges and 12 inch o.c. throughout the field of the board.
7. Hold back nails or screws 3/8 inch (9.5mm) from panel edges.

3.4 ADJUSTING AND CLEANING

A. Replace panels that cannot be repaired.

B. Light sanding by using 280-320 grit paper.

3.5 FINISHING GYPSUM BOARD

A. Paint per manufacturer’s recommendations.

END OF SECTION 09 80 00

**SECTION 09 91 00**
**PAINTING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General and Technical Provisions of the Contract apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Surface preparation and painting of all interior and exterior exposed items and surfaces unless specifically indicated otherwise.

2. Refer to surface finish schedules.

1.3 RELATED SECTIONS

A. Refer to various other Sections for identification of shop primed items.
B. Section 04 22 00 Concrete Masonry Unit
C. Section 05 12 00 Structural Steel Framing for Shade Structure and structural steel.
D. Section 05 50 00 Metal Fabrications for exterior steel coatings.
E. Section 07 62 00 Sheet Metal Flashing and Trim
F. Section 07 46 00 Non-Combustible Siding and Trim
G. Section 09 29 00 Gypsum Board for interior wall finishes

1.4 REFERENCES

A. Green Seal Standard GS-11; May 20, 1993.
B. US Green Building Council, (USGBC) - Green Seal standards for LEED paint credits.
C. Occupational Safety and Health Act (OSHA) - Safety Standards.
D. American National Standards Institute (ANSI) - Performance Standards.
E. Paint Decorating Contractors of America (PDCA) - Application Standard.
F. National Paint and Coatings Association (NPCA) - Gloss Standard.
G. American Society for Testing Materials (ASTM) - Testing Methods.
H. Master Paint Institute (MPI #) - Established paint categories and standards.
I. SCAQMD 1168 - South Coast Air Quality Management District Rule #1168; October 3, 2003.
J. SSPC (PM1) - Steel Structures Painting Manual, Vol. 1, Good Painting Practice; Society for Protective Coatings; 1993, Third Edition.

K. SSPC (PM2) - Steel Structures Painting Manual, Vol. 2, Systems and Specifications; Society for Protective Coatings; 1995, Seventh Edition.

L. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

1.5 DEFINITIONS

A. Exposed: Exposed items and surfaces are defined as those which may be seen while standing on any floor, the roof, or in any occupied space.

B. Exterior: On the outside; exposed to the outside air or weather, either directly or indirectly.

C. Commercial as used in this Section refers to a product well suited for a commercial application.

D. DFT as used in this Section refers to the Dry Film Thickness of the coating.

E. Enamel refers to any acrylic or alkyd (oil) base paint which dries leaving an eggshell, pearl, satin, semi-gloss or high gloss enamel finish.

F. DTM as used in this Section refers to paint that is applied Direct To Metal.

G. LEED as used in this Section refers to Leadership in Energy and Environmental Design. Products listed meet LEED criteria for environmentally safe interior primers, paints and coatings.

H. Premium as used in this Section refers to the best quality product "top of the line".

I. VOC as used in this Section refers to Volatile Organic Compounds found in primers, paints, sealers and stains. The level of VOCs appears after each product listed in the Schedule in grams per liter (g/L).

J. Paints are available in a wide range of sheens or glosses, as measured by a gloss meter from a 60 and/or 85 degree angle from vertical, as a percentage of the amount of light that is reflected. The following terms are used to describe the gloss of our products. The list below is provided for general guidance; refer to the technical data sheet for the actual gloss/sheen level for each product.

1. Flat - Less than 5 Percent.
2. Eggshell - 5 - 20 Percent.
3. Satin - 20 - 35 Percent.
4. Semi-Gloss - 30 - 65 Percent.
5. Gloss - Over 65 Percent.

## 1.6 SUBMITTALS

A. Submit under provisions of Division 1.

B. Schedule: Submit a schedule listing each coat and manufacturer's product number for all finishing products. Provide all architectural paint products manufactured by the same manufacturer, unless otherwise indicated.

C. Product Data: Submit manufacturer's product data on paints and coatings indicating VOC content. Submit manufacturer's application instructions.

1. Include MSDS sheets for paints and coatings, including printed statement of VOC content and chemical components.

D. Samples: Submit three samples 8 x 10 inch in size illustrating each color and texture for each surface finish scheduled, made from actual paint to be used.
1. Submit Samples on rigid backing.
2. Label each coat of each Sample.
3. Label each Sample for location and application area.

E. Qualification Data: Submit for applicator.

F. Manufacturer's Instructions: Indicate special surface preparation procedures.

G. Coating Maintenance Manual: Provide coating maintenance manual including area summary with finish schedule, area detail designating location where each product/color/finish was used, product data pages, material safety data sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

## 1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten years experience.

B. Applicator Qualifications: Company specializing in commercial painting and finishing with a minimum of five years documented experience in surface preparation and field application of the same type and scope as specified and approved by product manufacturer.

C. Regulatory Requirements:

1. Flammability: Conform to California Building Code, latest edition, for flame/fuel/smoke rating requirements.

2. VOC Content: Conform to CCR Title 24, Part 11 (CALGreen), Section 5.504.4.3 "Pollution Control - Paints and Coatings", and Bay Area Air Quality Management District for air pollution control requirements.
3. Aerosol paints and coatings shall meet the Product-Weighted MIR Limits for ROC in Section 94522(a)(3) and other requirements, including prohibitions on use of certain toxic compounds and ozone depleting substances in Sections 94522(c)(2) and (d)(2) of *California Code of Regulations*, Title 17, commencing with Section 94520; and in areas under the jurisdiction of the Bay Area Air Quality Management District additionally comply with the percent VOC by weight of product limits of Regulation 8 Rule 49. (5.504.4.3.1)

C. Field Samples: Provide field sample panels, 4 x 4 foot minimum size, illustrating coating color, texture, and finish. Field samples may be requested for any and all paint finishes. Locate where directed. State's Representative may require one color adjustment of each field sample color on the wall at no cost to the State. Accepted samples may remain as part of the Work. Refinish field samples as required to produce acceptable Work.

D. Labeling: Include following on label of each container:

1. Manufacturer's name and product name.
2. Generic type of paint.
3. Manufacturer's stock number.
4. Color.
5. Instructions for reducing, where applicable.

E. Pre-Installation Meeting: Convene a pre-installation meeting before application of painting materials, to be attended by the paint supplier, painting applicator, Contractor, State Representative and Architect to discuss application methods, substrate and preparation, desired mil thicknesses, and other topics related to achieving the quality of finish desired.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptance. Remove immediately any item rejected by the State's Representative.

B. Container labeling shall include manufacturer's name, type of paint, brand name, brand code, coverage, surface preparation, drying time, cleanup, color designation, and instructions for mixing and reducing.

C. Store paint materials at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in well ventilated area, unless required otherwise by manufacturer's instructions.

D. Take precautionary measures to prevent fire hazards and spontaneous combustion.

E. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1. Remove rages and waste from storage areas daily. Store rags used with oil and solvent-based materials in fire-resistant metal containers and dispose of in accordance with requirements of local authorities having jurisdiction. Do not dispose of rags used with oil and solvent-based materials in regular garbage.

F. Disposal:

1. Never pour leftover coating down any sink or drain. Use up material on the job or seal can and store safely for future use.
2. Do not incinerate closed containers.
3. For specific disposal or recycle guidelines, contact the local waste management agency or district. Recycle whenever possible.

## 1.9 ENVIRONMENTAL REQUIREMENTS

A. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures above 45 degrees F (7 degrees C) for 24 hours before, during, and 48 hours after application of finishes, unless required otherwise by manufacturer's instructions.

B. Do not apply exterior coatings in rain, fog, mist, or snow; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 degrees F above the dew point; or to damp or wet surfaces, unless required otherwise by manufacturer's instructions.

C. Minimum Application Temperatures for Latex Paints: 45 degrees F (7 degrees C) for interiors; 50 degrees F (10 degrees C) for exterior; unless required otherwise by manufacturer's instructions.

D. Provide lighting level of 80 ft candles measured mid-height at substrate surface during application and inspection of the work.

E. Mix materials in ventilated areas as directed. Remove all empty containers, waste and contaminated rags from premises at end of each working day.

F. Do not apply finish in areas where dust is being generated.

G. Hazardous Materials: Hazardous materials including lead paint may be present in buildings and structures to be painted.

1. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified.

2. Perform preparation for painting of substrates known to include lead paint in accordance with EPA Renovation, Repair and Painting Rule and additional requirements of authorities having jurisdiction.

1.10 SCHEDULING

A. Gypsum Board: Verify with Section 09 29 00 that skim coat has been applied to surfaces scheduled to receive semi-gloss and gloss paints. Do not proceed until completed.

1.11 MAINTENANCE

A. Extra Materials: Furnish one gallon of each color and type of paint used to State Representative. Tightly seal and clearly label containers. Label each container with color and room locations, in addition to the manufacturer's label.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide all products from the same manufacturer, unless otherwise indicated.
   1. Basis of Design: Benjamin Moore and Co. 101 Paragon Dr Montvale, NJ 07645; Toll Free Tel: 866-708-9181; info@benjaminmoore.com; www.benjaminmoore.com
   2. Tnemec
   3. Dunn Edwards
   4. Sherwin Williams
   5. WB
   6. Or approved equal.

B. Base the bid on providing up to 6 paint colors, with up to 1 deep tone color, consisting of any combined mix of gloss enamel, satin enamel, eggshell enamel, or flat latex. Each office wall surface, soffit, ceiling, or plane will consist of only one color or type paint, unless otherwise shown.

2.2 MATERIALS - GENERAL

A. Paints:
   1. Definition: "Paint" as used herein means coating systems including primers, emulsions, enamels, stains, sealers and fillers, whether used as prime, intermediate, or finish coats.

2. Quality: Use only pure, unadulterated, first quality materials. If manufacturer makes more than one quality of material, use only their best quality.

3. Compatibility: Use primers and succeeding coats of any given system from the same manufacturer, that are compatible with one another and with the substrate, and which are approved by the manufacturer, unless specifically scheduled otherwise. No thinning, reducing, or changing of mix is permitted unless specifically indicated herein.

B. For interior applications use paints and coatings that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D, and the following chemical restrictions:

1. Architectural paints, coatings, and primers applied to interior walls and ceilings: Do not exceed the VOC limits established in Green Seal Standard GS-11, Paints, Edition 4.0, September 27, 2021.

   a. Flat Paints and Coatings: 50 g/L.
   b. Non-Flat Paints and Coatings: 100 g/L.
   c. Non-Flat High Gloss Coatings: 150 g/L.
   d. Primers, Sealers, and Undercoats: 100 g/L.

2. Anti-corrosive and anti-rust paints applied to interior ferrous metal substrates: VOC not more than 250 g/L, established in Green Seal Standard GS-11, Paints, Edition 4.0, September 27, 2021.

3. Low-Emitting Materials: Interior paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Method for the Testing and Evaluation of Volatile Organic Emissions from Indoor Sources Using Environmental Chambers."

4. Clear wood finishes, floor coatings, stains, sealers and shellacs applied to interior elements: Do not exceed the VOC limits established in South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, February 5, 2016.

   a. Floor Coatings: 50 g/L.
   b. General Purpose Sealers: 100 g/L.
   c. Stains: 250 g/L.
   d. Waterproofing Sealers: 100 g/L.
   e. Sanding Sealers: 275 g/L.
   f. Clear Wood Varnishes: 275 g/L.
   g. Lacquers: 275 g/L

5. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).

6. Restricted Components: Paints and coatings shall not contain any of the following:

    a. Acrolein.
    b. Acrylonitrile.
    c. Antimony.
    d. Benzene.
    e. Butyl benzyl phthalate.
    f. Cadmium.
    g. Di (2-ethylhexyl) phthalate.
    h. Di-n-butyl phthalate.
    i. Di-n-octyl phthalate.
    j. 1,2-dichlorobenzene.
    k. Diethyl phthalate.
    l. Dimethyl phthalate.
    m. Ethylbenzene.
    n. Formaldehyde.
    o. Hexavalent chromium.
    p. Isophorone.
    q. Lead.
    r. Mercury.
    s. Methyl ethyl ketone.
    t. Methyl isobutyl ketone.
    u. Methylene chloride.
    v. Naphthalene.
    w. Toluene (methylbenzene).
    x. 1,1,1-trichloroethane.
    y. Vinyl chloride.

C. General Purpose Filler: Standard spackling compound or gypsum wallboard joint compound or latex patching compound; for patching gypsum wallboard.

D. Cementitious Filler: Nonshrink formulation; white portland cement with fine silicate aggregate, zinc-oxide pigment, and reinforcing chemical binder as approved.

E. Accessory Materials: Paint thinners, turpentine, linseed oil, shellac, and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality, as recommended by each manufacturer for his respective product.

F. Equipment: Provide scaffolding, staging, drop cloths, covers, brushes, rollers, and spraying and other equipment of type, grade, and size required for proper execution of the Work.

2.3 MIXING AND TINTING

A. Except where specifically noted in this section, all paint shall be ready-mixed and pre-tinted. Agitate all paint prior to and during application to ensure uniform color, gloss, and consistency.

B. Thinner addition shall not exceed manufacturer's printed recommendations. Do not use kerosene or other organic solvents to thin water-based paints.

C. Where paint is to be sprayed, thin according to manufacturer's current guidelines.

2.4 COLORS AND FINISHES

A. Use only materials capable of achieving the finishes and colors specified and scheduled.

B. Finish Sheens: Within MPI Standard; reflectance tested at 60 degrees in accordance with ASTM D523.

1. Gloss Level 1 - Flat: <3
2. Gloss Level 2 - Low Sheen: 5-10
3. Gloss Level 3 - Eggshell: 10-15
4. Gloss Level 4 - Satin: 25-35
5. Gloss Level 5 - Semi-Gloss: 50-55
6. Gloss Level 6 - Gloss: 70-80
7. Gloss Level 7 - Gloss: >85

C. If the Contractor chooses to use a manufacturer's materials other than those for which specific color selections are made, match the specified colors exactly.

D. Paint colors are intended to be correct for next-to-last coat. Final approved color selections will be close to, but may vary slightly from, samples indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Review the product manufacturer's special instructions for surface preparation, application, temperature, re-coat times, and product limitations.

B. Review product health and safety precautions listed by the manufacturer.

C. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

D. Examine surfaces scheduled to be finished prior to commencement of work for surface imperfections and contaminants that could impair performance or appearance of coatings, including but not limited to, loose primer, rust, scale, oil, grease, mildew, algae, or fungus, stains or marks, cracks, indentations, or abrasions. Report any condition that may potentially affect proper application.

E. Correct conditions that could impair performance or appearance of coatings in accordance with specified surface preparation procedures before proceeding with coating application.

F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:

1. Plaster and Gypsum Wallboard: 12 percent.
2. Concrete and Masonry: 12 percent or as required by manufacturer.
3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
4. Interior Finish Detail Woodwork, Including Trim and Casework: 10 percent.
5. Concrete Slab-On-Grade: Perform calcium chloride test over 24 hour period or other acceptable test to manufacturer. Verify acceptable moisture transmission and pH levels.

D. Do not begin work until unsatisfactory conditions have been resolved.

3.2 PREPARATION

A. General:

1. Remove electrical plates, hardware, light fixture trim, and fittings prior to preparing surfaces or finishing.
2. Correct minor defects and clean surfaces which affect work of this Section.
3. Shellac and seal marks which may bleed through surface finishes.
4. Do not start work until surfaces to be finished are in proper condition to produce finished surfaces of uniform, satisfactory appearance.

B. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

a. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems

indicated.

C. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

D. Aluminum Surfaces Scheduled for Paint Finish: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.

E. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer. Clean and prep to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

F. Uncoated Steel and Iron Surfaces: Remove grease, scale, dirt, and rust. Where heavy coatings of scale are evident, remove by wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs. Clean using methods recommended in writing by paint manufacturer but not less than the following:

1. SPC-SP 2, "Hand Tool Cleaning."
2. SSPC-SP 3, "Power Tool Cleaning."
3. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
4. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."

G. Shop Primed Steel Surfaces: Touch-up primed steel frame immediately after erection, including end of beam plates. Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

H. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.

I. Gypsum Board Surfaces: Latex fill minor defects. Spot prime defects after repair.

J. Concrete Surfaces Scheduled to Receive Paint Finish: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

1. Concrete Floors: Remove oil, dust, grease, dirt, and other foreign materials. Comply with SSPC-SP-13/NACE 6 or ICRI 03732.

K. Wood Substrates:

1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

L. Plastic Trim Fabrication Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

M. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

## 3.3 PROTECTION

A. Protect elements surrounding the work of this Section from damage or disfiguration. Furnish drop cloths, shields, and protective methods to prevent spray or droppings from disfiguring other surfaces.

B. Neatly mask door and frame rating labels and equipment labels.

## 3.4 APPLICATION

A. General: Apply paints and coatings by brush, roller, spray, or other applicators in accordance with manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied. Do not apply finishes to surfaces that are not dry.

1. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.

2. Provide finish coats that are compatible with primers used.

3. Apply each coat to uniform finish and mil thickness. Apply each coat following manufacturer's recommended minimum Dry Film Thickness (DFT).

4. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.

5. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, and similar components are in place. Extend coatings in these areas as required to maintain system integrity and provide desired protection.

6. Paint surfaces behind movable equipment and furniture the same as similar exposed equipment. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.

7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.

8. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.

9. Sand lightly between each succeeding enamel or varnish coat.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and film thickness required are the same regardless of application method.

2. Allow each coat to dry before next coat is applied, as recommended by manufacturer.

3. If sanding is required to produce a smooth, even surface, sand between applications.

4. Omit primer over metal surfaces that have been shop primed and touchup painted.

5. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color and appearance. Ensure that edges, corners, crevices, welds, and exposed fasteners receive the same dry film thickness as flat surfaces.

C. Painting Fire Suppression, Plumbing, Mechanical, Electrical, Communication and Electronic Safety and Security Equipment:

1. Paint shop primed equipment. Do not paint identification markings on mechanical or electrical equipment.

2. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

3. In occupied spaces, prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, except where items are prefinished. Such items are not required to be painted in mechanical rooms.

4. Paint interior surfaces of air ducts, and convectors that are visible through grilles and louvers with one coat of flat black paint, to limit of sight line. Paint dampers exposed behind louvers, grilles, and convectors to match louver face panels.

5. Paint exposed conduit and electrical equipment occurring in finished areas.

6. Replace electrical plates, hardware, light fixture trim, and fittings removed prior to finishing.

D. Painting Doors and Frames:

1. Paint doors and frames same color on both sides and edges, unless otherwise noted on the door schedule.

2. Where doors are scheduled to be painted two colors, paint the edges to match the face toward which the door swings.

3. Where frames are scheduled to be painted two colors, the joint between colors shall occur behind the edge of the door where the stop meets the frame.

## 3.5 FIELD QUALITY CONTROL

A. Site Tests: Provide testing of mil thickness of coatings and finishes. All field painting is subject to verification of mil 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.

## 3.6 CLEANING

A. As Work proceeds, promptly remove paint where spilled, splashed, or spattered. Clean excess coating materials, and coating materials deposited on surfaces not indicated to receive coatings, as construction activities of this section progress; do not allow to dry.

B. Repair damage to other surfaces caused by work of this Section.

C. During progress of Work maintain premises free of unnecessary accumulation of tools, equipment, surplus materials, and debris.

D. Collect cotton waste, cloths, and material which may constitute a fire hazard, place in closed metal containers and remove daily from site. Remove empty paint containers from site.

E. Re-install hardware, electrical equipment plates, mechanical grilles and louvers, lighting fixture trim, and other items that have been removed to protect from contact with coatings.

F. Reconnect equipment adjacent to surfaces indicated to receive coatings.

G. Relocate to original position equipment and fixtures that have been moved to allow application of coatings.

H. Remove protective materials.

## 3.7 PROTECTION AND REPAIR

A. Protect completed coating applications from damage by subsequent construction activities until completion of painting project.

B. Touch-up coatings damaged by subsequent construction activities.

## 3.8 PAINT SYSTEMS

A. Schedule: See Material and Finish Schedule. Only major areas are scheduled. Treat miscellaneous and similar items and areas within room or space with similar system. All paint systems to be confirmed by State’s Representative.

1. Exterior

    a. Structural steel and metal fabrications, see Sections 05 12 00 and 05 50 00.

b. Misc. flashing and trim: Kynar coated, See Section 07 62 00, touch up as recommended by manufacturer.

c. Education Center Exterior Closets Metal Doors and Frames: Benjamin Moore Benjamin Moore Aura Exterior Paint Satin N631. Color to be selected by State's Representative from a range of (3) color samples.

d. Non-Combustible Siding: Benjamin Moore Aura Exterior Paint Low Lustre N634, BM HC-46 Jackson Tan or as selected by State's Representative from a range of (3) color samples.

e. Non-Combustible Trim: Benjamin Moore Aura Exterior Paint Satin N631. Color as selected by State's Representative from a range of (3) color samples.

f. Non-Combustible Beadboard Soffit: Benjamin Moore Aura Exterior Paint Flat N629. Color as selected by State's Representative from a range of (3) color samples.

g. Non-Combustible V-Groove Entry: Benjamin Moore Aura Exterior Paint Low Lustre N634. Color as selected by State's Representative from a range of (3) color samples.

h. DEDUCT ALT 01: Sliding Barn Door Shutters: Benjamin Moore Aura Exterior Paint Low Lustre N634. Color as selected by State's Representative from a range of (3) color samples.

i. Concrete Masonry Unit: Benjamin Moore Aura Low Lustre N634. Color to match existing or as selected by State's Representative from a range of (3) color samples.

j. Exterior Gypsum Soffit Board: Benjamin Moore Aura Exterior Paint Flat N629. White or as selected by State's Representative from a range of (3) color samples.

k. Restroom Metal Doors and Frames: Benjamin Moore Command Waterborne Acrylic Urethane Satin HP 3920, verify with State's Representative. Color to be selected by State's Representative from a range of (3) color samples.

2. Interior

a. Gypsum Board at Education Center Walls: Benjamin Moore Aura Interior Eggshell N524. BM891 Opal or as selected by State's Representative from a range of (3) color samples.

b. Pinnable Display Board at Education Center Walls: Benjamin Moore Aura Interior Eggshell N524. BM891 Opal or as selected by State's Representative from a range of (3) color samples.

c. Gypsum Board at Education Center Storage Room, Electrical/Mechanical Room, and Exterior Closet Walls: Benjamin Moore Aura Interior Eggshell N524. White or as selected by State's Representative from a range of (3) color samples.

d. Gypsum Board at Education Center Storage Room, Electrical/Mechanical Room, and Exterior Closet Ceilings: Benjamin Moore Aura Interior Matte N528. White or as selected by State's Representative from a range of (3) color samples.

e. Gypsum Board at Education Center Skylight Lightwell: Benjamin Moore Aura Interior Matte N528. White or as selected by State's Representative from a range of (3) color samples.

f. Wood at Education Center Window Jambs, Heads, Sills, and Baseboard: Benjamin Moore Aura Interior Semi-Gloss N528. BM HC-46 Jackson Tan or as selected by State's Representative from a range of (3) color samples, Semi-Gloss.

g. Wood at Education Center Interior Doors: Benjamin Moore Aura Interior Semi-Gloss N528 BM HC-46 Jackson Tan or as selected by State's Representative from a range of (3) color samples.

h. Gypsum Board at Restroom Interior Walls: Benjamin Moore Aura Interior Eggshell N524. Color to match existing or as selected by State's Representative from a range of (3) color samples, Semi-Gloss. Verify with State's Representative.

i. Restroom Door and Frame interior faces: Benjamin Moore Command Waterborne Acrylic Urethane Satin HP 3920, verify with State's Representative. Color to be selected by State's Representative from a range of (3) color samples.

j. Structural steel and metal fabrications, see Sections 05 12 00 and 05 50 00.

B. Number of Coats: Where number of coats is specified, it is only as a minimum requirement. Apply additional coats, at no additional cost to District Representative, if necessary to completely hide base material, produce uniform color, and provide satisfactory finish result.

C. Systems Specifications: These specifications are a guide and are meant to establish procedure and quality. Confer with State's Representative to determine exact finish desired.

D. Acceptance of Final Colors: Do not apply final coats of paint for both exterior and interior systems until colors have been accepted by State's Representative.

E. Exterior Painting Systems:

1. Metal Surfaces:

a. Acrylic Enamel Finish for Galvanized Steel, Galvannealed Steel, Zinc-Rich Painted Steel, and Aluminum: (see also Section 05 50 00 Metal Fabrications)

i. Prime Coat: **Tnemec Series N69 Hi-Build Epoxoline II (Shop) at 2.0 to 3.0 mils DFT or V69 Hi-Build Epoxoline II (Field) at 4.0 to 6.0 mils DFT.** [ALT: Benjamin Moore High Performance Acrylic Metal Primer HP1100]

(a) Thoroughly clean and prepare all substrates per manufacturer recommendations.
(b) For Benjamin Moore Primer: Thoroughly clean all new metal surfaces with Oil & Grease Emulsifier HP6000 to remove contaminants. New shiny non-ferrous metal surfaces subject to abrasion should be dulled with very fine sandpaper or a synthetic steel wool pad to promote adhesion per manufacturer's recommendations.

ii. Stripe-Coat Procedure: **Tnemec Series 1095 Endura-Shield**; brush-applied to all welds, voids, nuts, bolts and sharp edges referencing Paint Application Guide No. 11 Protecting Corners, Edges, Crevices, and Irregular Steel Geometries by Stripe Coating.

iii. Body Coat: **Tnemec Series V69 High Build Epoxoline II Primer** or per manufacturer's recommendations.

iv. Finish Coat: **Tnemec Enduratone Series 1029** [ALT: Benjamin Moore Aura Waterborne Exterior Soft Gloss N632 or Dunn Edwards Spartagloss W7600V Interior/Exterior Acrylic Gloss]

b. Acrylic Enamel Finish for Shop-Primed Ferrous Metal (Excluding Structural Steel – See Section 05 12 00 Structural Steel Framing):

i. Touch-up damaged priming: **Series 90-97 Tneme-Zinc or 93-H2O Hydro-Zinc at 2.5 to 3.5 mils DFT.** [ALT: WB SYN-LUSTRO Premium Interior/Exterior Rust Preventative Metal Primer, 100% Acrylic]. VOC content shall comply with local governing air district.

ii. Stripe Coat Procedure: **Tnemec Series V69 High Build Epoxoline II** brush-applied to all welds, voids, nuts, bolts and sharp edges referencing Paint Application Guide No. 11 Protecting Corners, Edges, Crevices, and Irregular Steel Geometries by Stripe Coating.

iii. Body Coat: **Tnemec Series V69 High Build Epoxoline II Primer** or per manufacturer's recommendations.

iv. Finish Coat: **Tnemec Enduratone Series 1029** [ALT: Dunn Edwards Spartagloss W7600V Interior/Exterior Acrylic Gloss].

c. Polyurethane Enamel Coating System:

i. Prime Coat: Shop-applied under other applicable Sections. Touch up shop primer where needed with Ameron 385 Epoxy primer or Devoe Bar-Rust 235V Surface Tolerant Epoxy.

ii. Finish Coats: Tnemec's Series 1075 (1074) Endura-Shield, Devoe Devthane 378H Aliphatic Urethane Semi-Gloss or Ameron Amershield 450SA, semi-gloss (gloss) sheen, 2.5 mils dry film thickness.

d. Fluoropolymer Finish for Hot Dip Galvanized Steel (See Section 05 50 00 Metal Fabrications).

i. Metal Primer For Hot-Dip Galvanized Steel: Compatible with finish coats of paint; shop apply to the respective dry film mil thickness specified **Tnemec Series N69 Hi-Build Epoxoline II (Shop) at 2.0 to 3.0 mils DFT or V69 Hi-Build Epoxoline II (Field) at 4.0 to 6.0 mils DFT.** [ALT: Benjamin Moore High Performance Acrylic Metal Primer HP1100], or approved equal.

(a) Exposed to view items to be field painted for repairs shall be primed with a primer compatible with final finish coat.

ii. Galvanizing Repair Paint: High zinc dust content paint for re-galvanizing welds in galvanized steel; **Tnemec 90-93,** or

approved equal. VOC content shall comply with local governing air district.

iii. Stripe-Coat Procedure: **Tnemec Series 1095 Endura-Shield**; brush-applied to all welds, voids, nuts, bolts and sharp edges referencing Paint Application Guide No. 11 Protecting Corners, Edges, Crevices, and Irregular Steel Geometries by Stripe Coating.

iv. Finish Coats: Finish Coat: **TnemecSeries 1071V | Fluoronar Semi-gloss** (Color TBC by State's Representative); 2.5 to 3.5 mils DFT, per manufacturer's recommendations.

e. Fluoropolymer Finish for Ferrous Metal - Bare (See Section 05 50 00 Metal Fabrications).

i. Shop or Field Primer: **Series 90-97 Tneme-Zinc or 93-H2O Hydro-Zinc at 2.5 to 3.5 mils DFT** VOC content shall comply with local governing air district.

(a) Exposed to view items to be field painted for repairs shall be primed with a primer compatible with final finish coats specified.

ii. Galvanizing Repair Paint: High zinc dust content paint for re-galvanizing welds in galvanized steel; **Tnemec 90-93**," or approved equal. VOC content shall comply with local governing air district.

iii. Stripe-Coat Procedure: **Tnemec Series 1095 Endura-Shield;** brush-applied to all welds, voids, nuts, bolts and sharp edges and areas inaccessible to roller application referencing Paint Application Guide No. 11 Protecting Corners, Edges, Crevices, and Irregular Steel Geometries by Stripe Coating.

iv. Intermediate Coat: **Tnemec Series 1095 Endura-Shield**; 3.0 to 5.0 mils DFT per coat

v. Finish Coats: **Tnemec Series 1071V Fluoronar semi-gloss**; 2.5 to 3.5 mils DFT, per manufacturer's recommendations.

2. Concrete and Masonry Surfaces:

a. Concrete/Masonry Non-Traffic Surfaces, Porous

i. Primer Coat: Ultra Spec Masonry Interior/Exterior High Build Block Filler (571).

ii. Body Coat: Same as topcoat.

iii. Finish Coat: Benjamin Moore Aura Waterborne Exterior **Low Lustre N634.**

b. Concrete Masonry Unit Non-Traffic Surfaces:

i. Primer Coat: **Benjamin Moore Ultra Spec Masonry Interior/Exterior Hi-Build Block Filler 571** [ALT: Dunn Edwards FLEX-PRIME W6315 Flexible Crack-Resistant Primer]

ii. Body Coat: Same as finish coat.

iii. Finish Coat: **Benjamin Moore Aura Flat N629** [ALT: Dunn Edwards ACRI-HUES W720 Exterior Acrylic Flat].

c. Concrete Pedestrian Traffic Surfaces:

i. Primer Coat: Benjamin Moore Latex Floor & Patio Low Sheen Enamel N122.

ii. Primer Coat: Same as finish coat.

iii. Finish Coat: Benjamin Moore Latex Floor & Patio Low Sheen Enamel N122.

3. Exterior Gypsum and Fiber Cement Board Surfaces (Verify application for Non-Combustible siding with manufacturer):
   a. Gypsum and Fiber Cement Board Soffit

i. Primer Coat: Benjamin Moore **Ultra Spec Masonry Interior/Exterior 100% Acrylic Masonry Sealer 608 or Masonry High Build Primer N609, Deep Color Base Primer tinted as recommended by manufacturer.**

ii. Body Coat: Same as finish coat.

iii. Finish Coat: Benjamin Moore Aura Waterborne Exterior **Flat N629 or Low Lustre N634.**

b. Fiber Cement Board Siding:

i. Primer Coat: Benjamin Moore **Ultra Spec Masonry Interior/Exterior 100% Acrylic Masonry Sealer 608 or**

**Masonry High Build Primer N609 with Deep Color Base Primer tinted as recommended by manufacturer.**

ii. Body Coat: Same as finish coat.

iii. Finish Coat: Benjamin Moore Aura Waterborne Exterior **Flat N629 or Low Lustre N634.**

c. Fiber Cement Board Trim

i. Primer Coat: Benjamin Moore **Ultra Spec Masonry Interior/Exterior 100% Acrylic Masonry Sealer 608 or Masonry High Build Primer N609 with Deep Color Base Primer tinted as recommended by manufacturer.**

ii. Body Coat: Same as finish coat.

iii. Finish Coat: Benjamin Moore Aura Waterborne Exterior **Satin N631 or Semi-Gloss N632.**

4. Wood Surfaces
   a. Wood Soffit Surfaces, Non-Traffic

i. Primer Coat: Benjamin Moore **Insl-X Max Block Water-Based Stain Blocking Primer SB-5000, Fresh Start Exterior Deck & Siding Primer, or Fresh Start High Hiding All Purpose Primer** per manufacturer's recommendations.

ii. Body Coat: Same as finish coat.

iii. Finish Coat: Benjamin Moore Aura Waterborne Exterior **Flat N629 or Low Lustre N634.**

b. Wood Siding Surfaces, Non-Traffic

i. Primer Coat: Benjamin Moore **Insl-X Max Block Water-Based Stain Blocking Primer SB-5000, or Fresh Start Exterior Deck & Siding Primer, or Fresh Start High Hiding All Purpose Primer** per manufacturer's recommendations.

ii. Body Coat: Same as finish coat.

iii. Finish Coat: Benjamin Moore Aura Waterborne Exterior **Flat N629 or Low Lustre N634.**

c. Wood Trim Surfaces

i. Primer Coat: Benjamin Moore **Insl-X Max Block Water-Based Stain Blocking Primer SB-5000, or Fresh Start Exterior Deck & Siding Primer, or Fresh Start High Hiding All Purpose Primer** per manufacturer's recommendations.

ii. Body Coat: Same as finish coat.

iii. Finish Coat: Benjamin Moore Aura Waterborne Exterior **Satin N631 or Semi-Gloss N632.**

5. Exterior and Interior Fiberglass Doors and Frames (Enamel Finish).

a. Primer Coat: Benjamin Moore Insl-X Stix Waterborne Bonding Primer SXA-110 or as recommended by manufacturer

b. Body Coat: Same as finish coat.

c. Finish Coat: Benjamin Moore Command Waterborne Acrylic Urethane **Gloss HP3900 or Satin HP 3920.**

6. Exterior Metal Doors (Enamel Finish):

**a.** Prime Coat: Benjamin Moore High Performance **Acrylic Metal Primer HP1100** or as recommended by manufacturer.

b. Body Coat: Same as finish coat.

c. Finish Coat: Benjamin Moore **Command Waterborne Acrylic Urethane Gloss HP3900 or Satin HP 3920** [ALT: Aura Exterior Soft Gloss N632].

F. Interior Painting Systems:

1. Concrete and Masonry Surfaces:

a. Concrete/Masonry Non-Traffic Surfaces, Porous

i. Primer Coat: Ultra Spec Masonry Interior/Exterior High Build Block Filler (571).

ii. Body Coat: Same as finish coat.

iii. Finish Coat: Benjamin Moore Aura Interior **Matte N528, Eggshell N524, Satin N526 or Semi-Gloss N528.**

b. Concrete Masonry Unit:

i. Primer Coat: Benjamin Moore **Ultra Spec Masonry Interior/Exterior High Build Block Filler (571).**

ii. Body Coat: Same as finish coat.

iii. Finish Coat: Benjamin Moore Aura Interior **Matte N528, Eggshell N524, Satin N526 or Semi-Gloss N528.**

c. Concrete Pedestrian Traffic Surfaces:

i. Primer Coat: Benjamin Moore **Latex Floor & Patio Low Sheen Enamel N122.**

ii. Primer Coat: Same as finish coat.

iii. Finish Coat: Benjamin Moore **Latex Floor & Patio Low Sheen Enamel N122.**

2. Gypsum Board and Plaster Substrates:

a. Acrylic Finish:

i. Primer Coat: Benjamin Moore **Deep Base Primer** tinted to a special prescription formula to achieve the desired color or **Fresh Start Undercoater and Primer/Sealer 032** as recommended by manufacturer.

ii. Body Coat: same as finish coat.

iii. Finish Coat: Benjamin Moore Aura Interior Paint & Primer **Matte N528, Eggshell N524, Satin N526 or Semi-Gloss N528.**

b. Acrylic Finish for High Humidity:

i. Primer Coat: **Benjamin Moore Deep Base Primer** tinted to a special prescription formula to achieve the desired color or **Fresh Start Undercoater and Primer/Sealer 032** as recommended by manufacturer.

ii. Body Coat: same as finish coat.

iii. Finish Coat: Benjamin Moore **Aura Bath & Spa Matte 532.**

c. Acrylic Epoxy Finish:

i. Prime Coat: Devoe Tru-Glaze – WB 4426 semi-gloss epoxy finish.

ii. Finish Coats: Devoe Tru-Glaze – WB 4426 semi-gloss epoxy finish, not less than 3 mils dry film thickness. Sierra Performance S-16 Epoxy Acrylic Wall & Trim Semi- Gloss Enamel.

3. Metal Substrates:

a. Acrylic Enamel Finish for Galvanized Steel, Galvannealed Steel, Zinc-Rich Painted Steel, and Aluminum: (see also Section 05 50 00 Metal Fabrications)

i. Prime Coat: **Tnemec Series N69 Hi-Build Epoxoline II (Shop) at 2.0 to 3.0 mils DFT or V69 Hi-Build Epoxoline II (Field) at 4.0 to 6.0 mils DFT.** [ALT: Benjamin Moore High Performance Acrylic Metal Primer HP1100]

(a) Thoroughly clean and prepare all substrates per manufacturer recommendations.
(b) For Benjamin Moore Primer: Thoroughly clean all new metal surfaces with Oil & Grease Emulsifier HP6000 to remove contaminants. New shiny non-ferrous metal surfaces subject to abrasion should be dulled with very fine sandpaper or a synthetic steel wool pad to promote adhesion per manufacturer's recommendations.

ii. Stripe-Coat Procedure: **Tnemec Series 1095 Endura-Shield**; brush-applied to all welds, voids, nuts, bolts and sharp edges referencing Paint Application Guide No. 11 Protecting Corners, Edges, Crevices, and Irregular Steel Geometries by Stripe Coating.

iii. Body Coat: **Tnemec Series V69 High Build Epoxoline II Primer** or per manufacturer's recommendations.

iv. Finish Coat: **Tnemec Enduratone Series 1029** [ALT: Benjamin Benjamin Moore Aura Waterborne Exterior Soft Gloss N632 or Dunn Edwards Spartagloss W7600V Interior/Exterior Acrylic Gloss]

b. Acrylic Enamel Finish for Shop-Primed Ferrous Metal (Excluding Structural Steel – See Section 05 12 00 Structural Steel Framing):

i. Touch-up damaged priming: **Series 90-97 Tneme-Zinc or 93-H2O Hydro-Zinc at 2.5 to 3.5 mils DFT.** [ALT: WB SYN-LUSTRO Premium Interior/Exterior Rust Preventative Metal Primer, 100% Acrylic]. VOC content shall comply with local governing air district.

ii. Stripe Coat Procedure: **Tnemec Series V69 High Build Epoxoline II** brush-applied to all welds, voids, nuts, bolts and sharp edges referencing Paint Application Guide No. 11 Protecting Corners, Edges, Crevices, and Irregular Steel Geometries by Stripe Coating.

iii. Body Coat: **Tnemec Series V69 High Build Epoxoline II Primer** or per manufacturer's recommendations.

iv. Finish Coat: **Tnemec Enduratone Series 1029** [ALT: Dunn Edwards Spartagloss W7600V Interior/Exterior Acrylic Gloss].

c. Polyurethane Enamel Coating System:

i. Prime Coat: Shop-applied under other applicable Sections. Touch up shop primer where needed with Ameron 385 Epoxy primer or Devoe Bar-Rust 235V Surface Tolerant Epoxy.

ii. Finish Coats: Tnemec's Series 1075 (1074) Endura-Shield, Devoe Devthane 378H Aliphatic Urethane Semi-Gloss or Ameron Amershield 450SA, semi-gloss (gloss) sheen, 2.5 mils dry film thickness.

d. Fluoropolymer Finish for Hot Dip Galvanized Steel (See Section 05 50 00 Metal Fabrications).

i. Metal Primer For Hot-Dip Galvanized Steel: Compatible with finish coats of paint; shop apply to the respective dry film mil thickness specified **Tnemec Series N69 Hi-Build Epoxoline II (Shop) at 2.0 to 3.0 mils DFT or V69 Hi-Build Epoxoline II (Field) at 4.0 to 6.0 mils DFT.** [ALT: Benjamin Moore High Performance Acrylic Metal Primer HP1100], or approved equal.

(a) Exposed to view items to be field painted for repairs shall be primed with a primer compatible with final finish coat.

ii. Galvanizing Repair Paint: High zinc dust content paint for re-galvanizing welds in galvanized steel; **Tnemec 90-93,** or

approved equal. VOC content shall comply with local governing air district.

iii. Stripe-Coat Procedure: **Tnemec Series 1095 Endura-Shield**; brush-applied to all welds, voids, nuts, bolts and sharp edges referencing Paint Application Guide No. 11 Protecting Corners, Edges, Crevices, and Irregular Steel Geometries by Stripe Coating.

iv. Finish Coats: Finish Coat: **TnemecSeries 1071V | Fluoronar Semi-gloss** (Color TBC by State's Representative); 2.5 to 3.5 mils DFT, per manufacturer's recommendations.

e. Fluoropolymer Finish for Ferrous Metal - Bare (See Section 05 50 00 Metal Fabrications).

i. Shop or Field Primer: **Series 90-97 Tneme-Zinc or 93-H2O Hydro-Zinc at 2.5 to 3.5 mils DFT** VOC content shall comply with local governing air district.

(a) Exposed to view items to be field painted for repairs shall be primed with a primer compatible with final finish coats specified.

ii. Galvanizing Repair Paint: High zinc dust content paint for re-galvanizing welds in galvanized steel; **Tnemec 90-93**," or approved equal. VOC content shall comply with local governing air district.

iii. Stripe-Coat Procedure: **Tnemec Series 1095 Endura-Shield;** brush-applied to all welds, voids, nuts, bolts and sharp edges and areas inaccessible to roller application referencing Paint Application Guide No. 11 Protecting Corners, Edges, Crevices, and Irregular Steel Geometries by Stripe Coating.

iv. Intermediate Coat: **Tnemec Series 1095 Endura-Shield**; 3.0 to 5.0 mils DFT per coat

v. Finish Coats: **Tnemec Series 1071V Fluoronar semi-gloss**; 2.5 to 3.5 mils DFT, per manufacturer's recommendations.

4. Wood Surfaces:

a. Wood Wall Surfaces:

i. Prime Coat: Benjamin Moore **Fresh Start Undercoater and Primer/Sealer 032** or **Fresh Start High-Hiding All Purpose Primer 046.**

ii. Body Coat: Same as finish coat.

iii. Finish Coat: Benjamin Moore Aura Interior **Satin N526, Eggshell N524, or Semi-Gloss N528**.

b. Wood Door and Trim Surfaces Acrylic:

i. Prime Coat: Benjamin Moore **Fresh Start Undercoater and Primer/Sealer 032** or **Fresh Start High-Hiding All Purpose Primer 046.**

ii. Body Coat: Same as finish coat.

iii. Finish Coat: Benjamin Moore Aura Interior **Semi-Gloss N528**.

c. Wood Trim, Door, and Cabinetry Surfaces Alkyd Gloss

i. Prime Coat: Benjamin Moore Fresh Start Undercoater and Primer/Sealer 032 or Fresh Start High-Hiding All Purpose Primer 046.

ii. Body Coat: Same as finish coat.

iii. Finish Coat: Benjamin Moore Advance Waterborne Interior Alkyd **High Gloss N794 or Semi-Gloss N0793**.

G. Miscellaneous Interior Painting Systems:

1. Ductwork at Grilles and Diffusers: Flat black Benjamin Moore Regal Select. Apply to visible interior surfaces of ductwork.

2. Exposed Insulated Pipes and Ductwork:

a. Sealer: 1 coat Benjamin Moore Fresh Start High-Hiding All Purpose Primer 046 or Insul-X Stix Waterborne Bonding Primer SX-110 as recommended by manufacturer. Omit sealer where glass fabric jackets are used.

b. Body and Finish Coats: As specified for exposed non-insulated pipes, conduits, and ductwork.

3. Exposed Non-Insulated Pipes and Ductwork Including conduit:

a. Cast-Iron Pipe:

i. Prime Coat: Benjamin Moore Acrylic Metal Primer HP 1100.

ii. Body Coat: Same as finish coat.

iii. Finish Coat: Benjamin Moore DTM Acrylic Enamel Semi-Gloss or Benjamin Moore Regal Select Interior Semi-Gloss N551.

b. Other Pipes, Conduit, and Ductwork:

i. Prime Coat: As specified for ferrous and non-ferrous metals as applicable.

ii. Body Coat: Same as finish coat.

iii. Finish Coat: Benjamin Moore Benjamin Moore Regal Select Interior Semi-Gloss N551.

1. Factory Finished Equipment: Satisfactorily refinish surfaces damaged before, during, or after installation as directed; use Benjamin Moore Regal Select Interior Semi-Gloss N551 or as recommended by manufacturer.

2. Finish Hardware: Specified with USP finish under Section 08 71 00, paint as specified for metal. Color and gloss to match doors and frames as applicable, unless otherwise specified.

3. Plywood Backing: In Telephone and Electric Closets; one Benjamin Moore Regal Select Interior Semi-Gloss N551.

4. Protective Overspray: On sprayed-on fireproofing; 2 coats Benjamin Moore Regal Select Interior Flat N547.

END OF SECTION 09 91 00

**SECTION 10 21 13**
**TOILET COMPARTMENTS**

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Toilet Partitions:
   1. Stainless Steel

1.2 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.
B. Section 06 10 00 – Rough Carpentry
C. Section 05 50 00 – Metal Fabrications

1.3 REFERENCES

A. American National Standards Institute (ANSI):

   1. ANSI/ICC A117.1 - Accessible and Usable Buildings and Facilities.

B. ASTM International:

   1. ASTM A591 - Standard Specification for Steel Sheet, Electrolytic Zinc-Coated, for Light Coating Weight (Mass) Applications.
   2. ASTM A653 - Steel Sheet, zinc-coated (galvanized) or zinc iron alloy-coated, galvanealed by hot dip process.
   3. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
   4. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

A. Submit under provisions of Division 1.

B. Product Data: Manufacturer's product data for materials, fabrication, and installation including catalog cuts of anchors, hardware, fastenings, and accessories, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings:

1. Provide shop drawings for fabrication and installation of compartment assemblies that are not fully described by architectural drawings.
2. Provide template layouts and installation instructions for anchorage devices built into other work.

D. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square representing actual product, color, and patterns.

## 1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A company regularly engaged in manufacture of products specified in this section, and whose products have been in satisfactory use under similar service conditions for not less than 5 years.

B. Performance Requirements:
1. Fire Resistance: Partition materials shall comply with the following requirements, when tested in accordance with the ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials:
2. Smoke Developed Index: Not to exceed 450.
3. Flame Spread Index: Not to exceed 25.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
1. Finish areas designated by State’s Representative.
2. Do not proceed with remaining work until workmanship is approved by State’s Representative.
3. Rebuild mock-up area as required to produce acceptable work.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

## 1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits. Manufacturers storage and handling instruction shall be reviewed and maintained.

B. Field Measurements: Take field measurements prior to component fabrication to ensure proper fitting of work.

1.8 WARRANTY

A. Warranty: Manufacturer's standard form to repair or replace toilet compartment components (panels, doors, pilasters, and hardware) against defects in material and workmanship, at no cost to State Representative for the specified warranty period. Provide warranty to State Representative after completion of installation.
   1. Stainless Steel: Six (6) Years

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Metpar Corp., which is located at: 95 State St.; Westbury, NY 11590
   1. Contact Information: Phone : 516-333-2600, Email: sales@metpar.com, Website: www.metpar.com

B. Requests for substitutions will be considered in accordance with provisions of Division 1.

C. Confirm Toilet Partition make and model with State's Representative.

2.2 COMPARTMENTS AND SCREENS – GENERAL

A. General: Doors, panels, screens, and pilasters assembled into complete compartment system, with cutouts and drilled holes to receive hardware as indicated; processed and fabricated in a craftsman like manner; complying with ANSI/ICC A117.1, Americans with Disabilities Act (ADA).

2.3 STAINLESS STEEL PARTITIONS

A. Mounting Style:

   1. Stainless Steel Toilet Partitions: Floor mounted "Luxor" FT-700:
      a. Compartment Depth and Width: As indicated on Drawings.
      b. Door Width: 22 inch (559 mm) minimum; at ADA accessible compartments 32 inch (813 mm) clear minimum or as required by local codes.
      c. Pilaster Width: As required to fit space; maximum 24 inches (610 mm).
      d. Pilaster Height: 70 inches (1778 mm).
      e. Pilasters Mountings:

1) Mounting Channels: 12-gauge steel electrically welded to the pilaster face sheets.
2) Fastening: 3/8 inch (9.5 mm) diameter studs, lock washers, nuts, and lead expansion shields.
3) Shoes/Plinths: 4 inch (102 mm) high type 304 stainless steel plinth.

B. Privacy Series:

1. Door/Panel Height:
   a. "Dorian Max" Height: 72 inches (1829)
      1) 6 inches (152mm) height above the finished floor.

2. Door Privacy Strips:
   a. Continuous anodized aluminum extrusion.

C. General
1. Doors, Panels, Screens, and Pilasters Construction:
   a. Material: Type 304 stainless steel.

   b. Partition Core:
      1) Cemented under pressure to a two faced honeycomb core.

   c. Partition Edges:
      1) Roll formed 20-gauge interlocking edge molding. Stainless Steel, Satin No. 4 finish.

   d. Partition Corners:
      1) Finished with preformed, Type 304 stainless steel reinforcements.
         a) Corners of wall hung urinal screens are automatically welded, ground smooth, and polished.
   e. Doors, Panels, and Screens: 1 inch (25 mm) thick with 22 gauge face sheets.
   f. Pilasters: 1-1/4 inch (32 mm) thick with 22 gauge face sheets.
   g. Finish: No. 4 finish.

D. Hardware:

1. Hinges:
   a. Continuous MultiCam: Stainless Steel No. 4 Satin finish.
      1) Full height 57 inches.
      2) Outswing hinge has a cam action feature that returns the door to a closed position.
      3) Inswing hinge keeps door open at 30º.

2. Latches:
   a. Concealed Latch: Stainless Steel No. 4 Satin finish.
      a) ADA approved slide latch with external green/red “in-use” occupancy indicator.

3. Strike and Keeper:
   a. Stainless Steel No. 4 Satin finish.

4. Door Pull, Coat Hook, and Bumper:
   a. Stainless Steel No. 4 Satin finish.

5. Brackets:
   a. Continuous Angles & “U” Shaped Brackets: Stainless Steel No. 4 Satin finish.

6. Fasteners:
   a. Tamper-proof Torx Pin Head through bolts. Stainless Steel No. 4 Satin finish.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify State’s Representative of unsatisfactory preparation before proceeding.

### 3.2 PREPARATION

C. Clean surfaces thoroughly prior to installation.

D. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

### 3.3 INSTALLATION

A. General: Install in accordance with manufacturer's instructions.
   1. Install compartment units rigid, straight, plumb and level.
   2. Provide clearance of not more than 1/2 inch (13 mm) between stiles and panels and not more than 1 inch (25 mm) between panels and walls.
   3. Secure panels to walls with not less than two brackets attached near top and bottom of panel.
   4. Locate wall brackets so holes for wall anchorages occur in masonry or tile joints.

5. Secure panels to stiles with not less than two brackets located to align with brackets at wall.
6. Secure panels in position with manufacturer's recommended anchoring devices.
7. Level, plumb, and tighten installation with devices furnished.

B. Floor Mounted Compartments:
   1. Set stile units with anchorages having not less than 2 inches (51 mm) penetration into structural floor, unless otherwise recommended by manufacturer.
   2. Hang doors and adjust so tops of doors are level with tops of stiles when doors are in closed position.

3.4 ADJUSTING AND CLEANING

A. Clean and Protect: Clean exposed surfaces of compartment systems using materials and methods recommended by manufacturer and provide protection as necessary to prevent damage during remainder of construction period.

3.5 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 10 21 13

**SECTION 10 28 00**
**RESTROOM ACCESSORIES**

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. New toilet accessories, and installation of accessories at Restroom, complete, as specified and indicated on the Drawings, including attachment hardware.

B. Related Sections:

1. Section 06 10 00 – Rough Carpentry.

2. Section 22 40 00 – Plumbing Fixtures.

1.3 SYSTEM DESCRIPTION

A. Grab Bar Performance Requirement: Comply with ASTM International (ASTM) F446 - "Grab Bars and Accessories Installed in the Bathing Area", except capable of supporting a vertical load of 400 pounds and a horizontal load of 200 pounds applied to the bar.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each product specified herein, describing size, finish, details of function, and attachment method.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with 2022 California Building Code, Section 1115B "Bathing and Toilet Facilities", for installing work in conformance with accessibility standards.

2. Comply with Americans with Disabilities Act (ADA) "2010 ADA Standards for Accessible Design".

1.6 SEQUENCING AND SCHEDULING

A. Coordinate the work of this Section with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Provide accessories manufactured by Bobrick Washroom Accessories, Bradley, ASI, Koala Kare, Vandal Stop or equal.

2.2 MATERIALS - GENERAL

A. Stainless Steel: AISI Type 304, with No. 4 satin finish.

1. Recycled Content: Minimum 30 percent post-consumer recycled content.

B. Exposed Fasteners, Screws, and Bolts: Stainless steel, satin finish, tamperproof.

C. Concealed Fasteners, Screws, and Bolts: Stainless steel or hot-dip galvanized steel.

D. Sealant: Mildew-resistant silicone, as specified in Section 07 92 00.

2.3 FABRICATION

A. Weld and grind smooth joints of fabricated components. Form exposed surfaces from single sheet of stock, free of joints.

B. Back paint components where contact is made with building finishes to prevent electrolysis.

C. Shop assemble components and package complete with anchors and fittings. Provide steel anchor plates, adapters, and anchor components for installation.

D. Keying: Key all accessories alike; key all coin mechanisms alike but different from accessories. Provide three keys for accessories and three keys for coin mechanisms to State Representative.

2.4 FINISHES

A. Exposed Metal: AISI Type 304 stainless steel, with #4 satin finish, unless otherwise noted.

B. Galvanizing: ASTM A123 or A386 to 1.25-ounce/sq.ft.

C. Shop Primed Ferrous Metals: Pretreat and clean, spray apply one coat primer and bake.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that site conditions are ready to receive work and dimensions are as indicated on shop drawings. Do not begin installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Deliver inserts and rough-in frames to site at appropriate time for incorporating into construction. Provide templates and rough-in measurements as required.

B. Verify exact location of accessories for installation.

3.3 INSTALLATION

A. Install accessories at heights and locations in accordance with accessibility standards.

B. Install accessories and items securely fastened to backing plates and blocking in wall or partition, in accordance with manufacturers' written instructions. Anchorage from gypsum /cementitious board with Molly bolts or similar devices not acceptable.

C. Install plumb and level, securely and rigidly anchored to substrate.

3.4 CLEAN AND REPAIR

A. Repair or replace units which are damaged as acceptable to the State’s Representative.

B. Clean accessories prior to acceptance of the Project.

3.5 SCHEDULE OF ACCESSORIES – RESTROOM (SEE SCHEDULE SHEET A3-8.3). Confirm all accessories with State's Representative prior to ordering.

A. Diaper Changing Station: Meeting ASTM F2285 and the following; surface-mounted, high density polyethylene plastic, designed to withstand a 250 pound live load in the open position, steel to steel hinge, with pneumatic air pump for controlled lowering and retraction of the changing bed, safety straps, and integral sanitary liner dispenser; Koala Kare Products KB310-SSWM, American Infant Care Products Inc. "Diaper Deck", Foundations Worldwide Inc., or equal.

B. Toilet Paper Dispenser: Surface mounted multi-roll toilet tissue dispenser, 316 stainless steel; Vandal Stop "Vandal Resistant Three Roll Horizontal Toilet Paper Holder with Full Shroud Model #VSP-OFUx3", or equal.

C. Grab Bars: 1-1/2-inch diameter 316 stainless steel grab bars, concealed mounting, satin finish, snap-flange cover plate; Bobrick B-6806 Series, Bradley, or equal. Provide in sizes indicated on Drawings.

D. Waste Receptacle: Surface mounted; Bobrick "Surface Mounted Waste Receptacle with Disposal Door", Model #B-35639.

E. Soap Dispenser: Surface mounted; Vandal Stop "Surface-mounted Soap Dispenser", Model #VSP-SD-PF-304L-14g".

F. Toilet Seat Cover Dispenser: Surface mounted; Vandal Stop "Heavy Duty Toilet Seat Cover Dispenser", Model #VSP-TSCD.

G. Sanitary Waste Receptacle: Surface mounted; Vandal Stop "Vandal Resistant Sanitary Waste Receptacle", Model #VSP-SWR-316L-12g.

H. Hand Dryer: Dyson Air "Wall Mounted Hand Dryer", Model Airblade V.

I. Mop and Broom Holder at Closet: Stainless steel custodian's mop and broom holder; Bobrick B-223 x 24", Bradley, or equal.

J. Paper Towel Dispenser: As selected by State's Representative.

K. Framed Wall Mirror at Lavatory: Not used.

L Coat Hook: Metpar Stainless Steel Coat Hook and Bumper. See 10 21 13 Toilet Compartments 2.3 D 4

M. Open-Bottom Lavatory Plumbing Insulation: Molded closed-cell vinyl cover pipe wrap with nylon fasteners; anti-fungal, anti-microbial, meeting ADA

requirements; for sink drain pipe, and hot and cold water supply lines and stops; Truebro Inc. "Lav-Guard 2", Plumberex "Pro-2000", or equal.

END OF SECTION 10 28 00

**SECTION 10 71 10**
**EXTERIOR SUN CONTROL DEVICES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 DESCRIPTION

A. Provide fixed Custom Sunshades as shown on the drawings, as specified, and as needed for a complete and proper installation.

B. Related Sections:

1. Section 05 12 00 Structural Steel Framing
2. Section 05 50 00 Metal Fabrications
3. Section 08 53 14 Fiberglass Windows and Storefront

1.2 REFERENCE

A. National Association of Architectural Metal Manufacturers (NAAMM).

B. American Architectural Manufacturers Association (AAMA).

1.3 SUBMITTALS

A. Product Data: Include information on aluminum grade and finishing products including color samples, and sealants.

B. Shop Drawings: Include plans, elevations and details of sun shades and fins. Show anchorage and accessory items. Indicate materials, sizes, styles, fabrication, anchorage details, and installation details. Furnish templates for anchors and bolts installed under other Sections.

1.4 QUALITY ASSURANCE

A. Obtain entrances, storefronts, ribbon walls, window walls, curtain walls, window systems, and finish through one source from a single manufacturer.

B. Manufacturer must operate, design, assemble, and finish their product in the United States of America as a “Made in America” product. All materials must be procured from sources inside the United States of America.

## PART 2 - PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

A. Arcadia, Inc., 2301 E Vernon, Vernon, CA. Telephone 323/269-7300, Fax 323/269-7390

B. Acceptable Products:

1. Arcadia Brise Soleil Standard Series.
2. Arcadia Brise Soleil Design Series.

C. Or Approved Equal.

### 2.2 MATERIALS

A. Aluminum Extrusion Blades: ASTM B211, Alloy 6063-T6.

B. Aluminum Plate ASTM B211, Alloy 6061-T6.

C. Fasteners: Fasteners shall be stainless steel. Provide types, gauges and lengths to suit unit installation conditions.

D. Anchors and Inserts: Use non-Ferrous metal or hot dip galvanized anchors and inserts for installation and elsewhere as required for corrosion resistance. Use stainless steel or zinc galvanized expansion bolt devices for drill-in place anchors. Furnish inserts, as required, to be set into concrete or masonry work. Field weld clips

### 2.3 FABRICATION, GENERAL

A. Provide fixed Sunshades and accessories of design, material, sizes, depth, arrangement, and thickness as indicated or as required for optimal performance with respect to strength; durability; and uniform appearance.

B. Include supports, anchorage, and accessories required for complete assembly, including all attachment clips and necessary hardware for attachment to structure.

C. Manufacturer shall allow +/- 1/8” thermal expansion room at each shade to compensate for dissimilar movement between builing structure and aluminum

sunshade structure. This design shall be incorporated as to not induce self destructing loads onto either shade or building veneer.

D. No blade fasteners shall be visible after installation of sections. Provide cover plates at each outrigger end to conceal fasteners. Only mounting hardware shall be visible after installation.

## 2.4 SUNSHADE CONSTRUCTION

A. Components

1. All fascia & blades shall be 6063-T6 aluminum-extruded members.
   a. Blade infill shall be custom designed with integral screw boss that is hidden from view after installation. Size and spacing is to be as shown on the architectural details. Blade infill shall be airfoils, rectangle or tubular sections.
   b. Blades to be miter cut and fitted to outrigger plates at mitered corner conditions.
2. Outrigger components shall be 6061-T6 aluminum plates.
   a. Outriggers shall be tapered or shaped aluminum flat plates, screwed to aluminum extrusion blades via countersunk fastener holes. Connections of aluminum extrusions to outriggers should be flush with no protruding fasteners visible after installation. Outriggers are pre-drilled for mounting to the structural sunshade clip tab via stainless steel expansion slip connection to compensate for thermal expansion.
3. Clip brackets shall be of carbon steel.
   a. Connection of sunshade to building shall be friction type with the ability to properly level the shade during installation.
4. Outrigger cover plates shall be furnished of 6061-T6 aluminum plates at each end of sunshade run to cover extrusion fasteners.

B. Assembly: Components to be shop assembled in large practical sections to allow for immediate installation. Sections indicated on shop drawings to be assembled and shipped as units with cover plates and support arms, if required, shipped loose.

1. Fasteners shall be bagged in groups clearly identifying bolt locations and bag contents for easy installation. Manufacturer to provide anti-seize compound for any field bolted stainless hardware to facilitate proper erection.

## 2.5 ALUMINUM FINISH FOR SHADES

A. Finish all exposed areas of aluminum and components as indicated.

1. An Architectural Class II or I color anodic coating conforming with AA-M12C22A34/AA-M12C22A44.

b. Contractor shall provide a range of 4 color site samples for approval by State Representative prior to fabrication. Anodized finish color shall be selected from the manufacturer's standard range of colors: Colornodic AB4 Medium Bronze, AB5 Standard Medium Bronze, AB6 Dark Bronze, AB7 Standard Dark Bronze, or as selected by the State's Representative.

## PART 3 – EXECUTION

### 3.1 MATERIAL INSPECTION

A. Examine crates and reconcile to a shipping manifest or packing slip. Verify all required components are present.

### 3.2 FIELD DIMENSIONS / SITE INSPECTION

A. Prior to Clip Installation:

1. Verify conditions: Examine areas where work is to be performed and identify any conditions that could be detrimental to proper or timely completion.

B. Prior to Shade Installation:

1. Contractor Shall field confirm openings widths and elevations as shown on shop drawings prior to fabrication of shade sections. Field dimensions of clip locations shall be verified prior to fabrication of sections.

C. Installation of sections should not proceed until all conditions are satisfactory.

### 3.3 INSTALLATION / ERECTION

A. Comply with manufacturer's instructions and recommendations for installation of the work.

B. Verify dimensions of supporting structure at the site by accurate field measurements so that the work will be accurately designed, fabricated, and fitted to the structure.

C. Anchor Sunscreen to building substructure as indicated on the sunshade shop drawings and verified by the engineer of record.

D. Erection Tolerances:

1. Clips or Mounting Brackets:

a. Elevation clip Variation from level: 1/8" maximum in any column to column space or 20'-0" runs, non-cumulative.

b. Offsets in projection of clips front leading edge 1/16"+/-.

c. Veneer or Wall construction tolerance around clip projection. 1/4”+ outward.

d. Clip Plumbness: 1/16” in 6”

e. Clip projection level: 1/16” in 12”

2. Shade Sections:

a. Projection Level: 1/8” in 4’-0”

b. Horizontal Level: 1/8” max in any column to column space or in 20’-0” runs, non-cumulative.

c. Shade section to section variation 1/32” at adjoining sections.

E. Do not erect warped, bowed, deformed or otherwise damaged or defaced members. Remove and replace any members damaged in the erection process as directed.

F. Set units level, plumb and true to line, with uniform joints.

G. Erect sunshade sections after all adjacent painting, masonry (including chemical treatments), roofing, electrical, glazing, and other similar work is completed above and below the shade sections.

END OF SECTION 10 71 10

**SECTION 12 24 13**
**ROLLER WINDOW SHADES**

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Manually operated window shades and accessories for sun/glare/heat control and room darkening.

1.3 REFERENCE STANDARDS

A. ASTM International:
1. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

B. National Fire Protection Association:
1. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the Work with window shade installation and placement of concealed blocking to support window shades.

B. Scheduling: Schedule installation of window shades to occur after application of exposed finishes wherever installation will not damage exposed finish surfaces and completion of finishes will not impede installation.

1.5 SUBMITTALS

A. See Section 01 33 00 - Submittal Procedures, for submittal procedures.

B. Product Data: Manufacturer's catalog data, product descriptions, installation instructions, detail sheets, and specifications for each type of system specified.

C. Samples for Selection: Manufacturer's color chart or sample set.

D. Shop Drawings: Prepared specifically for this project; show dimensions and interface with other products.

1. Room schedule including field-verified dimensions of each opening to receive window shade systems.

2. Indicate System Series, operator, fabric selection, and mounting type.

3. Indicate control type.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Installer trained and certified by the manufacturer with a minimum of five years experience in installing products comparable to those specified in this Section.

C. Fire-Test-Response Characteristics: Passes NFPA 701 small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in factory-labeled packages, marked with manufacturer and product name, [firetest-response characteristics,] and location of installation using same room designations indicated on Drawings.

B. Individually package and mark shades with room number and opening number.

C. Inspect the materials upon delivery to assure that specified products have been received.

D. Store and handle shades to prevent damage to fabrics, finishes, and operators prior to installation.

1.8 SITE CONDITIONS

A. Environmental Limitations: Maintain ambient temperature and humidity conditions during installation of window shades at the levels indicated for Project when occupied for its intended use.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Roller Window Shade Manufacturers:
1. MechoShade Systems, Inc.
2. Solarfective Products Limited,
3. or Equal.

B. Provide all window shade systems from a single manufacturer.

2.2 WINDOW SHADE

A. Product: MechoShade Systems, Inc.'s "MechoShade/7".
1. Description:
a. Mounting: As indicated in drawings, per manufacturer's recommendations.
b. Operation: Chain operated, gear and sprocket mechanism.
c. Fabric: As selected by State's Representative.
d. Roller and Mounting Brackets: Manufacturer's standard.
e. Color: As selected by State's Representative.

B. Product: MechoShade Systems, Inc.'s "Solartrac Room".
1. Description:
a. Mounting: As indicated in drawings, per manufacturer's recommendations.
b. Operation: Automated.
c. Fabric: As selected by State's Representative.
d. Roller and Mounting Brackets: Manufacturer's standard.
e. Color: As selected by State's Representative.
f. Accessories: Manufacturer's standard, verify with State's Representative.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine construction to support, adjoin, or otherwise contact and verify that:

1. Field conditions and dimensions are acceptable and are ready to receive items.

2. Load-bearing studs are available where required by weight of items.

3. Dimensions of roller and shade clearance in the up position before mounting brackets.

4. Setting conditions are dry, clean, and otherwise proper for installation.

B. Do not install items until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Insure adequate support will be available at time of installation.

B. Clean surfaces thoroughly prior to installation.

C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install roller window shades in accordance with manufacturer’s written recommendations and reviewed Shop Drawings

B. Install roller window shades level, plumb, square, and true

C. Located so shade band is not closer than 2 inches to interior face of glass. Allow proper clearances for window operation hardware.

D. Assume responsibility for all field dimensions and mounting surfaces.

E. Use manufacturer's brackets and fasteners as required to penetrate material to which attached.

F. Fastenings: Use expansion bolts in concrete and machine screws or bolts to metal backing. Toggle bolts will not be permitted.

3.4 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

B. Adjust window shade systems for proper operation.

3.5 CLEANING

A. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

3.6 PROTECTION OF INSTALLED WORK

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

3.7 DEMONSTRATION AND TRAINING

A. Engage Installer to train maintenance personnel to adjust, operate and maintain roller shade systems.

END OF SECTION 12 24 13

**SECTION 12 26 00**
**INTERIOR DAYLIGHTING DEVICES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 DESCRIPTION

A. Provide fixed Custom lightshelf as shown on the drawings, as specified, and as needed for a complete and proper installation.

B. Related Sections

1. Section 05 12 00 Structural Steel Framing.
2. Section 05 50 00 Metal Fabrications.
3. Section 08 53 14 Fiberglass Windows and Storefront.

1.2 REFERENCE

A. National Association of Architectural Metal Manufacturers (NAAMM).

B. American Architectural Manufacturers Association (AAMA).

1.3 SUBMITTALS

A. Product Data: Include information on aluminum grade and finishing products including color samples, and sealants.

B. Shop Drawings: Include plans, elevations and details of light shelves. Show anchorage and accessory items. Indicate materials, sizes, styles, fabrication, anchorage details, and installation details. Furnish templates for anchors and bolts installed under other Sections.

1.4 QUALITY ASSURANCE

A. Obtain entrances, storefronts, ribbon walls, window walls, curtain walls, window systems, and finish through one source from a single manufacturer.

B. Manufacturer must operate, design, assemble, and finish their product in the United States of America as a “Made in America” product. All materials must be procured from sources inside the United States of America.

1.5 WARRANTY

A. Manufacturer’s Warranty: Submit, for Owner’s acceptance, manufacturer’s standard warranty.
   1. Warranty Period: Two (2) years from Date of Substantial Completion of the project, provided however that the Limited Warranty shall begin in no event later than six months from date of shipment by manufacturer.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Arcadia, Inc., 2301 E Vernon, Vernon, CA. Telephone 323/269-7300, Fax 323/269-7390

B. Acceptable Products:

   1. Arcadia Reflector Solar Series.

C. Or Approved Equal.

2.2 MATERIALS

A. Aluminum Extrusion Blades: ASTM B211, Alloy 6063-T6.

B. Aluminum Plate ASTM B211, Alloy 6061-T6.

C. Fasteners: Fasteners shall be stainless steel. Provide types, gauges and lengths to suit unit installation conditions.

D. Anchors and Inserts: Use non-Ferrous metal or hot dip galvanized anchors and inserts for installation and elsewhere as required for corrosion resistance. Use stainless steel or zinc galvanized expansion bolt devices for drill-in place anchors. Furnish inserts, as required, to be set into concrete or masonry work. Field weld clips as required.

E. Aluminum Composite Material (ACM): Panels

F. Polycarbonate Panel: Monolithic or multilayered extruded cellular polycarbonate panels.

2.3 FABRICATION, GENERAL:

A. Provide fixed or operable lightshelf and accessories of design, material, sizes, depth, arrangement, and thickness as indicated or as required for optimal performance with respect to strength; durability; and uniform appearance.

B. Include supports, anchorage, and accessories required for complete assembly, including all attachment clips and necessary hardware for attachment to structure.

C. Manufacturer shall allow +/- 1/8” thermal expansion room at each shade to compensate for dissimilar movement between building structure and aluminum lightshelf structure. This design shall be incorporated as to not induce self destructing loads onto either shade or building veneer.

D. Provide Outrigger at each end for mounting.

2.4 LIGHTSHELF CONSTRUCTION

A. Components

1. All fascia & blades shall be 6063-T6 aluminum-extruded members.
   a. Blade infill shall be custom designed with integral screw boss that is hidden from view after installation. Size and spacing is to be as shown on the architectural details. Blade infill shall be airfoils, rectangle or tubular sections.
   b. Blades to be miter cut and fitted to outrigger plates at mitered corner conditions.
2. Outrigger components shall be 6061-T6 aluminum plates.
   a. Outriggers shall be tapered or shaped aluminum flat plates, screwed to aluminum extrusion blades via countersunk fastener holes. Connections of aluminum extrusions to outriggers should be flush with no protruding fasteners visible after installation. Outriggers are pre-drilled for mounting to the structural sunshade clip tab via stainless steel expansion slip connection to compensate for thermal expansion.
3. Clip brackets shall be of carbon steel.
   a. Connection of sunshade to building shall be friction type with the ability to properly level the lightshelf during installation.

B. Assembly: Components to be shop assembled in large practical sections to allow for immediate installation. Sections indicated on shop drawings to be

assembled and shipped as units with cover plates and support arms, if required, shipped loose.

1. Fasteners shall be bagged in groups clearly identifying bolt locations and bag contents for easy installation. Manufacturer to provide anti-seze compound for any field bolted stainless hardware to facilitate proper erection.

2.5 ALUMINUM FINISH FOR LIGHTSHELF

A. Finish all exposed areas of aluminum and components as indicated.

1. An Architectural Class II or I color anodic coating conforming with AA-M12C22A34/AA-M12C22A44.

b. Contractor shall provide a range of 4 color site samples for approval by State Representative prior to fabrication. Anodized finish color shall be selected from the manufacturer's standard range of colors: Colornodic AB4 Medium Bronze, AB5 Standard Medium Bronze, AB6 Dark Bronze, AB7 Standard Dark Bronze, or as selected by the State's Representative.

PART 3 – EXECUTION

3.1 MATERIAL INSPECTION

A. Examine crates and reconcile to a shipping manifest or packing slip. Verify all required components are present.

3.2 FIELD DIMENSIONS / SITE INSPECTION

A. Prior to Clip Installation:

1. Verify conditions: Examine areas where work is to be performed and identify any conditions that could be detrimental to proper or timely completion.

B. Prior to Lightshelf Installation:

1. Contractor Shall field confirm openings widths and elevations as shown on shop drawings prior to fabrication of shade sections. Field dimensions of clip locations shall be verified prior to fabrication of sections.

C. Installation of sections should not proceed until all conditions are satisfactory.

3.3 INSTALLATION / ERECTION

A. Comply with manufacturer's instructions and recommendations for installation of the work.

B. Verify dimensions of supporting structure at the site by accurate field measurements so that the work will be accurately designed, fabricated, and fitted to the structure.

C. Anchor lightshelf to building substructure as indicated on the lightshelf shop drawings and verified by the engineer of record.

D. Erection Tolerances:

1. Clips or Mounting Brackets:

a. Elevation clip Variation from level: 1/8" maximum in any column to column space or 72" runs, non-cumulative.

b. Offsets in projection of clips front leading edge 1/16"+/-.

c. Veneer or Wall construction tolerance around clip projection. 1/4”+ outward.

d. Clip Plumbness: 1/16” in 6”

e. Clip projection level: 1/16” in 12”

2. Shade Sections:

a. Projection Level: 1/8” in 4’-0”

b. Horizontal Level: 1/8” max in any column to column space or in 20’-0” runs, non-cumulative.

c. Shade section to section variation 1/32” at adjoining sections.

E. Do not erect warped, bowed, deformed or otherwise damaged or defaced members. Remove and replace any members damaged in the erection process as directed.

F. Set units level, plumb and true to line, with uniform joints.

G. Erect lightshelf after all adjacent painting, masonry (including chemical treatments), roofing, electrical, glazing, and other similar work is completed above and below the shade sections.

END OF SECTION 12 26 00

**SECTION 12 36 00**
**COUNTERTOPS**

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 RELATED DOCUMENTS

1.1 SUMMARY

A. Section Includes: Caesarstone Quartz surfacing for
    1. Countertops

B. Related Sections
    1. Division 1 – Administrative, Procedural, and Temporary Work Requirements
    2. Division 1 – “LEED Requirements” and Additional Requirements
    3. Division 5 – Section Metal Fabrication for Blocking
    4. Division 6 – Section Rough Carpentry for Blocking
    5. Division 7 – Section Joint Sealers
    6. Division 22 – Plumbing Fixtures
    7. Division 26 – Wiring Devices

1.2 REFERENCES

A. ASTM International
    1. ASTM C97 – Absorption and Bulk Specific Gravity of Dimension Stone
    2. ASTM C170 – Compressive Strength of Dimension Stone
    3. ASTM C880 – Flexural Strength of Dimension Stone
    4. ASTM C1026 – Resistance of Ceramic Tile to Freeze-Thaw Cycling
    5. ASTM C1243 – Relative Resistance to Deep Abrasive Wear of Unglazed Ceramic Tile by Rotating Disc
    6. ASTM E84 – Surface Burning Characteristics of Building Materials
    7. ASTM 372 – Linear Thermal Expansion

B. American National Standards Institute (ANSI)
    1. ANSI Z124.6 – Stain Resistance

2. ANSI/N 42.14 – Radiation

C. National Electrical Manufacturers Association (NEMA)
1. NEMA LD 3-3.5 – Boiling Water Resistance
2. NEMA LD 3-3.6 – High Temperature Resistance

D. Others
1. NSF – ANSI/NSF Standard 51
2. MEA – New York Materials and Equipment Acceptance
3. OHSAS – 18001 – Occupational Health & Safety System
4. GREENGUARD – Federal, State and Municipal, Children and Schools
5. HPD – Health Product Declaration
6. SCS – Certified Recycled Content
7. USGBC – United States Green Building Council
8. Nordic Swan – Nordic Ecolabel Building Materials Database
9. Mindful Materials – Building industry library of statements and certifications
10. European Food Contact Materials Legislation – Regulation (EC) No 1935/2004 and Regulation (EC) No 2023/ 2006 on Good Manufacturing Practices
11. Kosher

1.3 SUBMITTALS

A. Product Data
1. Caesarstone Quartz Surfacing: Submit manufacturer’s product data, sample warranty form, fabrication, and installation instructions.

B. Shop Drawings: Identify color[s] and finish[es], and show the following:
1. Field-verified dimensions
2. Quartz surfacing dimensions
3. Locations and dimensions of cutouts
4. Required locations of support and blocking members
5. Edge profiles
6. Installation details and methods

C. Fabricator Qualifications: Submit evidence of fabricator’s qualifications

D. Closeout Submittals: Submit completed warranty form

E. Maintenance Data

1. Submit manufacturer's care and maintenance data (see page 18).
2. Include project closeout documents

1.4 QUALITY ASSURANCE

A. Applicable Standards

1. Standards from the following, as referenced herein:
   a. American National Standards Institute (ANSI)
   b. American Society for Testing and Materials (ASTM)
   c. National Electrical Manufacturers Association (NEMA)
   d. NSF International
   e. International Organization for Standardization (ISO)
   (See Reference Chart 2.02 QUARTZ SURFACING; D. Performance: Caesarstone Quartz Surfaces Technical Data)

2. Fire Test response characteristics
   a. The following Class A (Class 1) surface burning characteristics provided are evidenced by testing identical products against ASTM E84 (UL 723), or other testing, and inspected by an agency acceptable to authorities with jurisdiction.
   b. Flame Spread Index: 25 or less
   c. Smoke Developed Index: 450 or less
   (See Reference Chart 2.02 QUARTZ SURFACING;
   d. Performance: Caesarstone Quartz Surfaces Technical Data)

B. Allowable Tolerances
1. Variation in component size ± 1/8" (3 mm) over a ten (10) foot length
2. Location of openings: ± 1/8" (3 mm) from indicated location
3. Maximum 1/8" (3 mm) clearance between quartz surfaces and each wall
(See Reference Chart 2.02 QUARTZ SURFACING; D. Performance: Caesarstone Quartz Surfaces Technical Data)

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging, Shipping, Handling, and Unloading
1. Observe manufacturer's recommendations and handle accordingly in order to prevent breakage or damage
2. Brace parts if necessary
3. Transport in the near-vertical position with finished face turned toward

finished face
4. Do not allow finished surfaces to rub during shipping or handling

B. Storage and Protection
1. Store in racks in near-vertical position
2. Prevent warpage and breakage
3. Store inside away from direct exposure to sun
4. Store between 25ºF and 130ºF (-4ºC and 54ºC)
5. Store with finished face turned toward finished face

1.6 WARRANTY

A. Commercial: Provide manufacturer's Commercial Lifetime Warranty (product only) against product defects when fabricated and installed by a Caesarstone certified fabricator.

B. Residential: Provide manufacturer's Residential Lifetime Warranty against product defects when fabricated and installed by a Caesarstone certified fabricator.

PART 2 PRODUCT

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Provide Caesarstone Quartz Surfacing distributed by Caesarstone U.S.A., Inc.; 1401 W. Morehead, Charlotte, NC 28208, USA 877-9-QUARTZ (978.2789); www.caesarstoneus.com

B. Qualifications: Manufacturer shall be ISO 9001 and ISO 14001 certified

C. Substitutions: or approved equal.

2.2 QUARTZ SURFACING

A. Composition: up to ~90 percent crushed quartz aggregate combined with polymer resins and pigments, and fabricated into slabs using a vacuum vibro-compaction process.

*Due to its superior flexural strength compared to natural stone, Caesarstone can be fabricated in larger sized pieces. This may reduce the number of joints in an installation, which is more economical, and may produce a better-looking end result.*

*It may also allow the use of thinner material, producing additional economies and weight reductions.*

*Thickness: 2 cm is the minimum recommended for countertops or for food service areas; use 3 cm material in food service areas or when greater strength or thicker edges are required.*

B. Dimensions

1. Thickness: Nominal 30mm.
2. Size: Slabs shall be [56.5 x 120 inches (1.44 x 3.05 m)] or [65 x 130 inches (1.65 x 3.3 m)] to minimize the number of joints used in installation.

C. Identification: Material shall be labeled with a Caesarstone batch number and imprinted with Caesarstone's identifying mark on the back. The back of each slab of Caesarstone is imprinted with a trademarked zigzag pattern to simplify jobsite identification.

## D. Performance: Caesarstone Quartz Surfaces Technical Data

| PROPERTY | TEST STANDARD | RESULTS |
|---|---|---|
| Water Absorption | ASTM C97<br>EN-14617-1 | ≤0.05% |
| Density | ASTM C97<br>EN 14617-1 | ≥2.1 gr/cm$^3$ |
| Flexural Strength | ASTM C880/C880M-15<br>EN14617-2 | 35.5-77.5 MPa<br>43-80 MPa |
| Dimensional Stability | EN 14617-12 | Class A |
| Impact Resistance | EN 14617-9 | 5.0-14.4 L (J) |
| Compressive Strength | ASTM C170<br>EN 14617-15 | Dry: 219-299 MPa; Wet: 203-274 MPa<br>157-243 MPa |
| Abrasion | ASTM C1243-93<br>EN 14617-4 | Volume of chord: V = 59.2-107.2 mm$^3$<br>Chord length: 22.0-22.6 mm |
| Freeze-Thaw Resistance | ASTM C1026<br>EN 14617-2 & EN 14167-5 | No obvious damage after 20 freeze-thaw cycles<br>$KM_{f25}$=95.1-117.7% |
| Stain Resistance | ANSI Z 124.6 | Pass |
| Chemical Resistance | ANSI Z 124.6<br>EN 14617-10 | Pass<br>Class $C_4$ |
| Linear Thermal Expansion | ASTM 372<br>EN 14617-11 | 30°C-100°C: 3.0-5.0 x $10^{-5}$ per °C<br>13.4-26.4 ($10^{-6}$·$C^{-1}$) |
| Thermal Conductivity | EN 12664 | 0.445-0.475 W/(m·K) |
| Thermal Shock | EN 14617-6 | No visual defects after 20 cycles<br>Change in mass: 0.04% to 0.06%<br>Change in flexural strength: -6.7% to 9.3% |
| Boiling Water Resistance | ANSI NEMA LD3-3.5 | No effect |
| High Temperature Resistance | ANSI NEMA LD3-2005 | No effect |
| Surface Burning | ASTM E84 | Class A |
| Fire Performance | AS 1530.3:1999 | Ignitability Index (0-20): 6-8<br>Spread of Flame Index (0-10): 0-3<br>Heat Developed Index (0-10): 2-3<br>Smoke Developed Index (0-10): 6-7 |
| Fire Classification | EN 13501-1 | Wall cladding: B-s1-d0<br>Flooring and stairs: B-fl-s1 |

| Certifications and Approvals | | | |
|---|---|---|---|
| ISO 14001* | Environmental Management Systems | Certied by IQNet | Certificate # 90560 / 89126 |
| ISO 9001 | Quality Systems – Model for Quality Assurance in Production, Installations, and Servicing | Certified by IQNet | Certificate # 81935 / 85131 / 85137 |
| OHSAS 18001* | Health and Safety Systems | Certified by IQNet | Certificate # 90573 / 58744 |
| Kosher | | Certified by Rabbi Yisrael Rozen, the Zomet Institute | Certificate #58-003-523-6 |
| GREENGUARD | Certified for "Indoor Air Quality" | | Certificate # 5464-410 / 5464-420 |
| Scientific Certifications Systems (SCS) | Recycled Content | Certified by SCS | See page 9 |
| New York City Materials and Equipment Acceptance (MEA) | | Approved by City of New York | MEA 202-08-M |
| ANSI/NSF Standard 51 | Food Equipment Materials | Listed by NSF | Safe to use in food preparation areas |
| Health Product Declaration (HPD) | Disclosure of potential chemicals of concern | | |

* Our Sdot Yam and Bar Lev plants each have a certified Environment, Health & Safety Management System in accordance with ISO 14001 & OSHA 18001. Our US production facility operates with an Environment, Health & Safety Management System that complies with state and federal laws, and is undergoing reviews to be certified to ISO 14001 & ISO 45001 (ISO 45001 will replace OSHA 18001).

## 2.3 ACCESSORIES

A. Mounting Adhesives

1. Provide structural-grade silicone, or epoxy adhesives, as recommended by manufacturer for application and per conditions of use.

2. Acceptable Silicone Manufacturers
    a. Dow Corning®
    b. GE Sealants and Adhesives

3. Acceptable Epoxy Manufacturers
    a. Akemi North America
    b. Bonstone Materials Corporation
    c. Tenax U.S.A.
    d. As specified

4. Provide spacers, if required, recommended by adhesive manufacturer

5. Color: Adhesive that will be visible in finished work should be tinted to

match quartz surfacing.

*In most countertop and interior cladding applications, Caesarstone can be installed with structural adhesive. Where required, however, Caesarstone can also be set in grout or installed with ties, clips, or other types of hardware recommended for thin stone veneers.*

B. Joint Sealants
   1. Clear silicone sealant, as recommended by manufacturer for application and per conditions of use.
   2. Provide anti-bacterial type food preparation areas.
   3. Acceptable Manufacturers:
      a. Dow Corning®
      b. GE Sealants and Adhesives

C. Solvent: Product recommended by adhesive manufacturer to clear surface of quartz surfacing to assure adhesion of adhesives [and sealants].

D. Cleaning Agents: Non-abrasive, low pH cleansers.

2.4 FABRICATION

*Include manufacturer authorization if manufacturer's warranty is specified.*

A. Fabricator: Shop shall have five years' experience fabricating architectural stone and shall have water-cooled cutting tools.

B. Shop Assembly: Observe proper safety procedures and comply with Caesarstone's instruction.

C. Layout: Layout joints as shown on drawings.

D. Inspect Material
   1. Inspect material for defects prior to fabrication.
   2. Color Match
      a. Materials used throughout the project shall be from the same batch and bear labels with the same batch numbers.
      b. Visually inspect materials to be used for adjacent pieces, to ensure acceptable color match.
      c. Inspect in lighting conditions similar to those existing at the jobsite.

3. Variation in distribution of aggregates in Caesarstone surfacing that is within manufacturer's tolerance is not a defect.

E. Tools: Cut and polish with water-cooled power tools.

F. Cutouts

*As with any type of stone, smaller radius increases potential for crack propagation at inside corners; under no circumstances should the radius be less than 3/8 inch.*

1. Cutouts shall have 3/8 inches (10 mm) minimum, inside corner radius. Inside corners shall be reinforced in an acceptable manner to prevent cracking.

2. Polish edges where they will be exposed in finished work. Required edge radius is ⅜" or ¼" in high traffic areas.

*The following is recommended in areas subject to heavy usage or where additional strength is justified:*

G. Laminations: Laminate layers of quartz surfacing as required to create built-up edges, trim, and other areas requiring additional thickness.

PART 3 EXECUTION

3.1 ACCEPTABLE INSTALLER

Installer: Shop shall have five years' experience installing architectural stone and shall certified by Caesarstone.

3.2 EXAMINATION

A. Site Verification

1. Verify dimensions by field measurements prior to fabrication.
2. Verify that substrates supporting quartz surfaces are plumb, level, and flat to within 1/16 inch in ten feet (1.6 mm in 3000 mm), and that necessary supports and blocking are in place.
3. Base Cabinets: Cabinet units shall be securely fixed to adjoining units and back wall.

B. Materials Review

1. Inspect finished surfaces for damage.
2. Do not install until damaged materials have been repaired or replaced in an acceptable manner.

3.3 PREPARATION

A. General
1. Protect finished surfaces against scratches.
2. Apply masking where necessary.
3. Guard against grit, dust, and other potentially abrasive dirt or residue.

3.4 INSTALLATION

A. General
1. Install materials in accordance to manufacturer's recommendations.
2. Lift and place carefully to avoid breakage.

B. Preliminary Installation and Adjustment
1. Position materials to verify correct sizing and preparation.
2. Make necessary adjustments.
3. If cutting, grinding, or polishing is required at the jobsite, use water-cooled tools.
4. Protect jobsite and surfaces against dust and water.
5. Perform work away from installation site and always make sure to wear proper protection equipment.
6. Gypsum drywall back walls, which are not fire or acoustically rated, may be routed up to half the thickness of the drywall to allow the countertop to fit.
7. Allow gaps for expansion of no less than 1/16 inch (1.5 mm), per every five feet, when installed between walls or other fixed conditions.

C. Permanent Installation
1. After verifying fit:
a. Remove quartz surfacing from position.
b. Clean substrates of dust and contamination.
c. Clean quartz surfacing back side and joints with solvent.
2. Apply sufficient quantity of mounting adhesive in accordance with adhesive manufacturer's recommendations to provide permanent, secure installation.
3. Spacing of mounting adhesive shall not exceed:
a. Horizontal surfaces: per manufacturer's recommendations.
b. Vertical surfaces: per manufacturer's recommendations; provide

temporary shims until adhesive cures

5. Install surfacing plumb, level, square, and flat to within 1/16 inch in ten feet (1.6 mm in 3000 mm).

D. Joints

1. Joints between adjacent pieces of quartz surfacing
   a. Joints shall be flush, tight fitting, level, and neat.
   b. Securely join with stone adhesive.
   c. Fill joints level with quartz surfacing.
   d. Clamp or brace quartz surfacing in position until adhesive sets.
2. Joints between backsplashes and countertops and around tub and shower enclosures: Seal joints with silicone sealant.

3.5 REPAIR

Repair or replace damaged materials in a satisfactory manner.

3.6 CLEANING

Remove masking and excess adhesives and sealants. Clean exposed surfaces.

3.7 PROTECTION

Protect surfacing from damage by other sections.

3.8 SCHEDULES

A. Finish Schedule

1. Countertops
   a. Caesarstone
   b. 30 mm thick
   c. Straight edges
   d. Color as selected by State’s Representative.

END OF SECTION 12 36 61

**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 SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Wall Sleeves: R-K Industries, No. 100 (wall) and No. 10 (deck).
2. Pipe Sleeves: Zurn Z 195 and/or fabricated sleeve, or equal. Sleeves shall have membrane clamping rings and penetrations shall be sealed, waterproof sleeves.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

2.2 STACK-SLEEVE FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Smith, Jay R. Mfg. Co.

2. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.

B. 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.

2.3 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, Inc.
2. CALPICO, Inc.
3. Metraflex Company (The).
4. Pipeline Seal and Insulator, Inc.
5. Proco Products, Inc.

B. 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: Stainless steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.4 SLEEVE-SEAL FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Presealed Systems.

B. 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.

2.5 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.

Design Mix: 5000-psi, 28-day compressive strength.

C. 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. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
2. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Division 07 Section "Joint Sealants."

E. 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 Division 07 Section "Penetration Firestopping."

3.2 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.

3.3 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 water stop 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.

3.4 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:

   a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
   b. Piping NPS 6 and Larger: Galvanized-steel-wall sleeves.

2. Exterior Concrete Walls below Grade:

   a. Piping Smaller Than NPS 6: Cast-iron wall sleeves with sleeve-seal system.

      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

   b. Piping NPS 6 and Larger: Cast-iron wall sleeves with sleeve-seal system.

      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:

   a. Piping Smaller Than NPS 6: Cast-iron wall sleeves with sleeve-seal system.

      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 and Larger: Cast-iron wall sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

4. Concrete Slabs above Grade:

a. Piping Smaller Than NPS 6: Sleeve-seal fittings.

5. Interior Partitions:

a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
b. Piping NPS 6 and Larger: Galvanized-steel-sheet sleeves.

END OF SECTION 22 05 17

# SECTION 22 05 18
# ESCUTCHEONS 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. Escutcheons.

### 1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

## PART 2 - PRODUCTS

### 2.1 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and setscrew fastener.

C. One-Piece, Stamped-Stainless Steel Type: With chrome-plated finish and setscrew fastener.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.

### 3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons using new materials.

END OF SECTION 22 05 18

# SECTION 22 05 23
# GENERAL-DUTY 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.
3. Bronze swing check valves.

### 1.3 SUBMITTALS

A. Product Data: For each type of valve indicated.

### 1.4 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
2. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 for valve materials for potable-water service.

### 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 angle and gate valves closed to prevent rattling.
4. Set ball and plug valves open to minimize exposure of functional surfaces.
5. Block 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 hand wheels or stems as lifting or rigging points

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

B. Valve Sizes: Same as upstream piping unless otherwise indicated.

C. Valves in Insulated Piping: With 2-inch stem extensions and the following features:

1. Gate Valves: With rising stem.
2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

D. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Grooved: With grooves according to AWWA C606.
3. Solder Joint: With sockets according to ASME B16.18.
4. Threaded: With threads according to ASME B1.20.1.

E. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRASS BALL VALVES

A. One-Piece, Reduced-Port, Brass Ball Valves with Brass Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Sioux Chief 648 Series.
b. Or equal.

2. Description:

a. Standard: MSS SP-110.
b. CWP Rating: 400 psig.
c. Body Design: One piece.

d. Body Material: Forged brass.
e. Ends: Threaded.
f. Seats: PTFE or TFE.
g. Stem: Brass.
h. Ball: Chrome-plated brass.
i. Port: Full Port.

2.3 BRONZE BALL VALVES

A. One-Piece, Reduced-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Valve, Inc.
b. Conbraco Industries, Inc.; Apollo Valves.
c. NIBCO INC.
d. Sioux Chief

2. 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 or TFE.
g. Stem: Bronze.
h. Ball: Chrome-plated brass.
i. Port: Reduced.

B. One-Piece, Reduced-Port, Bronze Ball Valves with Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Conbraco Industries, Inc.; Apollo Valves.
b. NIBCO INC.

2. 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 or TFE.
g. Stem: Stainless steel.

h. Ball: Stainless steel, vented.
i. Port: Reduced.

2.4 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Valve, Inc.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Division.
e. Hammond Valve.
f. Kitz Corporation.
g. Milwaukee Valve Company.
h. NIBCO INC.
i. Powell Valves.
j. Red-White Valve Corporation.
k. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
l. Sioux Chief.

2. 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.
f. Disc: Bronze.

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. Lift Check Valves: With stem upright and plumb.

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. Shutoff Service: Ball or plug valves.
2. Throttling Service: Ball valves.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves, except wafer types, 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 3: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
3. For Steel Piping, NPS 2 and Smaller: Threaded ends.
4. For Steel Piping, NPS 2-1/2 to NPS: Flanged ends except where threaded valve-end option is indicated in valve schedules below.

END OF SECTION 22 05 23

# 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 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Equipment supports.

### 1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

### 1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

### 1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Metal framing systems.
3. Equipment supports.

C. Welding certificates.

1.6 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

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: Pre-galvanized 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 stainless steel.

B. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

C. Suspension pipe clamp: Oatey #33915 or equal shall be used to eliminate contact between piping and framing surface for noise-reduction.

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 METAL FRAMING SYSTEMS

A. Non-MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Anvil International; a subsidiary of Mueller Water Products Inc.
    b. Empire Industries, Inc.
    c. ERICO International Corporation.
    d. Haydon Corporation; H-Strut Division.
    e. NIBCO INC.
    f. PHD Manufacturing, Inc.
    g. PHS Industries, Inc.

2. Description: Shop or field-fabricated pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
3. Standard: Comply with MFMA-4.
4. Channels: Continuous slotted steel channel with in-turned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.
7. Coating: Zinc.

2.4 THERMAL-HANGER SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carpenter & Paterson, Inc.
2. Clement Support Services.
3. ERICO International Corporation.
4. National Pipe Hanger Corporation.
5. PHS Industries, Inc.
6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
7. Piping Technology & Products, Inc.
8. Rilco Manufacturing Co., Inc.
9. Value Engineered Products, Inc.

B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

C. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

2.5 FASTENER SYSTEMS

A. Mechanical-Expansion Anchors: Insert-wedge-type, stainless-steel anchors, for use in hardened Portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.6 EQUIPMENT SUPPORTS

A. Description: Welded, shop or field-fabricated equipment support made from structural carbon-steel shapes.

2.7 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, non-shrink 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. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. 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.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. 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.

K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. 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.

M. Insulated Piping:

1. Attach clamps and spacers to piping.

a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. 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 inch thick.

4. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

## 3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

## 3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

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.

## 3.4 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.

## 3.5 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 a minimum dry film thickness of 2.0 mils.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 painting Sections.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

## 3.6 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 and metal framing systems and attachments for general service applications.

F. Use copper-plated pipe hangers and stainless-steel attachments for copper piping and tubing.

G. Use padded hangers for piping that is subject to scratching.

H. Use thermal-hanger shield inserts for insulated piping and tubing.

I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
3. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
4. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
5. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
6. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
7. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
8. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
9. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
10. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
11. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
12. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
13. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
14. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.

J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

M. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

1. Light (MSS Type 31): 750 lb.
2. Medium (MSS Type 32): 1500 lb.
3. Heavy (MSS Type 33): 3000 lb.
4. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams

N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

O. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

P. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

Q. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 22 05 29

**SECTION 22 05 48**
**VIBRATION AND SEISMIC CONTROLS 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. This Section includes the following:

1. Spring hangers.
2. Pipe riser resilient supports.
3. Resilient pipe guides.
4. Restraining braces and cables.

1.3 SUBMITTALS

A. Product Data: For the following:

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.

a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
b. Annotate to indicate application of each product submitted and compliance with requirements.

B. Coordination Drawings: Show coordination of seismic bracing for plumbing piping and equipment with other systems and equipment in the vicinity, including other supports and seismic restraints.

C. Welding certificates.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

A. Elastomeric Hangers: Single or double-deflection type, fitted with molded, oil-resistant elastomeric isolator elements bonded to steel housings with threaded

connections for hanger rods. Color-code or otherwise identify to indicate capacity range.

B. Spring Hangers: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
7. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

C. Pipe Riser Resilient Support: All-directional, acoustical pipe anchor consisting of 2 steel tubes separated by a minimum of 1/2-inch- thick neoprene. Include steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions. Design support for a maximum load on the isolation material of 500 psig and for equal resistance in all directions.

D. Resilient Pipe Guides: Telescopic arrangement of 2 steel tubes or post and sleeve arrangement separated by a minimum of 1/2-inch- thick neoprene. Where clearances are not readily visible, a factory-set guide height with a shear pin to allow vertical motion due to pipe expansion and contraction shall be fitted. Shear pin shall be removable and re-insertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

E. Acoustical plumbing isolators such as Oatey #33915 to be used to eliminate contact between piping and framing surface for noise reduction.

2.2 SEISMIC-RESTRAINT DEVICES

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Amber/Booth Company, Inc.
2. California Dynamics Corporation.

3. Cooper B-Line, Inc.; a division of Cooper Industries.
4. Hilti, Inc.
5. Kinetics Noise Control.
6. Loos & Co.; Cableware Division.
7. Mason Industries.
8. TOLCO Incorporated; a brand of NIBCO INC.
9. Unistrut; Tyco International, Ltd.

B. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.

C. Restraint Cables: ASTM A 603 galvanized-steel cables with end connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.

D. Hanger Rod Stiffener: Reinforcing steel angle clamped to hanger rod.

2.3 FACTORY FINISHES

A. Finish: Manufacturer’s standard prime coat finish ready for field painting.

B. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.

1. Powder coating on springs and housings.
2. All hardware shall be galvanized. Hot dip galvanizes metal components for exterior use.
3. Baked enamel or powder coat for metal components on isolators for interior use.
4. Color-code or otherwise mark vibration isolation and seismic-control devices to indicate capacity range.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze members with clamps approved for application by an agency acceptable to authorities having jurisdiction.

B. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.2 SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Piping Restraints:

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. Install cables so they do not bend across edges of adjacent equipment or building structure.

C. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

3.3 ADJUSTING

A. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 22 05 48

# 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. Warning signs and labels.
3. Pipe labels.

### 1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

### 1.4 COORDINATION

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 acoustic ceilings and similar concealment.

## PART 2 - PRODUCTS

### 2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Brass, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.

2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
3. 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-fourths the size of principal lettering.
4. Fasteners: Stainless-steel rivets or self-tapping screws.
5. 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), plus 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 (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8-inch-thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black.

C. Background Color: White.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. 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-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Pre-coiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, 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: At least 1-1/2 inches high.

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 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. 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. Where flow pattern is not obvious, mark each pipe at branch.

3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. Near major equipment items and other points of origination and termination.

B. Pipe Label Color Schedule:

1. Domestic Cold-Water Piping:

   a. Background Color: Green.
   b. Letter Color: White.

2. Sanitary Waste Piping:

   a. Background Color: White.
   b. Letter Color: Black.

END OF SECTION 22 05 53

**SECTION 22 07 00**
**PLUMBING 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. Insulation Materials:
   a. Cellular glass.
   b. Flexible elastomeric.
   c. Mineral fiber.

2. Adhesives.
3. Mastics.
4. Lagging adhesives.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets both factory and field applied, if any.

1.4 COORDINATION

A. Coordinate clearance requirements with piping Installer for piping insulation application and equipment Installer for equipment 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.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

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. Cell-U-Foam Corporation; Ultra-CUF.
    b. Pittsburgh Corning Corporation; Foamglas Super K.

2. Block Insulation: ASTM C 552, Type I.
3. Special-Shaped Insulation: ASTM C 552, Type III.
4. Board Insulation: ASTM C 552, Type IV.
5. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
6. Preformed Pipe Insulation with Factory-Applied ASJ-SSL: Comply with ASTM C 552, Type II, Class 2.
7. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

D. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

    1. Products: Subject to compliance with requirements, provide one of the following:

        a. Aeroflex USA Inc.; Aerocel.
        b. Armacell LLC; AP Armaflex.
        c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

E. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

    1. Products: Subject to compliance with requirements, provide one of the following:

        a. CertainTeed Corp.; Duct Wrap.
        b. Johns Manville; Microlite.
        c. Knauf Insulation; Duct Wrap.
        d. Manson Insulation Inc.; Alley Wrap.
        e. Owens Corning; All-Service Duct Wrap.

F. Mineral-Fiber, Preformed Pipe Insulation:

    1. Products: Subject to compliance with requirements, provide one of the following:

        a. Fibrex Insulations Inc.; Coreplus 1200.
        b. Johns Manville; Micro-Lok.

c. Knauf Insulation; 1000 Pipe Insulation.
d. Manson Insulation Inc.; Alley-K.
e. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-82.
b. Foster Products Corporation, H. B. Fuller Company; 85-20.
c. ITW TACC, Division of Illinois Tool Works; S-90/80.
d. Marathon Industries, Inc.; 225.
e. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-35.
b. Foster Products Corporation, H. B. Fuller Company; 30-90.
c. ITW TACC, Division of Illinois Tool Works; CB-50.
d. Marathon Industries, Inc.; 590.

e. Mon-Eco Industries, Inc.; 55-40.
f. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
5. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; CP-10.
b. Foster Products Corporation, H. B. Fuller Company; 35-00.
c. ITW TACC, Division of Illinois Tool Works; CB-05/15.
d. Marathon Industries, Inc.; 550.
e. Mon-Eco Industries, Inc.; 55-50.
f. Vimasco Corporation; WC-1/WC-5.

2. Water-Vapor Permeance: ASTM F 1249, 3 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 200 deg F.
4. Solids Content: 63 percent by volume and 73 percent by weight.
5. Color: White.

## 2.4 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A, and shall be compatible with insulation materials, jackets, and substrates.

1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-52.
b. Foster Products Corporation, H. B. Fuller Company; 81-42.
c. Marathon Industries, Inc.; 130.
d. Mon-Eco Industries, Inc.; 11-30.
e. Vimasco Corporation; 136.

3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over equipment and pipe insulation.
4. Service Temperature Range: Minus 50 to plus 180 deg F.
5. Color: White.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment and 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 4 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape as recommended by insulation material manufacturer 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. Manholes.
5. Handholes.
6. Cleanouts.

## 3.3 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Division 07 Section "Penetration Firestopping" and fire-resistive joint sealers.

E. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

## 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.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. 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.

## 3.5 MINERAL-FIBER INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

## 3.6 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Hot Water:

1. NPS 1 and Smaller: Insulation shall be one of the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

2. NPS 1” up to 4”: Insulation shall be one of the following:

a. Cellular Glass: 1-1/2 inches thick.
b. Flexible Elastomeric: 1-1/2 inch thick.
c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inch thick.
d. Phenolic: 1-1/2 inch thick.
e. Polyisocyanurate: 1-1/2 inch thick.
f. Polyolefin1-1/2 inch thick.

B. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:

1. All Pipe Sizes: Insulation shall be one of the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.

END OF SECTION 22 07 00

**SECTION 22 11 16**
**DOMESTIC WATER 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 PERFORMANCE REQUIREMENTS

A. General

1. Capable of safely accepting indicated external forces without failure.
2. Maintain equipment, piping in a captive position.

B. Criteria: Design for seismic forces specified in the Seismic Restraint Manual Guidelines for Mechanical Systems First Edition, 1991, published by Sheet Metal and Air Conditioning Contractors National Association, SMACNA.

1.3 SUBMITTALS

A. Product Data: For the following products:

1. Specialty valves.
2. Transition fittings.
3. Dielectric fittings.
4. Backflow preventers.
5. Water penetration systems.

1.4 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14 for plastic, potable domestic water piping and components. Include marking "NSF-pw" on piping.

C. Comply with NSF 61 for potable domestic water piping and components.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Water Piping: Inside Building and Exposed: Type "L" copper pipe, hard drawn, 95/5 (no Lead) solder with cast wrought copper solder fittings and adapters for screw pipe connections. Water Piping Inside the building concealed: Schedule

40 CPVC plastic pipe with schedule 80 solvent weld fittings. Provide Hilti FS-ONE High Performance Intumescent Firestop Sealant with CPVC, PVC plastic piping. Piping CPVC - mount with plastic.

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L (ASTM B 88M, Type B) water tube, drawn temper.

1. Cast-Copper Solder-Joint Fittings: ASME B16.18, pressure fittings.
2. Wrought-Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
3. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
4. 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.
5. Copper Pressure-Seal-Joint Fittings:

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Elkhart Products Corporation; Industrial Division.
        2) NIBCO INC.
        3) Viega; Plumbing and Heating Systems.

    b. NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber O-ring seal in each end.
    c. NPS 2-1/2 to NPS 4: Cast-bronze or wrought-copper fitting with EPDM-rubber O-ring seal in each end.

6. Copper Push-on-Joint Fittings:

    a. Manufacturers: Subject to compliance with requirements, provide products by the following:

        1) NVent LLC.

    b. Description: Cast-copper fitting complying with ASME B16.18 or wrought-copper fitting complying with ASME B 16.22; with stainless-steel teeth and EPDM-rubber O-ring seal in each end instead of solder-joint ends.

7. Copper-Tube Extruded-Tee Connections:

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) T-DRILL Industries Inc.

b. Description: Tee formed in copper tube according to ASTM F 2014.

8. Grooved-Joint Copper-Tube Appurtenances:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Anvil International.
2) Shurjoint Piping Products.
3) Victaulic Company.

b. Copper Grooved-End Fittings: ASTM B 75 (ASTM B 75M) copper tube or ASTM B 584 bronze castings.
c. Grooved-End-Tube Couplings: Copper-tube dimensions and design similar to AWWA C606. Include ferrous housing sections, EPDM-rubber gaskets suitable for hot and cold water, and bolts and nuts.

B. Soft Copper Tube: ASTM B 88, Type K (ASTM B 88M, Type A) and ASTM B 88, Type L (ASTM B 88M, Type B) water tube, annealed temper.

1. Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
2. Copper Pressure-Seal-Joint Fittings:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Elkhart Products Corporation; Industrial Division.
2) NIBCO INC.
3) Viega; Plumbing and Heating Systems.

b. NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber O-ring seal in each end.
c. NPS 3 and NPS 4: Cast-bronze or wrought-copper fitting with EPDM-rubber O-ring seal in each end.

2.3 CPVC PIPING

A. CPVC Pipe: ASTM F 441/F 441M, Schedule 80.

1. CPVC Socket Fittings: ASTM F 439 for Schedule 80.
2. CPVC Threaded Fittings: ASTM F 437, Schedule 80.

B. CPVC Piping System: ASTM D 2846/D 2846M, SDR 11, pipe and socket fittings.

C. CPVC Tubing System: ASTM D 2846/D 2846M, SDR 11, tube and socket fittings.

2.4 PIPING JOINING MATERIALS

A. For all domestic hot water piping provide Ethylene Propylene Diene Monomer (EPDM) M-Class rubber formulated to be resistant to Chloramine or provide Fluorocarbon (FKM) or Silicone (VMQ) formulated to be resistant to Chloramine for gasket material in the domestic hot water system including but not limited to:

1. Piping connections
2. Equipment Connections
3. Isolation Valves
4. O-rings

B. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free, Chloramine resistant as stated above; full-face or ring type unless otherwise indicated.

C. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel 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. Solvent Cements for Joining CPVC Piping and Tubing: ASTM F 493.

1. Use CPVC solvent cement that has a VOC content of 490 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

G. Plastic, Pipe-Flange Gaskets, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

2.5 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105.

B. Form: Sheet or Tube.

C. Material: LLDPE film of 0.008-inch minimum thickness or high-density, cross-laminated PE film of 0.004-inch minimum thickness.

D. Color: Black.

2.6 SPECIALTY VALVES

A. All plumbing valves upstream from the apartment shutoff shall be brass. The apartment shutoff valves shall be brass body but can have CPVC socket connections (Sioux Chief 648 series brass ball valve w/ CPVC socket connections or equal). Inside apartments –brass valves, shut offs and fixture stops can be CPVC. In building types where apartment shut offs do not exist but CPVC is allowed, all valves that would require shutting more than 1 apartment down if they need to be replaced shall be brass bodied ball valves similar to apartment shut off valve specified (Sioux Chief or equal).

B. CPVC Union Ball Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. American Valve, Inc.
    b. Asahi/America, Inc.
    c. IPEX Inc.
    d. NIBCO INC.

2. Description:

    a. Standard: MSS SP-122.
    b. Pressure Rating: 150 psig at 73 deg F.
    c. Body Material: CPVC.
    d. Body Design: Union type.
    e. End Connections for Valves NPS 2 and Smaller: Detachable, socket or threaded.
    f. End Connections for Valves NPS 2-1/2 to NPS 4: Detachable, socket or threaded.
    g. Ball: CPVC; full port.
    h. Seals: PTFE or EPDM-rubber O-rings.
    i. Handle: Tee shaped.

C. CPVC Non-Union Ball Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. American Valve, Inc.
    b. Asahi/America, Inc.
    c. NIBCO INC.
    d. Spears Manufacturing Company.
    e. Thermoplastic Valves Inc.

2. Description:

    a. Standard: MSS SP-122.
    b. Pressure Rating: 150 psig at 73 deg F.

c. Body Material: CPVC.
d. Body Design: Non-union type.
e. End Connections: Socket or threaded.
f. Ball: CPVC; full or reduced port.
g. Seals: PTFE or EPDM-rubber O-rings.
h. Handle: Tee shaped.

D. CPVC Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Sloane, George Fischer, Inc.
b. Spears Manufacturing Company.

2. Description:

a. Pressure Rating: 150 psig at 73 deg F.
b. Body Material: CPVC.
c. Body Design: Nonrising stem.
d. End Connections for Valves NPS 2 and Smaller: Socket or Threaded.
e. End Connections for Valves NPS 2-1/2 to NPS 4: Flanged.
f. Gate and Stem: Plastic.
g. Seals: EPDM rubber.
h. Handle: Wheel.

2.7 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

C. Sleeve-Type Transition Coupling: AWWA C219.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Cascade Waterworks Manufacturing.
b. Dresser, Inc.; Dresser Piping Specialties.
c. Ford Meter Box Company, Inc. (The).
d. JCM Industries.
e. Romac Industries, Inc.
f. Smith-Blair, Inc; a Sensus company.

g. Viking Johnson; c/o Mueller Co.

D. Plastic-to-Metal Transition Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Charlotte Pipe and Foundry Company.
b. Harvel Plastics, Inc.
c. Spears Manufacturing Company.

2. Description: CPVC or PVC one-piece fitting with manufacturer's Schedule 40 equivalent dimensions; one end with threaded brass insert and one solvent-cement-socket or threaded end.

E. Plastic-to-Metal Transition Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Colonial Engineering, Inc.
b. NIBCO INC.
c. Spears Manufacturing Company.

2. Description: CPVC or PVC four-part union. Include brass or stainless-steel threaded end, solvent-cement-joint or threaded plastic end, rubber O-ring, and union nut.

2.8 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Capitol Manufacturing Company.
b. Central Plastics Company.
c. EPCO Sales, Inc.
d. Hart Industries International, Inc.
e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
f. Zurn Plumbing Products Group; Wilkins Water Control Products.

2. Description:

a. Pressure Rating: 250 psig at 180 deg F.
b. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Capitol Manufacturing Company.
b. Central Plastics Company.
c. EPCO Sales, Inc.
d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Factory-fabricated, bolted, companion-flange assembly.
b. Pressure Rating: 300 psig.
c. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Calpico, Inc.
b. Lochinvar Corporation.

2. Description:

a. Galvanized-steel coupling.
b. Pressure Rating: 300 psig at 225 deg F.
c. End Connections: Female threaded.
d. Lining: Inert and noncorrosive, thermoplastic.

## PART 3 - EXECUTION

### 3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping per manufacturer’s recommendations.

C. Install shutoff valve immediately upstream of each dielectric fitting.

D. Install domestic water piping level without pitch and plumb.

E. Install seismic restraints on piping.

F. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

G. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

H. Install piping to permit valve servicing.

I. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than system pressure rating used in applications below unless otherwise indicated.

J. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

K. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 22 Section "Escutcheons for Plumbing Piping."

3.2 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 pipes, tubes, 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.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.

E. Soldered Joints: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

F. Pressure-Sealed Joints: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.

G. Copper-Tubing, Push-on Joints: Clean end of tube. Measure insertion depth with manufacturer's depth gauge. Join copper tube and push-on-joint fittings by inserting tube to measured depth.

H. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

I. Copper-Tubing Grooved Joints: Roll groove end of tube. Assemble coupling with housing, gasket, lubricant, and bolts. Join copper tube and grooved-end fittings according to AWWA C606 for roll-grooved joints.

J. Ductile-Iron-Piping Grooved Joints: Cut groove end of pipe. Assemble coupling with housing, gasket, lubricant, and bolts. Join ductile-iron pipe and grooved-end fittings according to AWWA C606 for ductile-iron-pipe, cut-grooved joints.

K. Steel-Piping Grooved Joints: Cut or roll groove end of pipe. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

L. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service Chloramine resistant as stated above. Join flanges with gasket and bolts according to ASME B31.9.

M. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements. Apply primer.
2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.

N. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

## 3.3 VALVE INSTALLATION

A. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping.

1. Hose-End Drain Valves: At low points in water mains, risers, and branches.
2. Stop-and-Waste Drain Valves: Instead of hose-end drain valves where indicated.

## 3.4 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:

1. NPS 1-1/2 and Smaller: Fitting-type coupling.
2. NPS 2 and Larger: Sleeve-type coupling.

C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings or unions.

3.5 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings or nipples.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.

D. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.6 FIELD QUALITY CONTROL

A. Piping Tests:

1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
2. Test for leaks and defects in new piping. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. 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.
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 for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.7 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
5. Remove and clean strainer screens. Close drain valves and replace drain plugs.
6. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
7. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.8 CLEANING

A. Clean and disinfect potable and non-potable domestic water piping as follows:

1. Purge new piping before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652.

B. Prepare and submit reports of purging and disinfecting activities.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.9 PIPING SCHEDULE

A. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

B. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

C. Above ground domestic water piping, NPS 2 and smaller, shall be one of the following:

1. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); cast- or wrought- copper solder-joint fittings; and brazed soldered joints.
2. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); copper pressure-seal-joint fittings; and pressure-sealed joints.
3. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); copper push-on-joint fittings; and push-on joints.
4. CPVC, Schedule 40 pipe; CPVC, Schedule 40 Schedule 80 pipe; CPVC, Schedule 80 socket fittings; and solvent-cemented joints.

5. CPVC Tubing System: CPVC tube; CPVC socket fittings; and solvent-cemented joints. NPS 1-1/2 and NPS 2 CPVC pipe with CPVC socket fittings may be used instead of tubing.

D. Above ground domestic water piping, NPS 2-1/2 to NPS 4 shall be one of the following:

1. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); cast- or wrought- copper solder-joint fittings; and soldered joints.
2. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); copper pressure-seal-joint fittings; and pressure-sealed joints.
3. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); grooved-joint copper-tube appurtenances; and grooved joints.
4. Galvanized-steel pipe and nipples; galvanized, gray-iron threaded fittings; and threaded joints.
5. Galvanized-steel pipe; grooved-joint, galvanized-steel-pipe appurtenances; and grooved joints.
6. CPVC, Schedule 80 pipe; CPVC, Schedule 80 socket fittings; and solvent-cemented joints.

END OF SECTION 22 11 16

# SECTION 22 11 19
# DOMESTIC WATER PIPING SPECIALTIES

## 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 the following domestic water piping specialties:

1. Vacuum breakers.
2. Strainers.
3. Outlet boxes.
4. Hose bibbs.
5. Wall hydrants.
6. Drain valves.
7. Air vents.
8. Trap-seal primer valves.

### 1.3 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig, unless otherwise indicated.

B. This section covers variable speed domestic cold water and domestic hot water pressure booster systems.

### 1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

C. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

## PART 2 - PRODUCTS

### 2.1 VACUUM BREAKERS

A. Hose-Connection Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Arrowhead Brass Products, Inc.
b. Cash Acme.
c. Conbraco Industries, Inc.
d. Legend Valve.
e. MIFAB, Inc.
f. Prier Products, Inc.
g. Watts Industries, Inc.; Water Products Div.
h. Woodford Manufacturing Company.
i. Zurn Plumbing Products Group; Light Commercial Operation.
j. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1011.
3. Body: Bronze, nonremovable, with manual drain.
4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
5. Finish: Chrome or nickel plated.

B. Hose-Connection Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Conbraco Industries, Inc.
b. Watts Industries, Inc.; Water Products Div.
c. Woodford Manufacturing Company.

2. Standard: ASSE 1052.
3. Operation: Up to 10-foot head of water back pressure.
4. Inlet Size: NPS ½ or NPS ¾.
5. Outlet Size: Garden-hose thread complying with ASME B1.20.7.
6. Capacity: At least 3-gpm flow.

## 2.2 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum, unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating and for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations, unless otherwise indicated.
5. Perforation Size:

a. Strainers NPS 2 and Smaller: 0.020 inch.
b. Strainers NPS 2-1/2 to NPS 4: 0.045 inch.

6. Drain: Pipe plug.

## 2.3 HOSE BIBBS

A. Hose Bibbs:

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS ½ or NPS ¾ threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral or field-installation, nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Rough bronze.
10. Finishing for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation for Service Areas: Operating key.
13. Operation for Finished Rooms: Operating key.
14. Include operating key with each operating-key hose bibb.
15. Include integral wall flange with each chrome- or nickel-plated hose bibb.

## 2.4 WALL HYDRANTS

A. Non-freeze Wall Hydrants:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Josam Company.
    b. MIFAB, Inc.
    c. Prier Products, Inc.
    d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    e. Tyler Pipe; Wade Div.
    f. Watts Drainage Products Inc.
    g. Woodford Manufacturing Company.
    h. Zurn Plumbing Products Group; Light Commercial Operation.
    i. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.21.3M for exposed-outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig.
4. Operation: Loose key.
5. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
6. Inlet: NPS ¾ or NPS 1.

7. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
8. Box: Deep, flush mounting with cover.
9. Box and Cover Finish: Chrome plated.
10. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
11. Nozzle and Wall-Plate Finish: Polished nickel bronze.
12. Operating Keys(s): One with each wall hydrant.

2.5 TRAP-SEAL PRIMER VALVES

A. Supply-Type, Trap-Seal Primer Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. PPP Inc.
   b. Sioux Chief Manufacturing Company, Inc.
   c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   d. Watts Industries, Inc.; Water Products Div.

2. Standard: ASSE 1018.
3. Pressure Rating: 125 psig minimum.
4. Body: Bronze.
5. Inlet and Outlet Connections: NPS ½ threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS ½ threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in the same room as connected equipment or system.
2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed airgap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
3. Do not install bypass piping around backflow preventers.

B. Install balancing valves in locations where they can easily be adjusted.

C. Install temperature-actuated water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.

1. Install thermometers and pressure gauges.

D. Install water hammer arresters in water piping according to PDI-WH 201.

E. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

3.2 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

END OF SECTION 22 11 19

# SECTION 22 13 16
# SANITARY WASTE AND PIPE VENTING

## 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, tube, and fittings.
2. Specialty pipe fittings.

### 1.3 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water.

### 1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, and details.

C. Field quality-control reports.

## PART 2 - PRODUCTS

### 2.1 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS MANUFACTURERS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. CISPI, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ANACO-Husky.
b. Dallas Specialty & Mfg. Co.
c. Fernco Inc.
d. Matco-Norca, Inc.

e. MIFAB, Inc.
f. AB&I Foundry.
g. Stant.
h. Tyler Pipe.

2. Standards: ASTM C 1277 and CISPI 310.
3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

C. Heavy-Duty, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ANACO-Husky.
b. Clamp-All Corp.
c. Dallas Specialty & Mfg. Co.
d. MIFAB, Inc.
e. Mission Rubber Company; a division of MCP Industries, Inc.
f. Stant.
g. Tyler Pipe.

2. Standards: ASTM C 1277 and ASTM C 1540.
3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

D. Cast-Iron, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. MG Piping Products Company.

2. Standard: ASTM C 1277.
3. Description: Two-piece ASTM A 48/A 48M, cast-iron housing; stainless-steel bolts and nuts; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.2 ABS PIPE AND PVC PIPE FITTINGS

A. ABS pipe for drainage shall conform to one of the following standards:

1. ASTM D3034, “Standard Specification for Type ABS Sewer Pipe and Fittings”.
2. ASTM F949, “Standard Specification for Type ABS Corrugated Sewer Pipe with a Smooth Interior and Fittings”.

3. ASTM F1336, “Standard Specification for Type ABS Gasketed Sewer Fittings”.

B. Joints of ABS pipe shall consist of either an elastomeric gasket coupling or an integral bell and spigot with an elastomeric gasket. The assembly of joints shall be in accordance with the pipe manufacturer’s recommendation and the requirements of ASTM D3212.

1. Gaskets: ASTM F 477, elastomeric seal.
2. Fittings: ABS elastomeric joint complying with ASTMD3212.
3. Couplings: Rubber or elastomeric seal and stainless steel band assembly fabricated to match outside diameters of pipes to be jointed.

a. Sleeves: ASTM F477, elastomeric seal for plastic pipe. Sleeves for dissimilar or other pipe materials shall be compatible with pipe materials being joined.
b. Bands: Stainless steel, one at each point of pipe insert.

C. Pipe and Fittings should be installed in accordance with ASTM D2321, “Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Application”.

## 2.3 SPECIALTY PIPE FITTINGS

A. Dielectric Fittings:

1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
2. Dielectric Unions:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Capitol Manufacturing Company.
2) Central Plastics Company.
3) Hart Industries International, Inc.
4) Jomar International Ltd.
5) Matco-Norca, Inc.
6) McDonald, A. Y. Mfg. Co.
7) Watts Regulator Co.; a division of Watts Water Technologies, Inc.
8) Wilkins; a Zurn company.

b. Description:

1) Standard: ASSE 1079.
2) Pressure Rating: 125 psig minimum at 180 deg F.
3) End Connections: Solder-joint copper alloy and threaded ferrous.

## PART 3 - EXECUTION

### 3.1 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 and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations 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 specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Install piping to allow application of insulation.

I. Make changes in direction for soil and waste drainage and vent 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 two 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.

J. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

K. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:

1. Building Sanitary Drain: 2 percent downward in direction of flow.
2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

L. 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."

1. Install encasement on underground piping according to ASTM A 674 or AWWA C105/A 21.5.

M. Install buried piping inside building between wall and floor penetrations and connection to sanitary sewer piping outside building with restrained joints. Anchor pipe to wall or floor. Install thrust-block supports at vertical and horizontal offsets.

1. Install encasement on piping according to ASTM A 674 or AWWA C105/A 21.5.

N. Plumbing Specialties:

1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping.
2. Install drains in sanitary drainage gravity-flow piping.

O. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

P. Install escutcheons for piping penetrations of walls, ceilings, and floors.

## 3.2 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during the 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.

END OF SECTION 22 13 16

# SECTION 22 13 19
# SANITARY WASTE PIPING SPECIALTIES

## 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 the following sanitary drainage piping specialties:

1. Cleanouts.
2. Floor drains.
3. Trench drains.
4. Roof flashing assemblies.
5. Through-penetration firestop assemblies.
6. Miscellaneous sanitary drainage piping specialties.
7. Flashing materials.

B. Related Sections include the following:

1. Division 22 Section "Storm Drainage Piping Specialties" for trench drains for storm water, roof drains, and catch basins.

### 1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. FRP: Fiberglass-reinforced plastic.

C. HDPE: High-density polyethylene plastic.

D. PE: Polyethylene plastic.

E. PP: Polypropylene plastic.

F. PVC: Polyvinyl chloride plastic.

### 1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

C. Operation and Maintenance Data: For drainage piping specialties to include in emergencies, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agencies.

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. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

1.6 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate size and location of roof penetrations.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Exposed Metal Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Josam Company; Josam Div.
    b. MIFAB, Inc.
    c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    d. Tyler Pipe; Wade Div.
    e. Watts Drainage Products Inc.
    f. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
3. Size: Same as connected drainage piping
4. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk or raised-head cast-iron plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Closure: Stainless-steel plug with seal.

B. Metal Floor Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Josam Company; Josam Div.
    b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    c. Tyler Pipe; Wade Div.
    d. Watts Drainage Products Inc.
    e. Zurn Plumbing Products Group.

2. Standard: ASME A112.36.2M for cast-iron soil pipe with cast-iron ferrule cleanout.
3. Size: Same as connected branch.
4. Type: Heavy-duty, adjustable housing.
5. Body or Ferrule: Cast iron.
6. Clamping Device: Required.
7. Outlet Connection: Threaded.
8. Closure: Cast-iron plug.
9. Adjustable Housing Material: Cast iron with threads.
10. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
11. Frame and Cover Shape: Round.
12. Top Loading Classification: Extra Heavy Duty.
13. Riser: ASTM A 74, Extra-Heavy class, cast-iron drainage pipe fitting and riser to clean out.
14. Standard: ASME A112.3.1.
15. Size: Same as connected branch.
16. Housing: Stainless steel.
17. Closure: Stainless steel with seal.
18. Riser: Stainless-steel drainage pipe fitting to cleanout.

C. Cast-Iron Wall Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Josam Company; Josam Div.
    b. MIFAB, Inc.
    c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    d. Tyler Pipe; Wade Div.
    e. Watts Drainage Products Inc.
    f. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hub less, cast-iron soil pipe test tee as required to match connected piping.

5. Closure: Countersunk or raised-head, drilled-and-threaded plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.
8. Wall Access: Round nickel-bronze, copper-alloy, or stainless-steel wall-installation frame and cover.

## 2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Josam Company; Josam Div.
    b. MIFAB, Inc.
    c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    d. Tyler Pipe; Wade Div.
    e. Watts Drainage Products Inc.
    f. Zurn Plumbing Products Group.

2. Standard: ASME A112.6.3.
3. Pattern: Sanitary drain.
4. Body Material: Gray iron.
5. Seepage Flange: Required.
6. Anchor Flange: Required.
7. Clamping Device: Required.
8. Outlet: Bottom.
9. Backwater Valve: Not required.
10. Coating on Interior and Exposed Exterior Surfaces: Not required.
11. Sediment Bucket: Not required.
12. Top or Strainer Material: Nickel bronze.
13. Top of Body and Strainer Finish: Nickel bronze.
14. Top Shape: Round.
15. Funnel: Not required.
16. Inlet Fitting: Not required.
17. Trap Material: Cast iron.
18. Trap Pattern: Standard P-trap.
19. Trap Features: Trap-seal primer valve drain connection.

B. Stainless-Steel Floor Drains:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Josam Company; Blucher-Josam Div.

b. Josam Company; Josam Div.
c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
d. Tyler Pipe; Wade Div.
e. Watts Drainage Products Inc.
f. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.6.3.
3. Outlet: Bottom Side.
4. Top or Strainer Material: Stainless steel.
5. Top Shape: Square.
6. Seepage Flange: Required.
7. Anchor Flange: Required.
8. Clamping Device: Required.
9. Trap-Primer Connection: Required.
10. Trap Material: Cast iron.
11. Trap Pattern: Standard P-trap.

## 2.3 TRENCH DRAINS

A. Trench Drains:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Josam Company; Josam Div.
b. MIFAB, Inc.
c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
d. Tyler Pipe; Wade Div.
e. Watts Drainage Products Inc.
f. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.6.3 for trench drains.
3. Material: Ductile or gray iron.
4. Flange: Not required.
5. Clamping Device: Required.
6. Outlet: Bottom.
7. Grate Material: Ductile iron or gray iron.
8. Grate Finish: Not required.
9. Top Loading Classification: Extra Heavy-Duty.
10. Trap Material: Cast iron.
11. Trap Pattern: Standard P-trap.

## 2.4 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Acorn Engineering Company; Elmdor/Stoneman Div.
b. Thaler Metal Industries Ltd.

B. Description: Manufactured assembly made of 6.0-lb/sq. ft, 0.0938-inch- thick, lead flashing collar and skirt extending at least 8 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.

1. Open-Top Vent Cap: Without cap.
2. Low-Silhouette Vent Cap: With vandal-proof vent cap.
3. Extended Vent Cap: With field-installed, vandal-proof vent cap.

2.5 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

A. Through-Penetration Firestop Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide product by the following:

a. ProSet Systems Inc.

2. Standard: UL 1479 assembly of sleeve and stack fitting with firestopping plug.
3. Size: Same as connected soil, waste, or vent stack.
4. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
5. Stack Fitting: ASTM A 48/A 48M, gray-iron, hubless-pattern, wye branch with neoprene O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap for plug.
6. Special Coating: Corrosion resistant on interior of fittings.

2.6 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open Drains:

1. Description: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C 564, rubber gaskets.
2. Size: Same as connected waste piping.

B. Deep-Seal Traps:

1. Description: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.
2. Size: Same as connected waste piping.

a. NPS 2: 4-inch- minimum water seal.

b. NPS 2-1/2 and Larger: 5-inch- minimum water seal.

C. Floor-Drain, Trap-Seal Primer Fittings:

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 side inlet.

D. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

E. Sleeve Flashing Device:

1. Description: Manufactured, cast-iron fitting, with clamping device, that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend 2 inches above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
2. Size: As required for close fit to riser or stack piping.

F. Stack Flashing Fittings:

1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
2. Size: Same as connected stack vent or vent stack.

G. Vent Caps:

1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
2. Size: Same as connected stack vent or vent stack.

H. Expansion Joints:

1. Standard: ASME A112.21.2M.
2. Body: Cast iron with bronze sleeve, packing, and gland.
3. End Connections: Matching connected piping.
4. Size: Same as connected soil, waste, or vent piping.

## 2.7 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4.0-lb/sq. ft., 0.0625-inch thickness.
2. Vent Pipe Flashing: 3.0-lb/sq. ft., 0.0469-inch thickness.
3. Burning: 6-lb/sq. ft., 0.0938-inch thickness.

B. Copper Sheet: ASTM B 152/B 152M, of the following minimum weights and thicknesses, unless otherwise indicated:

1. General Applications: 12 oz./sq. ft. thickness.
2. Vent Pipe Flashing: 8 oz./sq. ft. thickness.

C. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch minimum thickness, unless otherwise indicated. Include G90 (Z275) hot-dip galvanized, mill-phosphatized finish for painting if indicated.

D. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

E. Fasteners: Metal compatible with material and substrate being fastened.

F. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

G. Solder: ASTM B 32, lead-free alloy.

H. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install backwater valves in building drain piping. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.

C. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger 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 NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

D. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

E. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

F. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

    a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
    b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
    c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

G. Install trench drains at low points of surface areas to be drained. Set grates of drains flush with finished surface, unless otherwise indicated.

H. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.

I. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.

J. Install through-penetration firestop assemblies in plastic conductors and stacks at floor penetrations.

K. Assemble open drain fittings and install with top of hub 2 inches above floor.

L. Install deep-seal traps on floor drains and other waste outlets, if indicated.

M. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

N. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

O. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

P. Install vent caps on each vent pipe passing through roof.

Q. Install frost-resistant vent terminals on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.

R. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.

S. Install frost-proof vent caps on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.

T. Install drain trough (clothes washer) with cleanout immediately downstream from drain trough that do not have integral cleanout on outlet. Install trap on drain trough that do not have integral trap and are connected to sanitary drainage and vent systems.

U. Install wood-blocking reinforcement for wall-mounting-type specialties.

V. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.
2. Copper Sheets: Solder joints of copper sheets.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum 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 8 inches around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Division 07 Section "Sheet Metal Flashing and Trim."

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.4 PROTECTION

A. Protect drains during the remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 22 13 19

# SECTION 22 14 13
# FACILITY STORM DRAINAGE PIPING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Hub-and-spigot, cast-iron soil pipe and fittings.
2. Hubless, cast-iron soil pipe and fittings.
3. ABS pipe and fittings.
4. PVC pipe and fittings.
5. Specialty pipe and fittings.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

### 1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Detail storm drainage piping. Show support locations, type of support, weight on each support, required clearances, and other details, drawn to scale, and coordinated with each other, using input from installers of the items involved.

B. Field quality-control reports.

### 1.4 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Storm Drainage Piping: 10-foot head of water.

### 2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Charlotte Pipe

2. Opus
3. Tyler Pipe

B. Pipe and Fittings:

1. Marked with CISPI collective trademark and NSF certification mark.
2. Class: ASTM A 74, Service class.

C. Gaskets: ASTM C 564, rubber.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Charlotte Pipe
2. Opus
3. Tyler Pipe

B. Pipe and Fittings:

1. Marked with CISPI collective trademark and NSF certification mark.
2. Standard: ASTM A 888 or CISPI 301.

C. CISPI, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Charlotte Pipe
b. McWare
c. Tyler Pipe

2. Couplings shall bear CISPI collective trademark and NSF certification mark.
3. Standards: ASTM C 1277 and CISPI 310.
4. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stops.

D. Heavy-Duty, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Charlotte Pipe

b. McWare
c. Tyler Pipe

2. Standard: ASTM C 1540.

3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

E. Cast-Iron, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Charlotte Pipe
b. McWare
c. Tyler Pipe

2. Standard: ASTM C 1277.
3. Description: Two-piece ASTM A 48/A 48M, cast-iron housing; stainless-steel bolts and nuts; and ASTM C 564, rubber sleeve with integral, center pipe stops.

## PART 3 - EXECUTION

### 3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.

1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
2. Install piping as indicated unless deviations from layout are approved on coordination drawings.

B. Install piping in concealed locations 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 specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

K. Make changes in direction for piping using appropriate branches, bends, and long-sweep bends.

1. Do not change direction of flow more than 90 degrees.
2. Use proper size of standard increasers and reducers if pipes of different sizes are connected.

    a. Reducing size of drainage piping in direction of flow is prohibited.

L. Lay buried building piping beginning at low point of each system.

1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

3. Maintain swab in piping and pull past each joint as completed.

M. Install piping at the following minimum slopes unless otherwise indicated:

1. Building Storm Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 2 percent downward in direction of flow for piping NPS 4 and larger.
2. Horizontal Storm Drainage Piping: 2 percent downward in direction of flow.

N. 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. Install aboveground ABS piping according to ASTM D 2661.

P. Install aboveground PVC piping according to ASTM D 2665.

Q. Plumbing Specialties:

1. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers in storm drainage gravity-flow piping.

    a. Comply with requirements for cleanouts specified in Section 221423 "Storm Drainage Piping Specialties."

2. Install drains in storm drainage gravity-flow piping.

    a. Comply with requirements for drains specified in Section 221423 "Storm Drainage Piping Specialties."

R. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

S. Install sleeves for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

T. Install sleeve seals for piping penetrations of concrete walls and slabs.

1. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

U. Install escutcheons for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

## 3.2 JOINT CONSTRUCTION

A. Hub-and-Spigot, Cast-Iron Soil Piping Gasketed Joints: Join according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Hubless, Cast-Iron Soil Piping Coupled Joints:

1. Join according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

C. Joint Restraints and Sway Bracing:

1. Provide joint restraints and sway bracing for storm drainage piping joints to comply with the following conditions:

    a. Provide axial restraint for pipe and fittings 5 inches and larger, upstream and downstream of all changes in direction, branches, and changes in diameter greater than two pipe sizes.
    b. Provide rigid sway bracing for pipe and fittings 4 inches and larger, upstream and downstream of all changes in direction 45 degrees and greater.
    c. Provide rigid sway bracing for pipe and fittings 5 inches and larger, upstream and downstream of all changes in direction and branch openings.

## 3.3 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for seismic-restraint devices "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for hangers, supports, and anchor devices "Hangers and Supports for Plumbing Piping and Equipment."

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
3. Install individual, straight, horizontal piping runs:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

4. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
5. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Install hangers for cast-iron soil piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

D. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.

E. Support vertical cast-iron soil piping with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent, but as a minimum at base and at each floor.

## 3.4 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.

C. Connect storm drainage piping to roof drains and storm drainage specialties.

1. Install test tees (wall cleanouts) in conductors near floor, and floor cleanouts with cover flush with floor.

D. Where installing piping adjacent to equipment, allow space for service and maintenance.

E. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

## 3.5 IDENTIFICATION

A. Identify exposed storm drainage piping.

B. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

## 3.6 FIELD QUALITY CONTROL

A. During installation, notify authorities 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.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.

    a. 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 storm drainage piping until it has been tested and approved.

    a. Expose work that was covered or concealed before it was tested.

3. Test Procedure:

    a. Test storm drainage piping, except outside leaders, on completion of roughing-in.
    b. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts until completion of inspection, water level must not drop. Inspect joints for leaks.

4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

C. Piping will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

## 3.7 CLEANING AND PROTECTION

A. Clean interior of piping. 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.

END OF SECTION 22 14 13

# SECTION 22 14 23
# STORM DRAINAGE PIPING SPECIALTIES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Metal roof drains.
2. Cleanouts.
3. Trench drains.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

### 1.3 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

## PART 2 - PRODUCTS

### 2.1 METAL ROOF DRAINS

A. Cast-Iron, Large-Sump, General-Purpose Roof Drains:

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Zurn
b. Oatey
c. J.R. Smith
d. Watts

2. Standard: ASME A112.6.4.
3. Body Material: Cast iron.
4. Dimension of Body: Nominal 14-to 16-inch diameter.
5. Combination Flashing Ring and Gravel Stop: Not required.
6. Flow-Control Weirs

B. Cast-Iron, Medium-Sump, General-Purpose Roof Drains:

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Zurn
b. Oatey
c. J.R. Smith
d. Watts

2. Standard: ASME A112.6.4.
3. Body Material: Cast iron.
4. Dimension of Body: 8- to 12-inch diameter.
5. Combination Flashing Ring and Gravel Stop.
6. Flow-Control Weirs

C. Cast-Iron, Small-Sump, General-Purpose Roof Drains:

1. Standard: ASME A112.6.4.
2. Body Material: Cast iron.
3. Dimension of Body: Nominal 8-inch diameter.
4. Combination Flashing Ring and Gravel Stop.

D. Metal Parapet Roof Drains

2.2 CLEANOUTS

A. Cast-Iron Exposed Cleanouts:

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Zurn
b. Oatey
c. J.R. Smith
d. Watts

2. Standard: ASME A112.36.2M.
3. Size: Same as connected branch.
4. Body Material: Hub-and-spigot, cast-iron soil pipe T-branch as required to match connected piping.
5. Closure: Countersunk, cast-iron plug.
6. Closure Plug Size: Same as, or not more than, one size smaller than cleanout size.

B. Cast-Iron Wall Cleanouts:

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Zurn

b. Oatey
c. J.R. Smith
d. Watts

2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: No-hub, cast-iron soil pipe test tee as required to match connected piping.
5. Closure Plug:

a. Cast iron.
b. Countersunk head.
c. Drilled and threaded for cover attachment screw.
d. Size: Same as, or not more than, one size smaller than cleanout size.

6. Wall Access, Cover Plate: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.
7. Wall Access, Frame and Cover: Round, nickel-bronze wall-installation frame and cover.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Install roof drains at low points of roof areas in accordance with roof membrane manufacturer's written installation instructions.

1. Install flashing collar or flange of roof drain to prevent leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
2. Install expansion joints, if indicated, in roof drain outlets.
3. Position roof drains for easy access and maintenance.

B. Install cleanouts in aboveground piping and building drain piping in accordance with the following instructions unless otherwise indicated:

1. Use cleanouts the same size as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate cleanouts at each change in direction of piping greater than 45 degrees.
3. Locate cleanouts at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate cleanouts at base of each vertical storm piping conductor.

C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

D. Install test tees in vertical conductors and near floor.

E. Install wall cleanouts in vertical conductors. Install access door in wall if indicated.

F. Install through-penetration firestop assemblies for penetrations of fire- and smoke-rated assemblies.

1. Comply with requirements in Section 078413 "Penetration Firestopping".

G. Comply with requirements for piping specified in Section 221413 "Facility Storm Drainage Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

3.2 INSTALLATION OF FLASHING

A. Fabricate flashing from single piece of metal unless large pans, sumps, or other drainage shapes are required.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

3.3 PROTECTION

A. Protect drains during the remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 22 14 23

**SECTION 22 40 00**
**PLUMBING FIXTURES**

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 the following conventional plumbing fixtures and related components:

1. Faucets for lavatories, drinking fountain and sinks.
2. Laminar-flow faucet-spout outlets.
3. Toilet seats.
4. Protective shielding guards.
5. Fixture supports.
6. Water closets.
7. Lavatories.
8. Kitchen sinks.
9. Hose bib.
10. Owner-furnished fixtures.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.

C. FRP: Fiberglass-reinforced plastic.

D. PMMA: Polymethyl methacrylate (acrylic) plastic.

E. PVC: Polyvinyl chloride plastic.

1.4 SUBMITTALS

A. Product Data: For each type of plumbing fixture indicated.

B. Operation and Maintenance Data.

PART 2 - PRODUCTS

A. Plumbing fixtures are per the plumbing fixture schedule on Design Consultant drawings and architectural specifications.

B. The target for this project is to achieve Cal green points.

C. Plumbing fixtures shall be labeled “Water Sense” and selected for ultra-low flow.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.

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-mounting 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-mounting fixtures with tubular waste piping attached to supports.

F. Install counter-mounting fixtures in and attached to casework.

G. Install fixtures level and plumb according to roughing-in drawings.

H. 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.

I. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

J. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

K. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.

L. Install toilet seats on water closets.

M. 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.

N. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.

O. 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.

P. Install traps on fixture outlets.

1. Exception: Omit trap on fixtures with integral traps.
2. Exception: Omit traps on indirect waste, unless otherwise indicated.

Q. Install disposer in outlet of each sink indicated to have disposer. Install switches were indicated or in wall adjacent to sink if location is not indicated.

R. 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.

S. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color.

3.2 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 22 40 00

**SECTION 23 00 50**
**BASIC MECHANICAL MATERIALS AND METHODS**

PART 1 - GENERAL

1.1 SUMMARY

A. Work included: Materials, equipment, fabrication, installation, starting, testing, and commissioning in conformance with applicable codes and authorities having jurisdiction for Mechanical Work covered by all sections within this Division including, but not limited to:

1. Heating, ventilating and air conditioning systems and equipment.

B. Related Sections

1. All work in every Section must also comply with such general conditions of the specifications as are applicable, including, but not limited to:
   a. Instructions to Bidders.
   b. General Conditions.
   c. Special Conditions.
   d. Supplementary Conditions.
   e. Division 1 – General Requirements Sections as specified hereinafter.

1.2 REFERENCE STANDARDS

A. Reference to codes, standards, specifications and recommendations of technical societies, trade organizations and governmental agencies shall mean that latest edition of such publications adopted and published prior to submittal of the bid. Such codes or standards shall be considered a part of this Specification as though fully repeated herein.

B. Work shall be performed in accordance with all applicable requirements of the latest edition of all governing codes, rules and regulations including but not limited to the following minimum standards, whether statutory or not.

C. Requirements of Regulatory Agencies.

1. In accordance with the requirements of Division 1 – General Requirements.
2. Nothing in contract documents shall be construed to permit work not conforming to current and applicable laws, ordinances, rules, and regulations.
3. When contract documents exceed requirements of applicable laws, ordinances, rules, and regulations, comply with documents establishing the more stringent requirement.
4. It is not the intent of contract documents to repeat requirements of codes except where necessary for completeness or clarity.

5. Seismic construction and restraints: In accordance with requirements of Title 17 of California Administrative Code.
6. Comply with the Safety Orders issued by California Occupational Safety and Health Act, COSHA and any other safety, health or environmental regulations of the State of California and any districts having jurisdictional authority. Where an omission or conflict appears between COSHA requirements and the Drawings and Specifications, COSHA requirements shall take precedence.
7. Applicable codes as listed below, in addition to others specified in individual sections.
    a. CEC – California Electrical Code
    b. CBC – California Building Code
    c. CMC – California Mechanical Code
    d. CPC – California Plumbing Code
    e. City and County Codes and Amendments
    f. California Code of Regulations, including Titles 8, 17, 19, 20, 21, 22 and the California Building Standards Code Part 2, Basic Building Regulations.

D. Published specifications, standards, tests or recommended method of trade, industry or governmental organizations as listed below apply to all work in Division 23 – Mechanical, in addition to other standards which may be specified in individual sections.

E. All base material shall meet ASTM and ANSI standards.

F. All Gas Fired Devices: Comply with standards and bear label of AGA.

G. All Pressure Vessels, Relief Valves, Safety Relief Valves and Safety Valves: Comply with standards, ASME stamped.

H. All Electrical Devices and Wiring

1. Conform to standards of CEC/NEC
2. All devices UL or ETL listed and identified.

I. Guidelines and Standards: The latest edition of guidelines and standards published by the following groups will govern the Mechanical Systems and associated support system design. The systems shall be designed to meet or exceed these guidelines and standards.

1. AABC – Associated Air Balance Council
2. ADC – Air Diffuser Balance Council
3. AFBMA – Anti-Friction Bearing Manufacturer's Association
4. AGA – American Gas Association
5. AMCA – Air Movement and Control Association, Inc.
6. ANSI – American National Standards Institute

7. ARI – Air Conditioning and Refrigeration Institute
8. ASC – Adhesive and Sealant Council
9. ASHRAE – American Society of Heating, Refrigeration and Air Conditioning Engineers
10. ASME – American Society of Mechanical Engineers
11. ASSE – American Society of Sanitary Engineering
12. ASTM – American Society for Testing and Materials
13. AWWA – American Water Works Association
14. AWS – American Welding Society
15. COSHA – California Occupational Safety and Health Act
16. ETL – Intertek Semko (Formerly Electrical Testing Laboratories)
17. General Industry Safety Orders
18. Hydraulic Institute
19. ICBO – International Conference of Building Officials
20. IEEE – Institute of Electrical and Electronics Engineers
21. NBS – National Bureau of Standards
22. NEBB – National Environmental Balancing Bureau
23. NEC – National Electrical Code
24. NEMA – National Electrical Manufacturer's Association
25. NFPA – National Fire Protection Association
26. OSHPD – Office of Statewide Health Planning and Development
27. PDI – Plumbing and Drainage Institute
28. SFA – California State and Local Fire Marshall
29. SMACNA – Sheet Metal and Air Conditioning Contractors National Association, Inc.
30. UL – Underwriters' Laboratories, Inc.

J. Insurance requirements

1. Provide entire fire protection system, including equipment, materials and services listed in accordance with the States's Insurance Underwriters' requirements.
   a. Specifications and drawings
   b. Requirements of local authority having jurisdiction
2. Obtain approval for fire protection system prior to the start of installation
   a. Approval means submittal to and acceptance by
      1) State's insurance underwriter
      2) Local authority having jurisdiction
   b. Provide verification of this approval to the State’s Representative
3. Nothing in specifications or drawings shall be construed as permitted deviation from requirements specified above.

1.3 QUALITY ASSURANCE

A. Supply all equipment and accessories in compliance with the applicable standards listed in Paragraph 1.1C and with all applicable national, state and local codes.

B. All equipment and accessories shall be new and the product of a manufacturer regularly engaged in its manufacture.

C. All items of a given type shall be the products of same manufacturer.

D. All work in Division 23 – Mechanical shall be commissioned per the relevant pre-functional tests, Section 23 0800 – Commissioning of HVAC.

1.4 SUBMITTALS

A. No work may begin on any segment of this Project until the related submittals have been reviewed for conformity with the design intent and the Contractor has responded to all comments to the satisfaction of the State's Representative.

B. Submit drawings, product data, samples, and certificates of compliance required as hereinafter specified. See also Division 1 – Shop Drawings, Product Data, and Samples. Conditions in this Section take precedence over conditions in the above-referenced Section.

C. Submit no later than 35 days after signing of Contract, or as otherwise indicated by State's Representative.

1. Complete schedule of submittals for equipment and layout shop drawings. Allow 15 working days for review unless the State's Representative agrees to an accelerated schedule.
2. List of all proposed substitutions: See Paragraph 1.6
3. Designate schedule dates for submission and dates when reviewed shop drawings, product data, and samples will be needed.
4. Provide submittals promptly in accordance with the schedule and in such sequence as to cause no delay in work or in the work of any other division.

D. Submission and Resubmission Procedure

1. Each submittal shall have a unique serial number that includes the associated specification section, followed by a number for each sub-part of the submittal for that specification section, such as "SUBMITTAL 23 xxxx-01"
2. Each resubmittal shall have the original unique serial number plus unique revision number, such as "SUBMITTAL 23 xxxx-01 REVISION 1"
3. Submit in format specified below. Submissions made in the wrong format will be returned without action.
    a. Product Submittals: One copy in electronic format per Paragraph 1.5A.4.c.
    b. Shop Drawings:
        1) One copy in electronic format .dwg, .dwf, .pdf, or .tif

2) Two and only two copies on paper; any additional copies will be returned without review.

c. Samples: As indicated in each specification section

4. State's Representative will return a memo or mark-up of submittal with comments and corrections noted where required.
5. Make corrections
   a. Revise the initial submittal to resolve review comments and corrections.
   b. Indicate any changes that have been made other than those requested.
   c. Clearly identify resubmittal by original submittal number and revision number
6. Resubmit revised submittals until no exceptions are taken.
7. Once submittals are accepted and stamped with no exceptions taken, Contractor shall make photocopies for coordination with other trades, as required by the General Contractor. Photocopies will serve as submittal for record and coordination.

E. Product Data Submittals

1. Contents
   a. Manufacturer's name and model number
   b. All information required to describe materials and equipment completely and to indicate compliance with drawings and specifications, including, but not limited to:
      1) Schedule when more than one of each item is covered by the submittal.
      2) Physical data, as applicable
         a) Dimensions
         b) Weight
         c) Finishes and colors
         d) Dimensional shop drawings
      3) Performance data, as applicable
         a) Rated capacities
         b) Performance curve
         c) Operating temperature and pressure
      4) Flow and wiring diagrams as applicable
      5) Description of system operation
   c. All other pertinent information requested in individual sections
2. Format
   a. See Division 1 – Shop Drawings, Product Data, and Samples
   b. Identify clearly if submittal is substitution: Refer to Paragraph 1.6
   c. Reference specification Division, Section, Title, Paragraph, and Page number or drawing number as applicable.
   d. Use the same nomenclature, legend, symbols, and abbreviations on submittal material as used in contract documents.

F. Layout Shop Drawings. Not required.

G. Layout Shop Drawings

1. Drawings shall be developed in a format compatible with AutoCAD version 2005 or later.
2. Shop fabrication, coordination, and installation drawings by the Contractor are for the Contractor's use and shall be the Contractor's responsibility. These Drawings indicate where the Contractor intends to install the material and equipment as required by the Contract Documents. Do not submit shop fabrication documents unless requested. The use of contract documents or electronic files of contract documents for shop drawings is not sufficient.
3. Prepare and submit Shop Drawings for all Work deviating from that indicated on Contract Drawings. Clearly indicate deviations.
4. Review is not intended to verify dimensions or quantities, or to coordinate items shown on these Drawings. The review is for general conformance with the design concept of the Project and general compliance with the information given in the Contract Documents. Contractor is responsible for dimensions, which shall be confirmed and correlated at the Jobsite, for fabrication processes and techniques, or construction, for coordination of Work with that of all other trades, and the satisfactory performance of Work.
5. Prepare and submit layout drawings, sections, and details for the following areas, minimum 1/4 inch scale:
    a. Mechanical rooms
6. Prepare layout shop drawings for all areas; minimum 3/8 inch scale.
7. Layout drawings, as a requirement of Division 23 Mechanical, shall indicate, superimposed, the Work of all Sections involved in the congested area, including ductwork, piping, electrical work, ceiling work, etc. Include all mechanical rooms. Identification of space problems without solutions is not acceptable.
8. Individual coordinated trade layout drawings are to be prepared for all deviations from design documents.
9. Contractor is to assure that each trade has coordinated work with other trades, prior to submittal where submittal is required.
    a. Include stamp on each submittal indicating that layout shop drawing has been coordinated:
    b. No layout shop drawing will be reviewed without a stamped and signed coordinated assurance by the Contractor.
10. All changes shall be clearly marked on each submitted layout drawing.
11. Drawings shall show work of all trades, including but not limited to:
    a. Ductwork
    b. Piping: All Trades
    c. Mechanical Equipment

1) For fire and smoke dampers, tag each damper with a unique tag, starting with the tag on the drawings, but adding a 4-digit number: xyzz where
   a) x= AC or AH unit that serves the damper
   b) y= floor
   c) zz= unique consecutive number

d. Electrical Equipment
e. Main Electrical conduits and bus ducts
f. Equipment supports and suspension devices
g. Structural and architectural constraints
h. Show location of
   1) Valves: manual and automatic
   2) Piping specialties
   3) Dampers: fire/smoke, automatic and manual volume, etc.
   4) Access doors
   5) Control and electrical panels
   6) Others as required for clear coordination.

12. Drawings shall indicate coordination with work specified in other Divisions, which must be coordinated with work specified under Division 23 Mechanical, including, but not limited to:
    a. Irrigation equipment and piping
    b. Elevator equipment
    c. Building vacuum cleaning systems
    d. Cable trays
    e. Computer equipment
    f. Others as required.
13. Submission of drawings
    a. See Division 1 – Shop Drawings, Product Data, and Samples
    b. Submit to other trades for review of space allocated to all trades
    c. Revise drawings to compensate for requirements of existing conditions and conditions created by other trades
    d. Ensure that each trade has coordinated work with other trades
    e. Submit with stamps of General and all other applicable Contractors, initialed and signed certifying
       1) Review of submittal
       2) Verification of products, field measurements, and field construction criteria
       3) Coordination of information in submittal with the requirements of the work of this Division and other divisions of the Contract Documents
    f. No layout shop drawing will be reviewed without a stamped and signed coordination assurance by the Contractor

H. Samples

1. Submit as required in each specification section

I. Tables of Submittals Required

1. Submit layout shop drawings, product data, or samples according to the following table
2. “R” in Submittal Data Column indicates submittal for State’s Representative’s review
3. “R” in the Layout Shop Drawings Column indicates the item shall be included in shop drawings for the State’s Representative’s review
4. “R2” indicates submittal for State’s Representative’s review for products and equipment differing from the specified manufacturer and model, and for “or equals” where specified
5. “M” indicates submittal shall be included in service and maintenance, and shall be included as part of the O&M Manual
6. Refer to individual Sections within Division 23 – Mechanical for additional submittal requirements.

| ITEM | | LAYOUT SHOP DRAWINGS | SUBMITTAL REQUIRED | |
|---|---|---|---|---|
| | | | DATA | SAMPLES |
| 230513 | MOTORS AND CONTROLLERS | | | |
| | MOTORS | | R2, M | |
| | BELTS AND DRIVES | | R2, M | |
| | VARIABLE SPEED DRIVES | R | R, M | |
| 230529 | HANGERS AND SUPPORTS | | | |
| | PIPE HANGERS AND SUPPORTS | | R2 | |
| | STRUCTURAL ATTACHMENTS | | R2 | |
| | PIPE PROTECTION AND THERMAL HANGER SHIELDS | | R2 | |
| | EXPANSION SHIELDS | | R2 | |
| 230548 | MECHANICAL SOUND, VIBRATION AND SEISMIC CONTROL | | | |
| | CONCRETE AND STEEL DETAILS FOR EQUIPMENT PADS. | R | | |
| | VIBRATION ISOLATION DEVICES: CATALOG CUTS, ISOLATION EFFICIENCIES AND RATED STATIC DEFLECTIONS. | | R, M | |
| | WELDS OR ANCHOR BOLT LOCATIONS. | R | | |

| ITEM | | LAYOUT SHOP DRAWINGS | SUBMITTAL REQUIRED | |
|---|---|---|---|---|
| | | | DATA | SAMPLES |
| | REINFORCING AND TEMPLATE STEELS. | R | | |
| | NUMBER AND LOCATION OF SEISMIC RESTRAINTS FOR EACH EQUIPMENT; SPECIFIC DETAILS OF RESTRAINTS INCLUDING ANCHOR BOLTS FOR MOUNTINGS AND MAXIMUM LOAD AT EACH LOCATION. | | R | |
| | SPRING O. D., FREE, OPERATING AND SOLID HEIGHTS OF SPRINGS AND RATIO OF HORIZONTAL TO VERTICAL STIFFNESS. | | R | |
| | NUMBER AND LOCATION OF VIBRATION ISOLATORS FOR EACH EQUIPMENT INCLUDING ACTUAL OPERATING LOAD FOR EACH VIBRATION ISOLATOR. | R | R | |
| | SEISMIC CALCULATIONS FOR EACH SEISMIC RESTRAINT SIZED AND SIGNED BY REGISTERED STRUCTURAL OR CIVIL ENGINEER. | | R | |
| | EQUIPMENT BASES AND PADS | R | R | |
| | ANCHOR, INSERT AND FASTENER BOLT FASTENING DETAILS | R | | |
| | ANCHORS, INSERTS AND FASTENERS | | R2 | |
| | SEISMIC RESTRAINTS | | R2 | |
| | SEISMIC BRACING AND RESTRAINT MOUNTING DETAILS | | R | |
| | FLEXIBLE DUCT CONNECTORS | R | R2 | |
| 230553 | MECHANICAL IDENTIFICATION | | | |
| | PIPING IDENTIFICATION CHARTS | | R | |
| | VALVE TAGS | | R | |
| | PIPE MARKERS | | R2 | |
| | EQUIPMENT TAGS | | R2 | |

| ITEM | | LAYOUT SHOP DRAWINGS | SUBMITTAL REQUIRED | |
|---|---|---|---|---|
| | | | DATA | SAMPLES |
| 230700 | MECHANICAL INSULATION | | | |
| | EQUIPMENT INSULATION | | R | |
| | PIPING INSULATION | | R | |
| | JACKETS | | R | |
| | DUCT INSULATION, WRAP AND LINER | | R | |
| | ADHESIVES AND COATINGS | | R2 | |
| | MECHANICAL FASTENERS | | R2 | |
| 233112 | DUCTS | | | |
| | DUCTWORK, GALVANIZED, ROUND AND RECTANGULAR | R | R2 | |
| | FLEXIBLE DUCTS | | R2 | |
| | DUCT SEALANTS | | R2 | |
| | FITTINGS | | R2 | |
| | DUCT PRESSURE TESTING REPORTS | | R, M | |
| 233300 | DUCT ACCESSORIES | | | |
| | ACCESS DOORS | R | R2 | |
| | MULTIBLADE VOLUME DAMPERS | R | R2 | |
| | BACKDRAFT DAMPERS | R | R2 | |
| | FIRE DAMPERS | R | R, M | |
| | SMOKE AND COMBINATION DAMPERS | R | R, M | |
| | CONTROL DAMPERS | R | R | |
| 233415 | FANS | | | |
| | FANS | R | R, M | |
| | FAN ACCESSORIES | | R, M | |
| 238219 | FAN COIL UNITS | | | |
| 233713 | AIR OUTLETS AND INLETS | R | R, M | |
| 234100 | AIR CLEANING DEVICES | | | |
| | FILTERS | R | R2, M | |

| ITEM | | LAYOUT SHOP DRAWINGS | SUBMITTAL REQUIRED | |
|---|---|---|---|---|
| | | | DATA | SAMPLES |
| | FILTER GAUGES | R | R2, M | |
| 230593 | TESTING, ADJUSTING AND BALANCING | | | |
| | AIR BALANCING REPORT | | R, M | R |
| 230800 | HVAC COMMISSIONING | | | |
| | PRE-FUNCTIONAL TEST REPORTS | | R, M | R |
| | FUNCTIONAL TEST REPORTS | | R, M | R |
| | FINAL COMMISSIONING REPORT | | R, M | |
| | TRAINING MATERIALS | | R, M | |

1.5 COMPLETION REQUIREMENTS

A. Procedure

1. Until the documents required in this section are submitted and approved, the system will not be considered “accepted.”
2. Before requesting acceptance of work, submit one set of Completion Documents for review and approval of State’s Representative
3. After review, furnish quantity of sets indicated below to State’s Format..
4. Format
   a. See Paragraph 1.5H for required format of Completion Documents
   b. Paper copies; assemble in chronological order following alpha-numeric system used in specification, in heavy three-ring binder
   c. Where electronic copies are called for in Paragraph 1.5H, comply with the following:
      1) Provide in word-searchable electronic format; acceptable formats are MS Word, Adobe Acrobat (pdf) and HTML; submit other formats for review and approval prior to submission; scanned paper documents not acceptable
      2) For submittals, provide separate file for each type of equipment
      3) For Test & Balance report, provide separate files for each air handling system
      4) Record drawings shall be in original format per paragraph 1.4G.1

B. Operating and Maintenance (O&M) Manual

1. In accordance with requirements of Division 1 – Operating and Maintenance and as follows.
2. O&M Manual shall include but is not limited to the following:

a. Complete Product Data Submittals per Paragraph 1.4E so that the details of the device are known.
b. Manufacturer's name, model number, service manual, spare-parts list and descriptive literature for all components
c. Operating instructions
d. Maintenance and repair requirements
e. Wiring diagrams
f. Requirements for special tools, test kits and calibration instructions
g. Replacement parts list
h. Valve tag directory
i. Name, address and phone number of contractor's equipment suppliers and service agencies

C. Record Drawings

1. Keep up to date during progress of job one set of Mechanical Drawings indicating the Record installation. In addition to changes made during course of Work, show following by dimension from readily obtained base lines.
   a. Fully illustrate all revisions made by all crafts in course of work.
   b. Include all field changes, adjustments, variances, substitutions and deletions, including all Change Orders
   c. Exact location, type and function of concealed valves, dampers, controllers, piping, air vents and piping drains
   d. Exact size, invert elevations and location of underground and under floor piping and ducts
2. Progress drawing set shall be available for inspection by State's Representative weekly
3. Update engineering design drawings and shop drawings to reflect revisions and additional data listed above at completion of Project
   a. Original engineering design drawings will be provided to Contactor in electronic format compatible with AutoCAD version 2005 or later
   b. Both shop and engineering design drawings shall be in format compatible with AutoCAD version 2005 or later
   c. Drawings required to be updated if revisions were made
      1) Floor plans
      2) Shop drawings required by Paragraph 1.4F
      3) Sections
      4) Riser diagrams

D. Test and Balance Reports

1. See Section 23 0593 – Testing, Adjusting and Balancing

E. Commissioning Reports

1. See Section 23 0800 – Commissioning of HVAC

F. Training Materials

1. See Section 23 0800 – Commissioning of HVAC

G. Miscellaneous Certificates

1. Pressure and Leakage Test documentation/certificates
2. Training/Instruction completion certificates
3. Fire Marshal and Fire Department approvals of system, as required
4. Final inspection certificate signed by governing authorities
5. Warranty period, including start and end period
6. Field test report, including as applicable
   a. Start up documents with date and name of technician
   b. Piping pressure tests
   c. Flex coupled pump alignment verification
   d. Duct leakage and pressure tests
   e. Drain pan drainage tests
   f. Letters from manufacturers certifying their supervision of equipment installation and start-up procedures
   g. Machinery vibration test reports
   h. Certificates of sterilization/chlorination of plumbing systems
   i. Others as specified herein and in other Division 23 – Mechanical sections

H. Format of Completion Documents

1. Provide the type and quantity of media listed in table below:

| | Document | Paper (binder or bound) | Electronic | |
|---|---|---|---|---|
| | | | Read only optical disk | Loaded onto Operator Workstation |
| 1. | O&M Manuals | 3 | 1 | 1 |
| 2. | Record Drawings | 2 Full size<br>2 Half size | 1 | 1 |
| 3. | Test and Balance Report | 5 | 1 | – |
| 4. | Commissioning Reports | 5 | 1 | – |
| 5. | Miscellaneous Certificates | 1 | 1 | – |
| 6. | Warranty documents | 1 | 1 | – |
| 7. | Training materials | 1 per trainee | 1 | 1 |

1.6 SUBSTITUTIONS AND PRODUCT OPTIONS

A. Contractor's Options.

1. For products specified only by reference standard, select product meeting that standard, by any manufacturer.
2. For products specified by naming one product or manufacturer, submit request for substitutions for any product or manufacturer which is not specifically named in accordance with substitutions clause.
3. Wherever catalog numbers and specific brands or trade names are used, they are used to establish standards of quality, utility and appearance required.

1.7 DESCRIPTION OF BID DOCUMENTS

A. Specifications

1. Specifications, in general, describe the quality and character of materials and equipment.
2. Specifications are of simplified form and include incomplete sentences.
3. Words or phrases such as "The Contractor shall," "shall be," "furnish," "provide," "a," "an," "the," and "all" have often been omitted for brevity.

B. Drawings

1. Drawings in general are diagrammatic. Intention is to show size, capacity, approximate location, direction, and general relationship of one work phase to another, but not exact detail or arrangement.
2. Scaled and figured dimensions are approximate and are for estimating purposes only. Indicated dimensions are limiting dimensions where noted. Duct and piping elevations are indicated for initial coordination; final requirements shall be determined by the Contractor after final coordination with other trades.
3. Before proceeding with work check and verify all dimensions in the field.
4. Assume all responsibility for fitting materials and equipment to other parts of equipment and structure.
5. Make adjustments that may be necessary or requested in order to resolve space problems, preserve headroom and avoid architectural openings, structural members and work of other trades.
6. For exact locations of building elements, refer to dimensional Architectural and Structural drawings.

C. Do not use equipment exceeding dimensions indicated on drawings or equipment or arrangements that reduce required clearances or exceed specified maximum dimensions.

D. If any part of Specifications or Drawings appears unclear or contradictory, apply to State’s Representative for an interpretation and decision as early as possible.

1. Do not proceed with work without the decision of the State's Representative.

1.8 ALTERNATES

A. Refer to Division 1 – Alternates for possible effect on this Section

1.9 DEFINITIONS

A. Definitions of term used in Division 23 – Mechanical may differ from those given in general and supplementary conditions and take precedence over them.

B. "Provide": to furnish, supply, install and connect up complete and ready safe and regular operation of particular work referred to unless specifically noted.

C. "Supply": to purchase, procure, acquire, and deliver complete with related accessories.

D. "Work": labor, materials, equipment, apparatus, controls, accessories, and other items required for proper and complete installation.

E. "Piping": pipe, tube, fittings, flanges, valves, controls, strainers, hangers, supports, unions, traps, drains, insulation, and related items.

F. "Wiring": raceway, fittings, wire, boxes, and related items.

G. "Concealed": embedded in masonry or other construction, installed in furred spaces, within double partitions, above hung ceilings, in trenches, in crawl spaces, or in enclosures.

H. "Exposed": not installed underground or "concealed" as defined above.

I. "Indicated," "shown" or "noted": as indicated, shown or noted on drawings or specifications.

J. "Reviewed," "approved," or "directed": as reviewed, approved, or directed by or to State's Representative.

K. "Motor Controllers": starters, variable speed drives, and other devices controlling the operation of motors.

L. "Control or Actuating Devices": automatic sensing and switching devices such as thermostats, pressure, float, electro-pneumatic switches and electrodes controlling operation of equipment.

1.10 PROJECT CONDITIONS

A. Examine site related work and surfaces before starting work of any Section

1. In case of conflict, the most stringent takes precedence
2. For purposes of clarity and legibility, Drawings are essentially diagrammatic to extent that many offsets, bends, unions, special fittings, exact locations of items are not indicated, unless specifically dimensioned. Especially note a number of required duct and pipe offsets to coordinate with structure and not shown. Coordinate dimensioned conditions, including invert elevations, with other trades prior to installation by any trade.
3. Exact routing of piping, ductwork, etc. shall be governed by structural conditions, obstructions. Not all offsets in ductwork or piping are shown on the Mechanical Drawings. Determine which item to offset or relocate. Maintain required slope in piping. Make use of data in Contract Documents. In addition, the State's Representative reserves right, at no additional cost to the State, to make any reasonable change in location of mechanical items, exposed at ceiling or on walls, to group them into orderly relationships or increase their utility. Verify State's Representative's requirements in this regard prior to rough-in.
4. Take dimensions, location of doors, partitions, similar physical features from Architectural Drawings. Verify at Site under this Division. Consult Architectural Drawings for exact location of outlets to center with Architectural features, panels, etc., at the approximate location shown on mechanical Drawings.
5. Mounting heights of brackets, outlets, etc., as required
6. Report to State's Representative, in writing, conditions which will prevent proper provision of this work.
7. Beginning work of any Section without reporting unsuitable conditions to State's Representative constitutes acceptance of conditions by Contractor.
8. Perform any required removal, repair or replacement of this work caused by unsuitable conditions at no additional cost to the State.

B. Coordination

1. Work out all "tight" conditions involving Work specified under this Division and Work in other Divisions in advance of installation. If necessary, and before Work proceeds in these areas, prepare supplementary Drawings under this Division for review showing all Work in congested area. Provide supplementary Drawings, additional Work necessary to overcome congested conditions, at no additional cost to the State.
2. Conflicts: Difference or disputes concerning coordination, interference or extent of Work between sections shall be decided as follows:

    a. Install mechanical and electrical systems in the following order of preference (those trades listed below another must reroute to resolve the conflict):
        1) Drain piping required by code to be sloped
        2) Supply air and exhaust air ductwork connected to fans
        3) Electrical conduit 4 inches and larger

4) Hydronic piping connected to pumps
5) Domestic water piping
6) Fire sprinkler piping
7) Electrical conduit smaller than 4 inches
8) Sprinkler piping
9) Transfer ducts and other ductwork not connected to fans
10) Control system piping and wiring

b. Continued disputes shall be decided by Contractor and Contractor's decision, if consistent with Contract Document requirements, shall be final.

3. Supervision: Personally, or through an authorized and competent representative, constantly supervise the work from beginning to completion and, within reason, keep the same foreman and workmen on the Project throughout the Project duration.
4. Provide templates, information, and instructions to other Divisions to properly locate holes and openings to be cut or provided.
5. The drawings govern matters of quantity, and the specifications govern in matters of quality. In the event of conflict within the drawings involving quantities, or within the specifications involving quantities, or within the specifications involving quality, the greater quantity and higher quality shall apply. Such discrepancies shall be noted and clarified in the Bid. No additional allowances will be made because of errors, ambiguities, or omissions that reasonably should have been discovered during the preparation of the Bid.

C. Equipment Rough-In

1. Rough-in locations shown on Mechanical Drawings for equipment furnished by the State and for equipment furnished under other Divisions are approximate only. Obtain exact rough-in locations from the following sources.

   a. From Shop Drawings for equipment provided under this contract
   b. From State's Representative for State furnished, Contractor installed equipment.
   c. From existing equipment where such equipment is relocated under this Contract

2. Verify mechanical characteristics of equipment before starting rough-in. Where conflict exists between equipment and rough-in shown on Drawings obtain clarification from State's Representative and provide as directed by the State's Representative at no additional cost to the State.
3. Make final connections.

1.11 CLEARANCE FROM ELECTRICAL EQUIPMENT

A. Piping or ductwork

1. Prohibited, except as noted, in
   a. Electric rooms and closets over equipment, as restricted by CEC
   b. Telephone rooms and closets
   c. Elevator machine rooms
   d. Electric switchboard room
2. Prohibited, except as noted, over or within 5 feet of
   a. Transformers
   b. Substations
   c. Switchboards
   d. Motor control centers
   e. Standby power plant
   f. Bus ducts
   g. Electrical panels

1.12 PRODUCT DELIVERY, HANDLING AND STORAGE

A. See Division 1 Product Requirements

B. Deliver equipment in its original package to prevent damage or entrance of foreign matter. Provide materials on factory provided shipping skids and lifting lugs if required for handling. Provide protective coverings during construction.

C. Handle and ship in accordance with manufacturer's recommendations

D. Identify materials and equipment delivered to Site to permit check against approved materials list, reviewed with no exceptions taken Shop Drawings

E. Protect from loss or damage. Replace lost or damaged materials and equipment with new at no additional cost to the State.

F. Where necessary, ship in crated sections of size to permit passing through available space.

1.13 PROJECT MANAGEMENT AND COORDINATION SERVICES

A. See Division 1 – Project Coordination

B. Overview: Provide a project manager/engineer for the duration of the Project to coordinate the Division 23 – Mechanical work with all other trades. Coordination services, procedures and documentation responsibility shall include, but shall not be limited to the items listed in this section.

C. Review of shop drawings prepared by other subcontractors.

1. Obtain copies of all shop drawings for equipment provided by others that require electrical service connections or interface with Division 23 – Mechanical work.
2. Perform a thorough review of the shop drawings to confirm compliance with the service requirements contained in the Division 23 – Mechanical contract documents. Document any discrepancy or deviation as follows:
   a. Prepare memo summarizing the discrepancy.
   b. Provide a copy of the specific shop drawing, indicating via cloud, the discrepancy.
3. Prepare and maintain a shop drawing review log indicating the following information.
   a. Shop drawing number and brief description of the system/material
   b. Date of your review
   c. Indication if follow-up coordination is required.

D. Request for information (RFI)

1. See Division 1 Request for Information

1.14 REVIEW OF CONSTRUCTION

A. Work may be reviewed at any time by the State's Representative

B. Advise State's Representative that work is ready for review at following times:

1. Prior to backfilling buried work.
2. Prior to concealment of work in walls and above ceilings.
3. When all requirements of Contract have been complete.

C. Neither backfill nor conceal work without State's Representative's consent.

D. Maintain on job set of Specifications and Drawings for use by State's Representative's.

1. Include all change orders.

E. Contractor is responsible for construction methods, sequences, and safety precautions.

1.15 SCHEDULE OF WORK

A. In accordance with Division 1 – Contract Schedules and as follows:

1. Arrange work to conform to schedule of construction established or required to comply with Contract Documents
2. In scheduling, anticipate means of installing equipment through available openings in structure.

B. Confirm in writing to State's Representative, within 35-days of signing of contract, anticipated number of days required to perform test, balance, acceptance testing and commissioning of mechanical systems. Schedule test, balance and acceptance testing of mechanical systems as follows:

1. Submit for review at this time, names and qualifications of test and balancing agencies to be used.
2. Test & Balance and commissioning must occur after completion of mechanical systems, including all control calibration and adjustment, and requires substantial completion of the building, including closure, ceilings, lighting, partitioning, etc.
3. Allow 21-days after test and balance for system commissioning and life safety testing (where applicable)
4. Complete and test all systems early enough to enable completion of commissioning prior to State's move-in.
5. Provide post construction purge direction immediately before occupancy.

1.16 CUTTING AND PATCHING

A. See Division 1 – Cutting, Patching and Matching

1.17 UTILITY CONNECTIONS

A. See Paragraph 1.1C.1

B. Connection to utility company mains

C. Connection to on-site piping mains

D. Payment of service charges

E. Provisions for temporary utilities

F. (Others as required)

1.18 WARRANTY

A. In accordance with Division 1 – Guarantees, Warranties, Bonds, Service & Maintenance Contracts and as follows.

B. Warranty all materials, equipment, apparatus and workmanship to be free of defective materials and faulty workmanship for period of one year from date of filing of Notice of Completion or upon beneficial use, at the direction of the State's Representative, see Paragraph 3.5A.1

C. Provide new materials, equipment, apparatus, and labor to replace that determined by State's Representative to be defective or faulty.

D. This guarantee also applies to services including instructions, adjusting, testing, noise, balancing, etc.

E. Furnish Manufacturers' standard Warranties in excess of one year.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Alternate manufacturers as identified in each section will be considered under conditions specified in Paragraph 1.6 of this section.

B. Identify materials, equipment by manufacturer's name, nameplate data. Remove unidentified materials and equipment from Site.

C. Equipment specified by manufacturer's number shall include all accessories, controls, etc., listed in catalog as standard with equipment. Furnish optional or additional accessories as specified.

D. Where no specific make of material or equipment is mentioned, any first class product of a reputable manufacturer may be used, provided it conforms to requirements of system and meets with acceptance.

E. Provide an authorized representative to constantly supervise work of this Division, check all materials prior to installation for conformance with Drawings, Specifications, reviewed Submittals and reviewed Shop Drawings.

F. Conform to conditions shown and specified. Coordinate with other trades for best possible assembly of combined Work. Relocate equipment when necessitated by failures to coordinate Work or to advise State’s Representative of conflicts in writing.

G. Material and Equipment-General Requirements

1. New.
2. Approved for use by State Fire Marshal and local building inspection department when applicable.
3. Testing agency labeled or with other identification wherever standards have been established.
4. State’s Representative reserves right to reject items not in accordance with Specification either before or after installation.
5. Comprised to render complete and operable systems; provide additional items needed to complete installation to realized design.
6. Compatible with space allocated; modifications necessary to adjust items to space limitations at Contractor's expense.
7. Installed fully operating and without objectionable noise or vibration.
8. Design of mechanical systems is generally based on product of the first named manufacturers cited. Where systems for product installed

necessitate modification of systems shown on drawings, Contractor is responsible for installation of systems appropriate to product installed.

H. Electrical Requirements.

1. Electrical Work performed under Division 23 – Mechanical shall conform to requirements of Division 26 Electrical
2. Provide weatherproof devices and installation for out-of-doors work.

PART 3 – EXECUTION

3.1 INSPECTION

A. Verify that conditions are satisfactory for the installation of materials and equipment. Notify State's Representative if conditions are not satisfactory and do not commence work until conditions have been corrected.

3.2 INSTALLATION

A. Install materials and equipment in compliance with governing codes.

B. Use printed descriptions, specifications, and recommendations of manufacturers as a guide for installation of Work. Follow in all cases where manufacturers of articles used furnish directions covering points not specified or shown.

C. Equipment

1. See Division 1 – Supporting from Building Structure.
2. Assemble equipment which is required to be field assembled under the direct supervision of the manufacturers' agent.
3. Prior to the final acceptance submit letters from the manufacturers that equipment has been assembled under the direct supervision of the manufacturers' agent.
4. Accurately set and level equipment with supports neatly placed and properly fastened.
5. Properly fasten equipment in place with bolts to prevent movement in earthquake.
6. Coordinate the installation of equipment with openings in structure.
7. Coordinate and fully dimension steel supports for mechanical equipment where shown on drawings with installing contractor.
8. Provide all roof curbs for roof mounted fans, flues, piping and duct penetrations, etc.

D. Electrical

1. See Division 26 Electrical.
2. Install electrical devices with code required clearances and access.

3. Assist the electrical contractor in the proper connecting of all electrical wiring and equipment required for mechanical equipment.

E. Sleeves, Chases and Concrete Inserts.

1. Provide all required sleeves, chases, concrete inserts, anchor bolts, etc.
2. Sleeves and chases are prohibited in structural members, except where shown or as directed by State's Representative in writing.
3. Embed no piping in concrete or masonry.

F. Waterproof Construction

1. Comply with Division 7 – Thermal and Moisture Protection
2. Include membrane clamps, sheet metal flashing, counter flashing, caulking and sealant as required for waterproofing of mechanical penetrations and sealing penetrations in or through fire walls, floors, ceiling slabs and foundation walls.
3. All penetrations through vapor barriers at slabs on grade shall be taped and made vapor tight.
4. Provide galvanized sheet metal weather protection canopies, hoods or enclosures over all out-of-doors equipment, the operation or maintenance of which would be impaired by rainwater; this requirement applies to damper operators and bearing, damper motors, controls, and instruments; see other Sections in this Division for application of this requirement to motors, drive, ducts and fans.

G. Restoration of Damage

1. Repair or replace, as directed by State's Representative, materials and parts of premises which become damaged.
2. Remove replaced parts from premises at no additional cost to the State.

H. Review architectural drawings and coordinate with Architect and other contractors to be sure that all architectural shafts, plenums, rated duct enclosures etc. required for mechanical systems are properly located and dimensioned.

I. Access Panels and Doors

1. Product specified under Structural and Architectural disciplines specifications.:
   a. Coordinate size requirements and exact location with Contractor who will provide and install access doors.
   b. Minimum Sizes: 18 inches by 18 inches unless otherwise shown on Drawings or approved by State's Representative.

2. Provide where shown, or required by Regulatory Agencies, for access of all concealed equipment such as terminal units, valves, fire/smoke dampers, etc., for Mechanical Work:
    a. Equipment shall be located wherever practical over accessible ceilings or rooms to avoid access doors.
    b. Access doors shall not be used solely for access to balancing dampers; use instead remote-control devices specified under Section 23 3300 – Duct Accessories.

J. Openings

1. Coordinate and fully dimension all openings in walls, floors, roofs and structural elements required for mechanical work.
2. Provide all required fire-stopping around pipe, duct and other penetrations required for mechanical work in rated partitions where required by code.
3. Fire damper openings: Contractor shall provide damper UL installation requirements to contractor installing partitions to ensure construction complies with listing.
4. Air outlet openings:
    a. Contractor shall coordinate exact locations of air outlets in floors, walls and ceilings with contractor installing partition.
    b. Contractor shall coordinate additional T-bar or spline required to accept air outlets with contractor providing and installing ceiling and associated materials.

## 3.3 PROTECTION OF MATERIALS

A. See Division 1 – Product Requirements.

B. Completely cover motors and other moving machinery to protect from dirt and water during construction.

C. Cap all openings in pipe and ductwork daily to protect against entry by foreign matter.

D. Material, equipment, or apparatus damaged because of improper storage or protection will be rejected.

1. Remove from site and provide new, duplicate, material, equipment, or apparatus in replacement of that rejected.
2. Any porous materials, such as duct liner or flexible ductwork that becomes wet; for example, due to rain shall be replaced; drying is not sufficient (due to possible microbial contamination).

E. Perform Work in manner precluding unnecessary fire hazard.

## 3.4 ADJUSTMENT

A. Preliminary Operation:

1. Operate any portion of installation for State's convenience if so requested by State's Representative. Such an operation does not constitute acceptance of Work as complete but does constitute beneficial use, see Paragraph 1.18B. Cost of utilities, such as gas and electrical power, will be borne by the State if operation is requested by State's Representative.

B. Startup Service

1. Prior to startup, ensure that systems are ready, including checking the following: Proper equipment rotation, proper wiring, auxiliary connections, lubrications, venting fan balance, controls and installed and properly set relief and safety valves. See pre-function tests in Division 23 – Mechanical.
2. Start and operate all systems.
3. Provide services of factory trained technicians for startup of major equipment and systems including boilers, fire pumps, etc.
4. Adjusting: See Section 23 0593 – Testing, Adjusting and Balancing
5. Life Safety Testing
    c. Assist Division 26 Electrical contractor in testing fire alarm controls, including control of smoke dampers and shut-off of fan systems.
    d. Correct any problems related to equipment supplied under Division 23 – Mechanical.
    e. Complete the control matrix with details such as fan tags, FSD tags, etc. based on control matrix provided with Life Safety Report.
    f. Assist Life Safety System commissioning agent in testing and commissioning Life Safety System.
    g. Provide all tests, air balance and start-up personnel required to start and commissioning the system and for assisting the design/construct team in demonstrating system compliance with the local fire district and building department.

C. Noise

1. Cooperate in reducing any objectionable noise or vibration caused by mechanical systems to the extent of adjustments to specified and installed equipment and appurtenances.
2. Completely correct noise problems caused by failure to make installation in accordance with Contract Documents, including labor and materials required as a result of such failure, at no additional cost to the State.

## 3.5 SPECIAL TOOLS

A. Furnish to State at completion of work.

1. One set of any special tools required to operate, adjust, dismantle, or repair equipment furnished under any section of this Division.
2. Pressure gauge and temperature sensor for piping test plug.

3.6 CLEANING

A. Cleaning

1. See Division 1 – Closeout Procedures, Final Cleaning and Extra Material.

B. Thoroughly clean equipment, fans, pumps, motors, piping and other materials under this Division free from all rust, scale and all other dirt before any covering or painting is done, or the systems put in operation; leave in condition satisfactory to State's Representative.

C. At all times keep the premises free from accumulation of waste material and debris caused by his employees. At the completion of the Project, and at other times as State's Representative may direct, remove refuse from within and around the building. All tools, scaffolding and surplus materials shall also be removed, leaving the Site of his Work clean.

D. Completely cover all plumbing fixtures and all motors and other moving machinery to prevent entry of dirt and water during construction.

E. Effectively cap all openings into ducts and pipes to keep moisture and foreign matter out during construction.

3.7 PAINTING

A. Cleaning

1. See Division 1 – Closeout Procedures, Final Cleaning and Extra Material.

B. Painting

1. Piping exposed to outdoors
   a. One coat primer.
   b. Two coat alkyd oil paint, UV resistant for PVC piping, color as indicated.
   c. Not required for copper, galvanized steel, or insulated piping.
2. Steel hangers and supports exposed to outdoors.
   a. One coat primer.
   b. Not required for galvanized steel.
3. Interior of ductwork and duct accessories, including insulation stick pins, at air outlets as far back as visible from occupied spaces.
   a. Flat black.
4. Marred surfaces of factory painted equipment.
   a. Spot coat to match the adjacent coat.

5. Insulation exposed to sunlight: See Section 23 0700 – HVAC Insulation.

C. Execution

1. Protect flooring and equipment with drip cloths.
2. Paint and materials stored in location where directed.
3. Oily rags and waste removed from building every night.
4. Wire brush and clean off all oil, dirt and grease areas to be painted before paint if applied.
5. Workmanship.
   a. No painting or finishing shall be done with:
      1) Dust laden air.
      2) Unsuitable weather conditions.
      3) Space temperature below 60 degrees Fahrenheit.
   b. Pipes painted containing no heat and remain cold until paint is dried.
   c. Paint spread with uniform and proper film thickness showing no runs, sags, crawls, or other defects.
   d. Finished surfaces shall be uniform in sheen, color and texture.
   e. All coats thoroughly dry before succeeding coats are applied, minimum 24 hours between coats.
   f. Priming undercoat of slightly different color for inspection purposes.
6. Piping continuously painted in all exposed areas.

D. Paint

1. High gloss medium or long alkyd paint.
2. Best grade for its purpose.
3. Deliver in original sealed containers.
4. Apply in accordance with manufacturer’s instructions.

E. Colors

1. Colors as directed by State’s Representative unless specified herein.
2. Condenser water piping: pale green.
3. Interior of ductwork as far back as visible from outside: flat black.
4. Uncoated hangers, supports, rods and insets: dip in zinc chromate primer.

F. Factory finish

1. Ceiling and wall mounted air outlets in acoustical tile ceilings: Baked white enamel.
2. Aluminum air outlets that are not to be painted: anodized.

G. Marred surfaces of prime coated equipment and piping: spot prime coat to match adjacent coat.

H. Properly prepare Work under this Division to be finish painted under Division 9 Painting.

I. Provide moisture resistant paint for exterior painting and heat resisting paint for hot piping, equipment, and materials.

J. Factory Finishes

1. Exposed fan coil units: baked enamel.
2. Unit ventilators and unit heaters: baked enamel.
3. Fans, pumps, compressors, tanks and like items.
4. Air handlers, pumps, water heaters and like items where exposed.

K. For the following, provide factory prime coat. Also, provide factory finish painting on each if not specified in Painting Division.

1. Other air outlets

L. Paint all equipment out-of-doors and equipment supports with two coats of weather resistant enamel.

M. Protect all finished surfaces of fixtures with heavy paper pasted thereon, or by other means, throughout the period of construction.

N. Refinish Work supplied with final finish under this Division if damaged under this Division to satisfaction of State's Representative.

3.8 FIELD QUALITY CONTROL

A. See Division 1 – Quality Control

B. Tests

1. Perform as specified in individual sections and as required by authorities having jurisdiction.
2. Perform commissioning work.
   a. Perform pre-function tests as specified in Division 23 – Mechanical.
   b. Perform functional and post-occupancy tests.
3. Duration as noted.

C. Provide required labor, material, equipment, and connections.

D. Furnish written report and certification that tests have been satisfactorily completed.

E. Repair or replace defective work, as directed by State's Representative in writing, at no additional cost to the State.

F. Restore or replace damaged work due to tests as directed by State's Representative in writing, at no additional cost to the State.

G. Restore or replace damaged work of others, due to tests, as directed by State's Representative in writing, at no additional cost to the State.

H. Remedial work shall be performed to the satisfaction of the State's Representative, at no additional cost to the State, including:

1. Work related to all Division 23 – Mechanical pre-functional tests.
2. Division 23 – Mechanical work related to Section 23 05 93 – Testing, Adjusting and Balancing.
3. Division 23 – Mechanical work related to Section 23 08 00 – Commissioning of HVAC.

I. Remedial work shall include performing any commissioning or other tests related to remedial work for an additional time at no additional cost to the State.

END OF SECTION 23 00 50

**SECTION 23 05 13**
**COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT**

PART 1 - GENERAL

1.1 SUMMARY

A. Work included in this section: materials, equipment, fabrication, installation and tests in conformity with applicable codes and authorities having jurisdiction for the following:

1. Motors
2. Variable speed drives
3. Motor controllers where provided as part of mechanical equipment

B. Related Sections

1. Section 23 00 50 – Basic Mechanical Materials and Methods
2. Section 23 08 00 – Commissioning of HVAC

1.2 REFERENCE STANDARDS

A. ABMA 9 – Load Ratings and Fatigue Life for Ball Bearings

B. ABMA 11 – Load Ratings and Fatigue Life for Roller Bearings

C. ANSI/IEEE 112 – Test Procedure for Polyphase Induction Motors and Generators

D. ANSI/NEMA MG 1 – Motors and Generators

E. ANSI/NFPA 70 – National Electrical Code

F. IEEE – Standard 519-1992, IEEE Guide for Harmonic Content and Control

G. NEMA – ICS 7.0, AC Adjustable Speed Drives

H. Underwriters laboratories – UL508C

1.3 SUBMITTALS

A. Submittals shall include certification from the motor manufacturer certifying compliance with NEMA MG-1, part 31 for motors that are driven by variable speed drives.

B. Submit a site-specific harmonic analysis showing total voltage harmonic distortion and total current harmonic distortion is in compliance with IEEE 519. If the analysis indicates that additional external devices or filters are required

to meet the power quality requirements of the VSD, provide the devices or filters at no additional cost to the University. See Paragraph 2.3B.2.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Motors

1. MagnaTek
2. Century Electric Co.
3. General Electric
4. Lincoln Electric Co.
5. Gould Inc.
6. Baldor
7. Or equal

2.2 MOTORS

A. General

1. In accordance with NEMA, IEEE, and ANSI C50 standards
2. Capacity:
   a. Minimum horsepower indicated.
   b. To operate driven devices under all conditions without overload.
3. Squirrel-cage induction type, NEMA Type "B: insulation class, continuous duty.
4. Speed:
   a. 1750 RPM, unless otherwise indicated.
   b. See schedules on drawings for other speeds.
5. NEMA KVA locked rotor CODE LETTER: "G" or better.
6. Service factor.
   a. Drip-proof enclosure (ODP): minimum service factor 1.15.
   b. Totally enclosed fan cooled (TEFC): minimum service factor 1.15.
7. Type:
   a. 1/3 horsepower and smaller: AC motor single-phase, 60 hertz, NEMA rated for 110 volt: With built-in overload protection.
   b. 1/2 horsepower and larger: AC motor 3 phase, 60 hertz, AC motor, NEMA rated for 460 volt or as scheduled on Drawings.
   c. Motors 50 horsepower and over: Reduced voltage start, suitable for star-delta starting.
8. Bearings, except as noted:
   a. Provide motors with double shielded, grease lubricated, ball bearings, with grease pockets on each side for re-greasing in service. Provide inlet and outlet grease connections in motor housings for each bearing. Provide factory sealed permanently lubricated ball bearings on roof mounted equipment. Similar bearing may be provided on

fractional horsepower motors. Provide sleeve bearings where so specified.
   b. Ball type, unless otherwise noted.
   c. Sealed, permanently lubricated, unless otherwise noted or not available in motor size.

B. Enclosure:

1. Open drip-proof (ODP)
   a. Provide ODP motors unless otherwise indicated
2. Totally enclosed (TEFC)
   a. Motors outside the building or otherwise exposed to the weather
   b. Non-ventilated: under 1/2 horsepower
   c. Fan-cooled: 1/2 horsepower and larger
3. See schedules on drawings for other enclosures

C. Belt-connected motors

1. Foundation slide base
2. Shaft as required for aligning pulleys

D. Efficiency

1. Except where otherwise noted in schedules, motor efficiency for motors shall be Standard efficiency.

2. Where Premium Efficiency motors are called for, motors shall have guaranteed minimum efficiencies equivalent to or exceeding NEMA Table 12-6D levels and NEMA Premium labeled:

| NEMA MG-1, Table 12-6D Nominal Efficiency for ODP and TEFC Motors | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| HP | eff | HP | eff | HP | Eff | HP | eff | HP | Eff |
| 1 | 85.5 | 5 | 89.5 | 20 | 92.4 | 50 | 94.1 | 125 | 95.4 |
| 1.5 | 86.5 | 7.5 | 91.0 | 25 | 93.6 | 60 | 94.5 | 150 | 95.8 |
| 2 | 86.5 | 10 | 91.0 | 30 | 93.6 | 75 | 95.0 | 200 | 95.8 |
| 3 | 89.5 | 15 | 92.4 | 40 | 94.1 | 100 | 95.4 | | |

3. Fractional horsepower motors 1/20 HP and larger shall not be shaded pole motors

E. Multi-speed motors

1. Two speed motors shall be single winding 1800/900 rpm unless otherwise specified or indicated
2. Provide 1800/1200 rpm multi-speed motors of separate winding, variable torque type, unless otherwise specified or indicated.

F. See DIVISION 26: ELECTRICAL

G. Refer to individual equipment sections for factory-provided controllers

1. Installed on equipment by manufacturer
2. Supplied with equipment by manufacturer for field installation

PART 3 - EXECUTION

3.1 INSTALLATION

A. See Section 23 0548 – Mechanical Sound, Vibration, and Seismic Control

B. Coordinate with work of other trades

C. Install in accordance with manufacturer's written installation instructions

D. Drives for packaged equipment shall be mounted and wired by equipment manufacturer

E. Mounting and power wiring of field mounted variable speed drives and other motor controllers are specified under Division 26 Electrical:

1. Where wall space is not available for mounting VSDs or other motor controllers, provide mounting struts securely mounted to the floor, roof, or adjacent structure
2. Where VSD has disconnect switch, locate VSD within sight of equipment served so that switch complies with NEC requirements

F. Set overload devices to suit motors provided in accordance with NEC

3.2 INSPECTION

A. Verify that adequate clearance between motor, controllers and adjacent walls or equipment is available to permit maintenance and repairs.

B. Check that motor and controller are properly supported and allows for proper alignment and tension adjustments as necessary for application.

3.3 PRE-OPERATING CHECKS

A. Before operating motors and controllers

1. Check for proper and sufficient lubrication
2. Check for correct rotation
3. Confirm alignment and re-align if required
4. Check for proper adjustment of vibration isolation.

3.4 STARTUP, TESTING, AND ADJUSTING

A. Start and test motors and controllers in accordance with manufacturers written installation instructions.

B. After starting motors:

1. Check for high bearing temperatures.
2. Check for motor overload by taking ampere reading at maximum operating conditions, with all valves open and individual motor running.
3. Check for objectionable noise or vibration; correct as needed at no additional cost to the Owner.

C. See Section 23 05 93 – Testing, Adjusting, and Balancing for HVAC

D. See Section 23 08 00 – Commissioning of HVAC

3.5 TRAINING

A. See Section 23 08 00 – Commissioning of HVAC

END OF SECTION 23 05 13

# 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.
3. Fiberglass pipe hangers.
4. Metal framing systems.
5. Fiberglass strut systems.
6. Thermal-hanger shield inserts.
7. Fastener systems.
8. Equipment supports.

B. Related Sections:

1. Division 23 Section 23 00 50 “Basic Mechanical Materials and Methods" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Division 23 Section 23 05 48 “Vibration and Seismic Controls for HVAC Piping & Equipment” for vibration isolation devices.
3. Division 23 Section23 31 17 “Ducts” for duct hangers and supports

### 1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of the Valve and Fittings Industry Inc.

### 1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Metal framing systems.
3. Fiberglass strut systems.
4. Equipment supports.

C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of trapeze hangers.
2. Design Calculations: Calculate requirements for designing trapeze hangers.

D. Welding certificates.

1.6 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

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: Pre-galvanized 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 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Allied Tube & Conduit.
   b. Cooper B-Line, Inc.
   c. Flex-Strut Inc.
   d. GS Metals Corp.
   e. Thomas & Betts Corporation.
   f. Unistrut Corporation; Tyco International, Ltd.
   g. Wesanco, Inc.
   h. ERICO International Corporation.
2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
3. Standard: MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel or stainless steel.
7. Metallic Coating: Hot-dipped galvanized.
8. Paint Coating: Epoxy.
9. Plastic Coating: Epoxy.

B. Non-MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Anvil International; a subsidiary of Mueller Water Products Inc.
   b. Empire Industries, Inc.
   c. ERICO International Corporation.
   d. Haydon Corporation; H-Strut Division.

e. NIBCO INC.
f. PHD Manufacturing, Inc.
g. PHS Industries, Inc.

2. Description: Shop- or field-fabricated pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
3. Standard: Comply with MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Coating: Zinc.

## 2.4 THERMAL-HANGER SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carpenter & Paterson, Inc.
2. Clement Support Services.
3. ERICO International Corporation.
4. National Pipe Hanger Corporation.
5. PHS Industries, Inc.
6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
7. Piping Technology & Products, Inc.
8. Rilco Manufacturing Co., Inc.
9. Value Engineered Products, Inc.

B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig (688-kPa) minimum compressive strength and vapor barrier.

C. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig (688-kPa) minimum compressive strength.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

## 2.5 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.6 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.7 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, non-shrink and non-metallic grout; suitable for interior and exterior applications.

1. Properties: Non-staining, non-corrosive, and non-gaseous.

2. Design Mix: 5000-psi (34.5-MPa), 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. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. 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.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads and at changes in direction of piping.

K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Insulated Piping:

1. Attach clamps and spacers to piping.
   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
   b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
   a. Option: Thermal-hanger shield inserts may be used.
3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

a. Option: Thermal-hanger shield inserts may be used.

4. Shield Dimensions for Pipe: Not less than the following:
   a. NPS ½ inch to NPS 3-1/2 inch:12 inches (305 mm) long and 0.048 inch thick.
5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

## 3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Provide lateral bracing, to prevent swaying, for equipment supports.

## 3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

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.

## 3.4 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.

## 3.5 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 copper attachments for copper piping and tubing.

F. Use thermal-hanger shield inserts for insulated piping and tubing.

G. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS ½ inch to NPS 3 inch.
2. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS ½ inch to NPS 3 inch.
3. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS ½ inch to NPS 3 inch.
4. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary NPS ½ inch to NPS 3 inch.
5. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS ½ inch to NPS 3 inch.
6. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS ½ inch to NPS 3 inch.
7. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.

H. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS ¾ inch to NPS 3 inch.

I. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13):
2. Steel Clevises (MSS Type 14):
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17).

J. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

K. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40).
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

L. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
3. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
4. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
5. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.

M. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

N. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

O. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 23 05 29

# SECTION 23 05 48
# VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Work included in this section: materials, equipment, fabrication, installation, and tests in conformity with applicable codes and authorities having jurisdiction for the following:

1. Vibration isolators for equipment
2. Vibration isolators for piping systems
3. Equipment bases
4. Inertia bases
5. Seismic control for equipment on isolators
6. Seismic bracing and restraints for piping and ductwork
7. Seismic bracing and restraints for rigidly mounted equipment
8. Seismic bracing and restraints for flues

B. Related Sections

1. Section 23 00 50 – Basic Mechanical Materials and Methods
2. Section 23 33 00 – Air Duct Accessories

### 1.2 REFERENCE STANDARDS

A. AFBMA – Anti-Friction Bearing Manufacturer's Association

B. ASHRAE – American Society of Heating, Refrigerating and Air Conditioning Engineers

C. NEMA – National Electrical Manufacturer's Association

D. Underwriters' Laboratories, Inc.: UL 778 – Motor Operated Water Pumps

E. American Society of Mechanical Engineers: ASME Section VIII – Boiler and Pressure Vessel Code – Pressure Vessels

F. Published specifications standards, tests or recommended methods of trade, industry or governmental organizations apply to work in this section where cited below:

1. Mason Industries “Seismic Restraint Guidelines for Suspended Piping, Ductwork, and Electrical Systems”
2. SMACNA and PPIC “Guidelines for Seismic Restraints of Mechanical Systems and Plumbing Piping Systems”.

a. Publication references below are basic industry standards; however, regulatory requirements may reference, modify, or supersede:
3. American Institute of Steel Construction (AISC) publications
   a. Specification for the Design, Fabrication and Erection of Structural Steel Buildings (Eighth Edition)
4. American National Standards Institute (ANSI) Standard
   a. B027.2-965 – Plain Washers
5. American Society for Testing and Materials (ASTM) Specifications

1.3 QUALITY ASSURANCE

A. Qualifications

1. Manufacturers:
   a. All equipment and accessories to be the product of a manufacturer regularly engaged in its manufacture for not less than five years

B. Manufacturer or manufacturer's representative of vibration isolation equipment shall have the following responsibilities

1. Determine vibration isolator sizes and locations
2. Provide piping and equipment isolation systems as scheduled or specified
3. Guarantee specified isolation system static deflection under installed actual load.
4. Provide installation instructions, drawings, and field supervision to assure proper installation, adjustment, and performance.

C. The installation of all vibration isolation units and associated hangers and bases shall be as directed by the vibration isolation manufacturer's representative.

D. It is the objective of this Specification to provide the necessary design for the control of excessive noise and vibration in the building due to the operation of machinery or equipment, and due to interconnected piping, ductwork, or conduit

1. All vibration isolators shall have either known un-deflected heights or calibration markings so that, after adjustment, when carrying their load, the deflection under load can be verified, thus determining that the load is within the proper range of the device and that the correct degree of vibration isolation is being provided according to the design.
2. All isolators shall operate in the linear portion of their load versus deflection curve. Load versus deflection curves shall be furnished by the manufacturer and must be linear over a deflection range of not less than 50 percent greater than the design deflection.

3. The theoretical vertical natural frequency for each support point, based upon load per isolator and isolator stiffness, shall not differ from the design objectives for the equipment as a whole by more than ±10 percent.
4. All neoprene mountings shall have a Shore hardness of 30 to 60 ±5, after minimum aging of 20 days or corresponding oven-aging.

E. Acoustical Testing

1. The contractor shall cooperate with regard to sound tests (ARI 575, ANSI S1.13) which may be conducted by the Owner's Representative to verify that noise criteria are met.
2. The contractor shall notify the Owner's Representative of any changes which will affect the acoustical performance.

F. Seismic load calculations for piping, ductwork, and equipment

1. Fp, the total design lateral seismic force, shall be calculated by a licensed structural engineer, unless it is explicitly stated in the plans or specifications. This engineer shall be hired by the contractor responsible for this Section of work.
2. Shall meet California Building Code requirements
3. Calculations required for supports and bracing for situations not covered by referenced Guidelines, see Paragraph 1.1B
   a. Hired by contractor under this Section or work
   b. Cost of calculations borne by contractor under this Section
4. Calculations made and signed by registered civil or structural engineer knowledgeable in seismic design
5. Include horizontal and vertical reaction loads at connections to building structures for all seismic restraints, including those covered by referenced Standards
   a. Coordinate reaction loads and attachment details with structural engineer for building.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Named manufacturer model numbers used as example of item and establish minimum level of quality and minimum standard options. Equivalent models of listed manufacturers are acceptable.

B. Vibration Isolation

1. Mason Industries, Inc.
2. Kinetics Noise Control, Inc.
3. M.L. Saussé & Co. (Vibrex)
4. Amber-Booth

5. Or equal.

C. Seismic Restraints

1. Hangers and snubbers: Any manufacturer who can verify compliance with SMACNA standards and the California Building Code
2. Strut - Channel Framing: Any manufacturer who can verify compliance with the ICBO standards
3. Anchors - Drill in, wedge type: Any manufacturer within the ICBO standards approved for seismic
4. Snubbers: Any manufacturer within the ICBO standards

2.2 VIBRATION ISOLATOR TYPES

A. Spring type

1. Spring isolators shall incorporate following
   a. All springs to be single coil steel with minimum spring coil outer diameter 0.8 of loaded operating height
   b. Horizontal spring stiffness within 0.8 to 1.25 times rated vertical spring stiffness
   c. Corrosion resistance
      1) Where exposed to corrosive environment including but not limited to:
         a) Outdoors
         b) Exposed to outdoor air within 5 feet of outdoor air intake
      2) Corrosion protection: painted with outdoor paint
      3) Springs neoprene coated
      4) Hardware cadmium plated
      5) All other metal parts hot dip galvanized
   d. Reserve deflection (from loaded to solid height) of 50 percent of rated deflection
   e. Designed and installed so that ends of springs remain parallel; neoprene cups not acceptable
   f. Noise pads of ½ inch or 1 inch thickness below the spring base to reduce the chance that the springs shall be resonant with equipment forcing frequencies or support structure natural frequencies. See Table in Paragraph 3.4B.
   g. Leveling device
   h. Where operating weight differs from installed weight provide built-in adjustable limit stops to prevent equipment rising when weight is removed. Stops shall not be in contact during normal operation.
2. Type "A": Similar to Mason Type SLF
3. Type "B": same as Type "A" except
   a. Provide built-in resilient vertical limit stops
   b. Tapped holes in top plate for bolting to equipment

   c. Capable of supporting equipment at fixed elevation during equipment erection
   d. Mason Type SLRS or equal for 1 inch and 2 inch deflection, Type SLR Series 100 for 3 inch to 5 inch deflection
4. Type "C": spring hanger rod isolators shall incorporate the following
   a. Spring element seated on steel washer within neoprene cup
   b. Steel retainer box encasing spring and neoprene cup
   c. Minimum 1/2 inch clearance between retainer box and spring hanger rod
   d. Minimum 15 degrees angular clearance between rod and retainer box
   e. Double deflection neoprene element at top of hanger box
   f. Mason 30N or equal

B. Elastomer mounting types

1. Type "D": Double deflecting type incorporating following
   a. Bolt holes for bolting to equipment base
   b. Bottom steel plates for bolting to sub-base as required
   c. Unit type design molded in black oil-resistant neoprene
   d. Neoprene compounded to meet following:
      1) Not greater than 50 durometer
      2) Minimum tensile strength 2000 pounds per square inch
      3) Minimum elongation 300 percent
      4) Maximum compression set of 25 percent of the original deflection
   e. Mason Type ND or equal (where seismic restraint not required by CBC)
   f. Mason Type BR or equal (where seismic restraint required by CBC)
2. Type "E": Elastomer hanger rod isolators shall incorporate following
   a. Molded unit type neoprene element
   b. Compounding described in Type "D" above
   c. Steel retainer box encasing neoprene mounting.
   d. Minimum 1/2 inch box
   e. Mason Type HD or equal
3. Type "F": pad type elastomer mountings to incorporate following
   a. 5/16 to 3/8 inch minimum thickness per layer
   b. 50 psi maximum loading
   c. Ribbed or waffled design
   d. 1/16 inch galvanized steel plate between multiple layers of pad thickness
   e. 1/16 inch deflection per pad thickness
   f. Suitable bearing plate to distribute load
   g. Bolts through equipment and pad shall be oversized and provided with resilient washers, bushings and lock nuts
   h. Mason Type W Series or equal
4. Type "G": Pad type elastomer mountings to incorporate following
   a. High quality bridge bearing neoprene
   b. Maximum loading 800 psi

c. Suitable bearing plate to distribute load
d. Minimum thickness 2 inch
e. Mason Type BBP or equal

5. Type "H": Combination spring/elastomer hanger rod isolators to incorporate following:
   a. Spring and neoprene isolator elements in steel box retainer
   b. Characteristics of spring and neoprene as described in Type "C" and Type "E" hanger isolators
   c. Factory preloading to 75 percent of rated load
   d. Mason PC30N or equal

C. Seismic Snubbers

1. Type SS: All-directional seismic snubber
2. Neoprene bushing to be bridge bearing quality
3. Male portion to be smooth round bar; threaded bolts not acceptable
4. Mason Z-1225 or equal

2.3 EQUIPMENT BASES

A. Integral structural steel bases, Type "B-1"

1. Reinforced as required to prevent base flexure at start-up and misalignment of drive and driven units
2. Fan bases complete with motor slide rails
3. Drilled for drive and driven unit mounting template
4. Mason Type WFSL or equal

B. Concrete inertia base, Type "B-2"

1. Formed in structural steel frame
2. Structural base reinforced as required to prevent flexure, misalignment of drive and driven unit or stress transferal into equipment
3. Minimum thickness of the inertia base shall be 6 inches or greater if required to meet weight ratio specified below
4. Fan bases complete with motor slide rails
5. Pump bases shall be large enough to support suction and discharge elbows and suction diffusers
6. Bases complete with
   a. Height saving brackets
   b. Reinforcing
   c. Equipment bolting provisions
   d. Isolators provided by vibration control supplier, type as scheduled
7. Base ready for concrete pour
8. Inertia Base Weights
   a. Centrifugal Fans, except as noted: Minimum 1.0 times weight of fan, motor and drive

b. Air handling Units, except as noted: Minimum 1.0 times weight of fan and coil cabinet, coils, fan, motor and drive
c. Pumps: Minimum 1.5 times weight of pump, motor and base
    1) Base to be sized to support suction diffuser when used
d. Air compressors
    1) Minimum 2 times weight of compressor, motor and base
    2) Weight can be reduced by weight of tank when tank mounted unit is provided.

9. Mason Type KSL/BMK or equal

C. Seismic restraint, Type I

1. All directional type
2. Steel and elastomeric
3. Mason Type Z-1225 or equal

D. Seismic restraint, Type II

1. Criteria
    a. Designed for seismic force criteria specified in Part 3
    b. Submit application details for approval

2.4 ANCHORS, INSERTS AND FASTENERS

A. All anchors and inserts shall be installed according to the ICBO standards

B. Do not use any anchor or insert in concrete which does not have a signed structurally engineered design value based on its installed application and one of the following

1. ICBO evaluation report
2. Lab test report verifying compliance

C. Do not use powder driven and power driven (Shoot-In) fasteners, expansion nails or friction spring clips

D. All over-head concrete anchors or inserts shall be selected to comply with the ICBO report or CBC table for the anchor or insert

E. Torque testing of anchors shall be allowed to verify compliance of anchor installation. However, torque testing shall not justify usability of anchor. Only load or pull testing shall be allowed to justify usability of anchors. Failure of torque shall constitute failure of anchor.

F. Bolts and nuts

1. Bolts and heavy hexagon nuts: ANSI B18.2.1 and ASTM A307 or A576
2. Bolts, underground: ASTM A325

3. Expansion anchors: Federal Specification A-A-1922

## 2.5 SEISMIC RESTRAINTS

A. General

1. Capable of safely accepting indicated external forces without failure
2. Maintain equipment, piping, and ducts in a captive position

B. Criteria: Design for seismic forces specified herein

C. Bracing system: Provide one of the following methods as most applicable for each brace

1. Material used, except for pipes, shall be structural steel with ASTM A36. Steel pipes shall conform to ASTM A501
2. Complete system of factory fabricated components
3. Complete system of job fabricated components
4. Miscellaneous metal structural shapes

## 2.6 FLEXIBLE PIPE CONNECTORS

A. Piping Connections for Vibration Isolation

1. Molded twin-sphere type connectors made of peroxide cured EPDM and Kevlar tire cord reinforcement
2. Connectors up to 2 inch diameter may have threaded ends
3. Connectors 2-1/2 inch diameter and larger to have floating steel flanges recessed to lock the connector's neoprene flanges
4. Connectors rated a minimum of 150 pounds per square inch at 220 degrees Fahrenheit without control rods or cables
5. Mason SAFEFLEX Type SFDEJ or equal

B. Piping Connections at Seismic Joints

1. Flexible hose configuration capable of the following seismic motion in all planes:
   a. At seismic joints: 4 inches
   b. At base isolation interconnections: 30 inches
2. 304 stainless steel hose and braid
3. 125 250 psi rated
4. Connectors up to 2 inch diameter may have threaded ends
5. Connectors 2 inch and larger shall have free floating flange or grooved connection
6. Mason SS 60º Vee

## 2.7 FLEXIBLE DUCT CONNECTORS

A. See Section 23 31 13 – Ducts

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install isolators and seismic restraints in accordance with manufacturer's written instructions.

B. Vibration isolators must not cause any change of position of equipment or piping resulting in piping stresses or misalignment.

C. Make no rigid connections between equipment and building structure that degrade noise and vibration isolation system herein specified

1. Electrical conduit connections to isolated equipment shall be flexible liquid tight conduit of sufficient length to incorporate a right angle bend, an offset of not less than 8 inches or a loop to allow free motion of isolated equipment.
2. The HVAC Sub-contractor shall not install any equipment, piping or conduit which makes rigid contact with the building unless permitted in this Specification; building includes, but is not limited to, slabs, beams, columns, studs and walls.
3. Coordinate work with other trades to avoid rigid contact with the building. Inform other trades following work, such as plastering or electrical, to avoid any contact which would reduce the vibration isolation.

D. Do not use isolator leveling bolts as jacking screws

E. Verify that all installed isolators and mounting systems permit equipment motion in all directions.

3.2 SEISMIC CONTROL

A. General

1. Install seismic restraints for pipes, ducts, and equipment per applicable code.
2. Design and provide restraints to prevent permanent displacement in any direction caused by lateral motion, overturning or uplift.
   a. Prepare designs and include on shop drawings, including arrangements, sizes and model numbers indicated or referenced in applicable standards. Each shop drawing shall bear a Structural or Civil Engineer’s stamp and signature registered in the State of California.
   b. Where designs, etc., are neither indicated nor referenced, contractor shall submit such designs, together with supporting calculations prepared by Structural or Civil Engineer registered in State of

California. Calculations shall substantiate seismic restraint capability to safely accept external forces without failure and maintain equipment in position.
   c. Capable of safely accepting external forces per CBC without failure.
3. Provide resilient restraining devices as required to prevent equipment motion in excess of 1/4 inch.
4. Coordinate seismic bracing requirements with other sections to result in
   a. Vertical pipe and duct restraints to coincide with and take place of required hangers.
   b. Longitudinal pipe bracing to coincide with required pipe anchors.
5. Shall not short circuit vibration isolation systems or transmit objectionable vibration or noise.

B. Attachments to Structure: See Section 23 05 29 – Hangers and Supports

## 3.3 FLOOR MOUNTED EQUIPMENT

A. Concrete housekeeping pads:

1. Isolation and seismic restraint supplier to determine dimensions and thickness required.
   a. Minimum thickness: 5.5 inches
2. Support all vibration isolation devices and bases.
3. Key with stirrups as required, integral with structural slab.
4. Incorporate seismic restraint anchor plates flush with top of housekeeping pad.

## 3.4 EQUIPMENT ISOLATION

A. General

1. Provide 1-inch operating clearance between equipment or structural bases and housekeeping pad.
   a. 1-inch minimum clearance for inertia bases over 96 inches in any dimension.
2. Position equipment, structural base and concrete bases on blocks or wedges at proper operating height.
3. Provide operating load conditions prior to transferring base isolator loads to springs and removing wedges.
4. Adjust or provide additional resilient restraints to flexibly limit start-up equipment lateral motion to 1/4 inch.
5. Prior to start-up, clean out all foreign matter between bases and equipment.
6. Verify that there are no isolation short circuits in the base, isolators or seismic restraints or conduit, pipe, and duct connections.

7. Position all corner or side seismic restraints with equipment in operation for proper operating clearance. Weld or bolt seismic restraints to seismic anchor plates in housekeeping pad.

B. Vibration Isolator Schedule:

| Equipment | Base Type | Isolator Type | Isolator Static Deflection | Acoustical Base Pad Thickness |
|---|---|---|---|---|
| Suspended fan-coils, AC, HP | None | C | 1 inch | – |
| Roof/Floor-mounted fans <10 HP | B-1 | A | 1 inch | 1/2 inch |
| Roof/Floor-mounted fans > 10 HP | | | | |
| <300 RPM | B-1 (B-2 if 50 HP or larger) | A | 3.5 inch | 1/2 inch |
| 300-450 RPM | Ditto | A | 3 inch | 1/2 inch |
| 451-600 RPM | Ditto | A | 2.5 inch | 1/2 inch |
| 601-750 RPM | Ditto | A | 2 inch | 1/2 inch |
| 751-850 RPM | Ditto | A | 1.5 inch | 1/2 inch |
| >850 RPM | Ditto | A | 1 inch | 1/2 inch |
| Suspended fans direct drive | None | E | 0.2 inch | – |
| Suspended fans belt drive | None | C | As for floor mounted fans plus 1/4 inch | As for floor mounted fans |
| Piping | | | | |
| Roof/Floor supported | None | B | 1 inch | - |
| Suspended <2 inch | None | H | 1 inch | - |
| Suspended 2 inch & less | None | E | 1/4 inch | - |

## 3.5 PIPING AND DUCTWORK ISOLATION

A. Refrigerant Piping

1. Hang pipe with spring type vibration isolator.

B. Pipe Risers

1. For pipe risers less than 75 feet, vertical risers shall be laterally supported with a riser clamp at each floor set on a Type F isolation pad, ¼" deflection.
2. For pipe risers greater than 75 feet, riser supports shall be engineered by the vibration isolation vendor as follows:
   a. All vertical risers shall be supported by spring isolators designed to support the riser filled with water. Assigned loads must be within the building design limits at the support points.
   b. Neutral central resilient anchors close to the center of the run shall direct movement up and down. The anchors shall be capable of holding an upward force equal to the water weight when the system is drained. If one level cannot accommodate this force, anchors can be located on 2 or 3 adjacent floors. Anchors shall be Mason ADA or equal.
   c. Resilient guides shall be spaced and sized properly depending on the pipe diameter. Guides shall be Mason VSG Vertical Sliding Guides or equal.
   d. Support spring mountings shall be Type A. The initial spring deflection shall be a minimum of 0.75 inches or four times the thermal movement at the isolator location, whichever is greater.
   e. Submittals must include the initial load, initial deflection, change in deflection, final load and change in load at all spring and anchor support locations, as well as guide spacing. Calculations shall include pipe stress at end conditions and branch off locations and the manufacturer must include installation instructions. Submittal must be stamped and signed by a licensed professional engineer in the employ of the vibration isolator vendor.

C. Wall and Floor Penetrations

1. All piping and ductwork to be vibration isolated, and all piping and ductwork passing through acoustically rated partitions, shall freely pass through walls and floors without rigid contacts or connections. Penetration points shall be sleeved or otherwise formed to allow passage of piping or ductwork, and maintain 0.75 inches to 1.25 inches clearance around the pipe or duct outside surfaces.
   a. For installations through air plenum partitions and through acoustically rated partitions, clearance space shall be tightly packed with fiberglass, and caulked airtight after installation of piping or ductwork
   b. For installation in rated walls, see Section 23 21 55 Refrigerant Piping and Section 23 31 17 – Ducts
2. Provide sleeves and escutcheons as specified in Section 23 21 55 Refrigerant Piping and Section 23 31 17 – Ducts.

3.6 SEISMIC BRACING INSTALLATION

A. Piping and Ductwork

1. Bracing system shall meet the seismic load requirements (See Section 1.3F).
2. Install all bracing and restraints per referenced Guidelines, see Paragraph 1.1B, where applicable.
3. Where the referenced Guidelines, see Paragraph 1.1B, are not applicable then submit details of a proposed bracing system. The proposed system shall be stamped by a licensed civil or structural engineer and shall be submitted for approval prior to construction.
4. Coordinate seismic bracing and restraints so that required expansion provisions will not be restricted.
5. Provide floor support and bracing of pipe connection risers to equipment.
6. Where seismic bracing and restraints are not required refer to Section 15060 – Hangers and Supports.

B. Flexibly Supported Piping and Ducts

1. Provide and locate restraints to allow normal operation of systems without transmitting vibrations to building structure.
2. Location of Restraints: Per referenced Guidelines, see Paragraph 1.1B, as specified herein before.
3. Construction of Restraints: Steel cables, installed slack.

C. Rigidly Mounted Equipment

1. Secure to floor as required to prevent horizontal motion and overturning.
2. Secure to walls or other equipment to prevent overturning.
   a. Attach to elements capable of taking calculated loads.
   b. Provide steel backing in walls as required to brace equipment and piping from wall.

3.7 FIELD QUALITY CONTROL

A. Inspection by manufacturer's representative of all vibration isolating devices.

1. After installation of all devices.
2. Provide written report by manufacturer regarding.
   a. Installation errors.
   b. Improper selection of devices.
   c. Other fault that could affect performance of system.

B. Submit written report to Owner’s Representative.

1. Include manufacturer's report indicating required corrections.
2. Include report on steps to properly complete isolation work.

C. See Section 23 08 00 – Commissioning of HVAC

END OF SECTION 23 05 48

# SECTION 23 05 93
# TESTING, ADJUSTING AND BALANCING FOR HVAC

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Work included in this section: materials, equipment, fabrication, installation, and tests in conformity with applicable codes and authorities having jurisdiction for the following:

1. Operational testing and adjusting of air handling equipment.
2. Balancing of air distribution systems
3. Adjustment of air terminal devices
4. Flow testing, adjusting, and balancing of hydronic systems.

B. Related Sections

1. Section 23 00 50 – Basic Mechanical Materials and Methods
2. Section 23 31 17 – Ducts
3. Section 23 08 00 – Commissioning of HVAC

### 1.2 REFERENCE STANDARDS

A. National Environmental Balancing Bureau Procedural Standards.

B. Associated Air Balance Council National Standards.

C. ASHRAE Standard 111 Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilating, and Air-Conditioning Systems.

### 1.3 QUALITY ASSURANCE

A. Contractor shall be member of Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB).

B. Contractor shall have satisfactorily balanced at least three systems of comparable type and size.

C. Prior to start of testing, adjusting, and balancing, verify that required Project conditions are met.

1. Systems installation is complete and in full operation.
2. All pre-functional tests have been performed.
3. Equipment has been started and tested in accordance with manufacturers' written installation instructions.
4. Doors and windows are in place or under normal traffic conditions.

### 1.4 SUBMITTALS

A. See Section 23 00 50 – Basic Mechanical Materials and Methods.

B. Submit to Owner's Representative documentation that:

1. Contractor is a member of Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB).
2. Contractor has satisfactorily balanced at least three systems of comparable type and size.
   a. Include list of such projects.
   b. Include sample forms for use in compiling and recording test and balance data.

C. Pre-Test Submittal

1. At least 15 days prior to starting field work, submit paper copies of the following:
   a. Set of final report forms.
      1) Complete with design conditions of all equipment and design flow rates for all equipment and devices to be balanced.
      2) Forms shall include blank entry space for all data requested in this Section. Carefully review requested data; standard balancing forms may not be acceptable.
      3) Verify that forms are in acceptable word-searchable electronic format per Section 23 00 50 – Basic Mechanical Materials and Methods.
   b. Complete list of instruments proposed to be used:
      1) Organize in appropriate categories.
      2) Include data sheets for each.
      3) Show
         a) Manufacturer and model number.
         b) Description and use when needed to further identify instrument.
         c) Size or capacity range.
         d) Latest calibration date.
   c. Provide certification that:
      1) All instruments have been calibrated prior to tests.
      2) Instruments comply with requirements of AABC or NEBB for tests required.
      3) Contractor is currently certified by AABC or NEBB.

2. Do not proceed with field work until the above submittal has been approved by Owner's Representative.

D. Final Test & Balance Report

1. At least 15 days prior to Contractor's request for final inspection, submit three paper copies of final reports on approved reporting forms for review

and approval by Owner's Representative. Once approved, provide required quantity of paper and electronic copies per 23 00 50 – Basic Mechanical Materials and Methods.

2. Form of Final Reports
    a. Fully completed report forms for all systems specified to be tested and balanced including at a minimum all data specified herein to be recorded.
    b. Each individual final reporting form must bear.
        1) Signature of person who recorded data.
        2) Signature of air balance supervisor of reporting organization.
    c. When more than one certified organization performs total air balance services, firm having managerial responsibility shall make submittals.
    d. Identify instruments of all types that were used and last date of calibration of each.

1.5 PROJECT REVIEW

A. Pre-Construction Review
    1. Review following documents
        a. Contract documents
            1) Drawings
            2) Specifications
            3) Addenda
            4) Change orders
        b. Design intent documents
        c. Submittal data
        d. Shop drawings
        e. Temperature control drawings
        f. Pre-functional test reports
    2. Assure that design intent and all sequences of operation are clearly understood.
    3. Identify potential problems from standpoint of total system balance.
    4. Review of specifications for:
        a. Scope of work
        b. Special requirements
        c. Items that will make balancing difficult or impossible
    5. Review of Drawings for:
        a. Potential problems for total system balance
            1) Location of balancing devices
            2) Lack of balancing devices
            3) General System layout
            4) Architectural features
            5) Accessibility
        b. Most effective system balance procedures
        c. Scheduling and coordination requirements
    6. Review of submittal data for:
        a. Completeness of data

b. Conformity with contract documents
c. Special instructions for use of balancing devices
d. Factors for flow meters
e. Limitations affecting accuracy of measurements.
f. Balancing forms shall show design data and submittal data where different.
g. Equipment performance data and curves

7. Review of shop drawings for potential problems for total system balance, as specified above for review of the contract Drawings.
8. Review of temperature control drawings for:
   a. Thorough understanding of system functions
   b. Determining most effective total system balance procedure for minimum control manipulation
9. Submit report recommending addition and/or relocation of balancing devices, including, but not limited to
   a. Volume dampers
   b. Flow metering devices, for air
   c. Pressure and temperature measuring points.

B. Construction Review

1. Make on-site visits during the progress of construction: Number of visits to be as required to perform the functions specified below.
2. Purpose of review
   a. Identify potential problem for performing total system balance.
   b. Identify modifications that will affect air total system balance.
   c. Schedule and coordinate total system balance with other work.
   d. Identify conditions that could create hazardous environment for building occupants.
3. Typical activities
   a. Check that necessary balancing and measuring hardware is:
      1) In place
      2) Located properly and accessibly
      3) Installed correctly
   b. Identify and evaluate variations from system design
   c. Record data from equipment nameplates
   d. Identify and report possible restrictions in systems; such as
      1) Closed fire dampers
      2) Long runs of flexible duct
      3) Poorly designed duct fittings
      4) Questionable piping connections
      5) Others as may arise or based on contractor’s experience
   e. Verify that construction progress will not delay total system balance
   f. Identify best location for duct Pitot tube traverses
   g. Identify scaffolding needs

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified herein. If not otherwise noted, the following minimum requirements apply.

1. Volt-meter: plus or minus 1 percent scale.
2. Ammeter: plus or minus 1 percent scale.
3. Ohmmeter: plus or minus 0.1 percent scale for calibrating plus or minus 0.4 degrees Fahrenheit resistance temperature sensors, plus or minus 0.25 percent scale for calibrating plus or minus 1 degrees Fahrenheit temperature sensors, plus or minus 1 percent scale for measuring motor current.
4. Ultrasonic time-of-travel strap-on flow sensor: plus or minus 5 percent of reading.
5. Other flow sensors: plus or minus 2 percent of reading.
6. Watt meter, plus or minus1/2 percent scale: 3 phase split core current transducers.
7. Temperature: plus or minus 0.4 degrees Fahrenheit.

B. All equipment shall be calibrated within 6 months of use, or according to the manufacturer's recommended interval, whichever is shorter, and when dropped or damaged. Calibration tags shall be affixed or certificates readily available and proof of calibration shall be included reports.

PART 3 - EXECUTION

3.1 GENERAL

A. Coordinate with work of other trades.

B. Coordinate all work with Commissioning Coordinator.

1. See Section 23 08 00 – Commissioning of HVAC

C. Report to Owner's Representative any discrepancies or items not installed in accordance with the Contract Drawings pertaining to proper balance and operation of air and water distribution systems.

D. Perform testing, adjusting, and balancing in accordance with AABC or NEBB standards.

E. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch

insulation with new materials identical to those removed. Restore vapor barrier and finish according to Section 23 07 00 – HVAC Insulation.

F. Mark equipment settings with paint or other suitable, permanent identification material, including damper control positions, valve indicators, and similar controls and devices, to show final settings.

G. Assist in Title 24 Acceptance Testing as specified in Section 23 08 00 – Commissioning of HVAC.

3.2 AIR SYSTEM BALANCING

A. General:

1. Do not operate fan systems for test or balance until spaces served have been cleaned of dust and debris, to avoid contamination of supply air or return air paths and equipment.
2. Check that filters are installed, free of bypass, and clean; type as specified herein
    a. Make allowance for air filter resistance at time of tests.
        1) Pressure drop across filter banks midway between drop for clean and dirty filters at design airflow.
    a. For systems with construction prefilters and high efficiency final filters.
        1) Perform all zone level balancing with only pre-filter installed, no final filter, and system operating on 100 percent outdoor air.
        2) Immediately prior to occupancy, or to 100 percent outdoor air purge if that procedure is to be implemented; see Section 15050 – Basic Mechanical Materials and Methods, replace prefilters with new clean filters and install final filters. With final filters in place, perform tests of air handling unit per Paragraph 3.3C followed by 100 percent outdoor air purge if required by Section 15050 – Basic Mechanical Materials and Methods.
3. In cooperation with Control installer, set adjustments of automatically operated dampers and valves to operate as indicated.
4. Balance hydronic systems prior to air balance and have operational during air balance for air temperature measurements.

B. Air Outlets:

1. Adjust diffusers' throw pattern, grilles and registers to pattern indicated on the Drawings.
2. Test and adjust each diffuser, grille and register to within plus or minus 10 percent of design requirements.
    a. Start with all dampers wide open.
    b. Adjust dampers, starting with nearest to terminal unit or fan. Make adjustments using duct mounted volume dampers rather than dampers at diffuser face unless absolutely required.

   c. At least one damper shall remain wide open at end of balance.
3. Plenum return air grilles or slots in lights: No balance required.
4. Read and Report:
   a. Tag each grille, diffuser and register and mark tag on copy of floor plan.
   b. For each grille, diffuser and register, indicate tag, size, type, and effective area (where applicable).
   c. Required velocity/cubic feet per minute.
   d. Initially tested velocity/cubic feet per minute
   e. Finally tested cubic feet per minute after adjustments.

C. Fan-coil Airflow Rate Readings:

1. Total supply air quantities shall be determined at all of the following where applicable:
   a. Pitot traverse in the supply duct downstream, positive pressure side of the fan.
   b. Pitot traverse at coil or filter bank.
   c. Totaling the readings of individual air outlets.
   d. Totaling the readings of individual terminals.
   e. Supply fan airflow sensor reading.

2. Total return air quantities shall be determined at all of the following where applicable:
   a. Pitot traverse in the return air duct or damper entering air handler
   b. Totaling the readings of individual air outlets, if ducted return system.
   c. Totaling reading of each return air shaft inlet, if multi-story plenum return system.
   d. Return fan airflow sensor reading.

3. Outside air quantities shall be determined by all of the following where applicable:
   a. Subtracting pitot traverses of supply and return ducts.
   b. Pitot traverse of outdoor air intake duct.
   c. Outdoor airflow sensor reading as.
   d. Note: Balance by measurement of return air, outside air, and mixed air temperatures shall not be used due to inherent inaccuracy.

4. For systems with airflow measuring stations, measure airflow and coordinate with Control installer to calibrate airflow stations at a minimum of three conditions:
   a. Design airflow
   b. 50 percent of design airflow
   c. Minimum airflow

D. Fan-Coils

1. Total air quantities shall be obtained within 10 percent of design by adjustment of fan speed
   a. Adjust sheaves on fans with adjustable sheaves.
   b. Change sheaves on fans with fixed sheaves; see Paragraph 3.3F.
2. Test and adjust minimum outside air flow:
   a. Supply air fan shall first be operating at design airflow.
   b. For systems with economizers.
      1) Open return air damper fully.
      2) Adjust the outdoor air damper signal until the minimum outdoor airflow rate is achieved.
      3) Convey this minimum signal to Control installer and note on air balance report.
   a. For systems without economizers:
      1) Adjust minimum outdoor air or return air damper balancing damper position or linkage to deliver design minimum outdoor airflow rate.
      2) Clearly mark minimum damper position on damper housing
3. Test with system operating at minimum outside air flow condition described above and record the following on a schematic of the system:
   a. Tag
   b. Manufacturer and model of fan and motor
   c. Sheave data at motor and fan; belt data
   d. Motor HP, rpm, volts, phase, FLA
   e. Fan airflow rate at all locations measured, as listed above
   f. Final measured amps
   g. Static pressures measured at:
      1) Return air plenum
      2) Mixed air plenum
      3) Downstream of filter
      4) Downstream of coil
      5) Discharge of fans
   h. Concurrent airflow rate readings from airflow sensors, where applicable.
   i. Minimum outdoor air control signal, where applicable.
   j. Coil Performance:
      1) Test with:
         a) Associated pumps running in automatic maintaining differential pressure setpoint determined above.
         b) Central plan cooling (heating) equipment operational.
         c) Controls adjusted to provide coil design water temperature entering coil.
         d) Fan is running at design airflow.
         e) Fully open control valve, allow steady-state to be reached, and measure.

2) Measure and record on a schematic of the system.
   a) Entering water temperature.
   b) Leaving water temperature.
   c) Coil differential pressure drop.
   d) Coil flow rate, from calibrated balance valve or deduced from manufacturer's coil flow vs. pressure drop data, see submittals.
   e) Coil entering drybulb and wetbulb to cooling coils, drybulb only for heating coils.
   f) Leaving supply air drybulb and wetbulb from cooling coils, drybulb only for heating coils
   g) Documentation of three-way valve bypass balance valve per Paragraph 3.2F.

E. Constant Volume Exhaust Fans

1. See Paragraph 3.3B for air outlet balancing.
2. Total air quantities for fan shall be determined by both:
   a. Pitot tube traverse of main ducts near the fan inlet, and
   b. Totaling the readings of individual air outlets
3. Total air quantities shall be obtained within 10 percent of design by adjustment of fan speed:
   a. Adjust sheaves on fans with adjustable sheaves.
   b. Change sheaves on fans with fixed sheaves. See Paragraph 3.3F.
4. Test and record:
   a. Tag.
   b. Manufacturer and model of fan and motor.
   c. Sheave data at motor and fan; belt data.
   d. Motor horsepower, rpm, volts, phase, full load amps.
   e. Fan airflow rate at all locations measured, as listed above.
   f. Final measured amps.
   g. Inlet and outlet static pressure.

3.2 ADDITIONAL COSTS

A. Fans: If drives are not capable of being adjusted to meet required performance, inform Owner's Representative, and indicate added price to supply and install required sheaves. Do not include sheave changes in initial bid.

B. Pumps: If impeller must be trimmed, see Paragraph 3.2G.2, inform Owner's Representative and indicate added price to trim impeller and replace. Do not include impeller changes in initial bid.

C. Do not proceed until work is approved by Owner's Representative.

3.3 SPOT CHECKING

A. Spot checks shall take place after test and balance work is complete and reports have been prepared and approved.

B. Spot checks shall be witnessed by an Owner's Representative. Schedule spot checks with Owner's Representative at least 1 week prior to proposed test date.

C. Owner's Representative shall select subsets of any tested and balanced air or hydronic system to be spot-checked on the day of tests without prior notice to the Contractor.

1. Spot-checking will not require more than one working day.
2. If additional spot checks are requested by the Owner's Representative causing the time limit above to be exceeded, inform Owner's Representative, and indicate added price to perform the additional tests. Do not include additional tests in initial bid.

D. Discrepancies

1. If any of the spot-check measurements differ more than 25 percent from those documented in test and balance reports, the Contractor shall completely rebalance the associated system. For balance discrepancies at or downstream of a VAV box, rebalance only is required at or downstream of that box.
2. If discrepancies as described above are found on more than 25 percent of the spot-checks for air systems, all air systems shall be rebalanced.
3. If discrepancies as described above are found on more than 25 percent of the spot-checks for hydronic systems, all hydronic systems shall be rebalanced.
4. Rebalance work shall be witnessed by an Owner's Representative at the option of the Owner's Representative.
5. All rebalance work shall be documented, and documentation shall be resubmitted as specified above.
6. All rebalance work shall be provided at no additional cost to the Owner.

3.4 TRAINING OWNER PERSONNEL

A. See Section 23 08 00 – Commissioning of HVAC

B. Go over the final Testing, Adjusting and Balancing Report, explaining the layout and the meanings of each data type.

C. Discuss any outstanding deficient items in control, ducting, piping, or design that may affect the delivery of air or water.

D. Identify and discuss any systems or system components that are not meeting their design capacities.

E. Discuss any temporary settings and steps to finalize them for any areas that are not finished or fully occupied.

F. Any other appropriate points that may be helpful for facilities operations, relative to testing, adjusting, and balancing or the mechanical systems.

END OF SECTION 23 05 93

# SECTION 23 07 00
# HVAC INSULATION

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Work Included in This Section: Materials, equipment, fabrication, installation, and tests in conformity with applicable codes and authorities having jurisdiction for the following:

1. Piping insulation
2. Pipe insulation jacket
3. Equipment insulation
4. Ducts and plenums, thermal insulation
5. Duct and plenums, acoustic insulation
6. Duct and plenums, fire rated insulation.

B. Related Sections

1. Section 23 00 50 – Basic Mechanical Materials and Methods
2. Section 23 08 00 – Commissioning of HVAC

### 1.2 REFERENCE STANDARDS

A. ASTM B209 – Aluminum and Aluminum-Alloy Sheet and Plate

B. ASTM C177 – Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus

C. ASTM C335 – Steady-State Heat Transfer Properties of Horizontal Pipe Insulation

D. ASTM C585 – Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe

E. ASTM C921 – Properties of Jacketing Materials for Thermal Insulation

F. ASTM E84 – Surface Burning Characteristics of Building Materials

G. ASTM E96 – Water Vapor Transmission of Materials

H. NFPA 255 – Surface Burning Characteristics of Building Materials

I. SMACNA – HVAC Duct Construction Standards - Metal and Flexible

J. UL 723 – Surface Burning Characteristics of Building Materials

K. ASTM E 814 – Standard Test Method for Fire Tests of Through-Penetration Fire Stops

L. UL 1978 – Standard for Grease Ducts

1.3 DEFINITIONS

A. Duct Dimensions

1. Where acoustical liner is indicated on the Drawings the duct sizes indicated shall be clear inside dimensions unless duct size is specifically indicated as outside dimensions (OD)

1.4 QUALITY ASSURANCE

A. Source Quality Control

1. Service: Use insulation specifically manufactured for service specified
2. Labeling: Insulation labeled or stamped with brand name and number

B. Applicator: Company specializing in performing the work of this section with minimum three years' experience

C. Fire Wrap Certification

1. The proposed fire-wrapping and fire-stopping shall be acceptable to the local authority having jurisdiction.
2. Provide evidence of AHJ approval in submittals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Named manufacturer model numbers used as example of item and establish minimum level of quality and minimum standard options. Equivalent models of listed manufacturers are acceptable.

B. Insulation: fiberglass

1. Owens-Corning Fiberglass Corporation
2. Manville
3. Certainteed Corporation
4. Knauf
5. Or equal

C. Insulation: Elastomeric Closed Cell

1. Armstrong World Industries, Inc.
2. Rubatex Corporation

3. Or equal

D. Weatherproof Aluminum Jacket

1. Childers Products Company
2. Insul-Coustic/Birma Corporation
3. Or equal

E. Pre-molded pipe fitting covers and Jacketing

1. Manville: Zeston
2. Childers Products Company
3. Proto Corporation
4. Insul-Coustic/Birma Corporation
5. Or equal

F. Fire-rated Duct Wrap

1. 3M Fire Protection Products, Inc
2. Or equal

G. Adhesives

1. Foster Div. Amchem Products Inc.
2. Childers Products Company
3. Epolux Mfg. Corporation
4. Insul-Coustic/Birma Corporation
5. Armstrong 520 Adhesive
6. Or equal

H. Mechanical Fasteners

1. AGM Industries, Inc.
2. Miracle Adhesives Corporation
3. Grip-Nail
4. Or equal

2.2 GENERAL

A. Energy Codes: The current versions of California Title 24 and California Building Code shall govern where requirements for thickness exceeds thickness specified

B. All insulation materials, including jackets, facings, adhesives, coatings, and accessories are to be fire hazard rated and listed by Underwriters' Laboratories, Inc., using Standard UL 723 (ASTM E-84), (NFPA-255), (ASA A2.5-1963)

1. Flamespread: maximum 25
2. Fuel contributed and smoke developed: maximum 50
3. Flameproofing treatments subject to deterioration from moisture or humidity are not acceptable

C. Insulation and accessories shall not provide any nutritional or bodily use to fungi, bacteria, insects, rats, mice, or other vermin, shall not react corrosively with equipment, piping or ductwork, and shall be asbestos free: Duct lining shall meet ASTM C1136 and ASTM C665 for biological growth in insulation

2.3 MATERIALS

A. Refrigerant Pipe Insulation

1. Flexible, closed cell elastomeric thermal insulation
   a. Insulation ASTM C534
   b. Service rating of 220 degrees Fahrenheit
   c. Density 6.0 pounds per cubic foot
   d. Closed cell foam: Vapor permeability ASTM E96 0.2 perm
   e. Max moisture absorption: 1.0 percent by volume, 10 percent by weight
   f. Molded pipe insulation
      1) Maximum 0.27 K factor at 75 degrees Fahrenheit mean temperature
      2) Maximum water vapor transmission rating of 0.17 perm-inches
   g. Sheet insulation
      1) Maximum 0.28 K factor at 75 degrees Fahrenheit mean temperature
      2) Maximum water vapor transmission rating of 0.17 perm-inches
   h. Seal with Rubatex adhesive or equal: Armstrong Armaflex II or equal
2. Calcium Silicate
   a. Insulation ASTM C 533, Type I
   b. Sectional with 14 pounds per cubic foot nominal density
   c. 0.40 maximum K-factor at 300 degrees Fahrenheit mean temperature and 1200 degrees Fahrenheit maximum service rating
   d. Waterproofed
   e. Flexural Strength 100 pounds per square inch
   f. Schuller Thermo-12 Gold or equal

B. Jackets For Exterior Installation

1. Factory Applied Vapor Barrier All Service Jacket (ASJ)
   a. ASTM C921, White kraft paper bonded to aluminum foil and reinforced with glass fiber yarn
   b. Moisture Vapor Transmission: ASTM E96; 0.02 perm inches
   c. Secure with self sealing longitudinal laps and butt strips
   d. Secure vapor barrier mastic

e. Tie Wire: See Paragraph E.1, with twisted ends on maximum 12 inch centers
f. Vapor Barrier Lap Adhesive: Compatible with insulation

2. Aluminum Jacket: ASTM B209
   a. Use for weatherproof jacket
   b. Thickness: 0.016 inch sheet
   c. Finish: Embossed
   d. Joining: Longitudinal slip joints and 2 inch laps
   e. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner
   f. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum or 0.010 inch thick stainless steel

C. Preformed Pipe Fitting Covers

1. Aluminum
   a. Factory fabricated formed covers
   b. General Aluminum Supply Corporation GASCO or equal

D. Adhesives and coatings

1. Foster product names and figure numbers or equal
   a. Lagging adhesive: 30-36
   b. Fiberglass: Zeston Z-Glu
   c. Vapor barrier coating: Tite-fit 30-80, UP Label, comply with MIL-C-19565C, Type II; fire and water resistant
   d. Vaporseal adhesive: 85-60
   e. Cellular glass bedding and sealing compound adhesive: Foamseal 30-45
   f. Outdoor mastic: 30-90
   g. Asphalt mastic: C.I. Mastic 60-25
   h. For elastomeric insulation: 520 contact adhesive

E. Wire, banding and fastening devices

1. Wire: minimum 16 gauge copper clad annealed steel wire
2. Bands: 3/4 inches nominal width with wing seals, of minimum thickness as follows:
   a. Aluminum: 0.020 inches
3. Staples: outward clinching type of corrosion resistant steel

F. Mechanical Fasteners

1. Mild steel, copper plated
2. AGM Industries Power Base insulation pins or equal
3. Insulation washers
   a. Galvanized steel

b. 1- 1/2 inch diameter
c. AGM Industries SLW-1 or equal

G. Provide a continuous vapor seal for all refrigerant piping. Pre-insulated pipe support and shields

1. Provide insulated pipe supports for all insulated pipe and tubing. Insulated pipe supports shall be Pipe Shields, Inc. or equal
2. All insulated pipe supports shall be load rated. Load ratings shall be established by pipe support manufacturer based upon testing and analysis in conformance with the latest edition of the following codes: ASME B31.1, MSS SP-58, MSS SP-69 and MSS SP-89.
3. All insulated pipe supports shall have Calcium Silicate insulation and galvanized steel jackets. Pipe supports for use on flat surfaces shall have integral load distribution plates coated with zinc primer minimum 3 mils thick.
4. See Section 230529 Hangers and Supports
5. Hangers and supports shall fit outside of all pipe insulation and insulation inserts. Provide pre-insulated pipe supports as specified and install per manufacturer's installation instructions. Shield lengths and gauges shall also be per manufacturer's recommendations.

H. Fire-stopping

1. At pipe penetrations through rated assemblies.
2. Commercial pipe sleeve assemblies that are UL listed and that have been approved by the fire marshal for this purpose.
3. Insulation shall be continuous through penetration.

I. Accessories

1. Insulation Protection Saddles: 12-inch long, 16 gauge steel
2. Paint: Ultraviolet resistant latex paint with special adherence capabilities to the fitting covers, elastomeric, aluminum facing, Kraft paper, tapes, and adhesives

J. Equipment Insulation

1. Glass fiber, semi-rigid
   a. Insulation: ASTM C612; rigid, noncombustible
      1) 'K' ('ksi') value: ASTM C335, 0.24 at 75 degrees Fahrenheit
      2) Maximum service temperature: 450 degrees Fahrenheit
      3) Maximum moisture absorption: 0.1 percent by volume
      4) Density: 3.0 pounds per cubic foot density
   b. Vapor Barrier Jacket
      1) Kraft paper reinforced with glass fiber yarn and bonded to aluminized film

2) Moisture vapor transmission: ASTM E96; 0.04 perm
3) Secure with self sealing longitudinal laps and butt strips. Minimum lap 2 inches
4) Secure with bands, adhesive or ties

c. Facing: 1 inch galvanized or stainless steel hexagonal wire mesh stitched on one face of insulation
d. Vapor Barrier Lap Adhesive: Compatible with insulation
e. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool

2. Jackets
   a. Aluminum
   b. Use for weatherproof jacket
   c. Thickness: 0.016 inch sheet
   d. Finish: Embossed
   e. Joining: Longitudinal slip joints and 2 inch laps
   f. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner
   g. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum or 0.010 inch thick stainless steel
3. Equipment insulation facings: Foil-scrim-kraft laminate of aluminum foil facing, glass scrim reinforcing, kraft paper backing
4. Wires, bands and fastening devices
   a. Wires: Minimum 16 gage galvanized steel wire
   b. Bands: 3/4 inch nominal width wing seals, of minimum thickness as follows
      1) Aluminum: 0.007 inches indoors. Where exposed to weather 0.020 inches
      2) Stainless Steel: 0.010 inches

K. Duct Insulation

1. Duct Wrap With Vapor Barrier; Type DW-V
   a. Insulation: ASTM C553 and C612; flexible, noncombustible blanket
      1) 'K' ('Ksi') value: ASTM C518, 0.24 at 75 degrees Fahrenheit
      2) Maximum service temperature: 350 degrees Fahrenheit
      3) Maximum moisture absorption: 0.20 percent by volume
   b. Vapor Barrier Jacket - factory installed. (FSK)
      1) Kraft paper reinforced with glass fiber yarn and bonded to aluminized film
      2) Moisture vapor transmission: ASTM E96 Procedure E; 0.02 perm
      3) Secure with pressure sensitive tape
   c. Vapor Barrier Tape: Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive
      1) Flexible fiberglass wrap. 3/4 pounds per cubic foot
      2) Installed conductance: 0.30 BTU-inch/hr/square foot/degree Fahrenheit

3) Factory applied jacket
   a) Foil-scrim-kraft laminate: Aluminum foil facing
   b) Glass scrim reinforcing
   c) Kraft paper backing
4) Maximum vapor permeance: 0.02 perms

d. Owens-Corning All Service Faced Duct-Wrap or equal

2. Duct Board Without Vapor Barrier; Type DB
   a. Insulation: ASTM C612; rigid, noncombustible blanket
      1) K (Ksi) value: ASTM C518, 0.23 at 75 degrees Fahrenheit
      2) Maximum service temperature: 350 degrees Fahrenheit
      3) Maximum moisture absorption: 0.20 percent by volume
   b. Installed conductance: 0.23 BTU-inch/hr/square foot/degree Fahrenheit
   c. Thickness per Paragraph 1.13A Duct Insulation Type and Thickness Schedule
   d. Owens-Corning Type 703 or equal
3. Duct Board With Vapor Barrier; Type DB-V
   a. Insulation: ASTM C612; rigid, noncombustible blanket
      1) 'K' ('Ksi') value: ASTM C518, 0.23 at 75 degrees Fahrenheit
      2) Maximum service temperature: 350 degrees Fahrenheit
      3) Maximum moisture absorption: 0.20 percent by volume
   b. Vapor Barrier Jacket - factory installed (FSK)
      1) Kraft paper reinforced with glass fiber yarn and bonded to aluminized film
      2) Moisture vapor transmission: ASTM E96; 0.02 perm
      3) Secure with pressure sensitive tape
   c. Vapor Barrier Tape: Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive
   d. Installed conductance: 0.23 BTU-inch/hr/square foot/degree Fahrenheit
   e. Thickness per Paragraph 1.13A Duct Insulation Type and Thickness Schedule
   f. Factory applied jacket
      1) Foil-scrim-kraft laminate
      2) Aluminum foil facing
      3) Glass scrim reinforcing
4. Tie Wire: Annealed steel, 16 gage

L. Duct and Plenum Lining

1. Rectangular Duct Lining; Type AL
   a. Material
      1) Insulation: ASTM C423
      2) 'K'': ASTM C518, 0.23 at 75 degrees Fahrenheit
      3) Maximum service temperature: 350 degrees Fahrenheit
      4) Maximum moisture absorption: 0.20 percent by volume

5) Thickness per Paragraph 1.13A Duct Insulation Type and Thickness Schedule
6) 1-1/2 pounds per cubic foot unless shown otherwise to be 3 pounds per cubic foot
7) Installed conductance: 0.25 BTU-inch/hr/square foot/degree Fahrenheit

b. Interior air-side surface
1) Smooth black neoprene or matte facing overlay on air side. Coating shall conform to NFPA 90A, ASTM C665, ASTM G21
2) Suitable for velocity up to 4000 feet per minute
3) Meet erosion test method described in UL publication No. 181
4) Durable and mechanically cleanable
5) EPA registered anti-microbial agent
6) Certainteed Toughgard Duct Liner or equal
7) Adhesives
a) Duct Insulation, Internal: Foster 85-60 or equal
b) Weld Pins: Duro-Dyne CP or equal

## 2.4 DUCT FIREPROOFING

A. Material applied directly to metal ducts and achieving 1- or 2-hour fire rated separation (as required by application) when tested in accordance with UL 1978 by independent testing agency

1. Surface Burning Characteristics: Flame spread index of 0 and smoke developed index of 0, when tested in accordance with ASTM E 84, both blanket and foil.
2. Combustibility: Non-combustible, when tested in accordance with ASTM E 136.
3. Flexibility: Capable of being formed around corners and shapes by hand.
4. Fiber Content: Demonstrated to be soluble in the lungs according to EU 67/548/EWG, Note Q for bio-persistence.
5. Surface: Foil or other damage resistant surface; fiber not exposed after installation.
6. Accommodation for Duct Access Doors and Panels: Capable of being installed to achieve fire rating without impeding access.
7. Acceptable Product: 3M Fire Barrier Duct Wrap; fire resistant inorganic blanket encapsulated with scrim-reinforced foil facing

B. Fasteners: Non-combustible; use one or both of the following to attach fireproofing to ducts.

1. Banding: Steel or stainless steel, 1/2 inch wide, minimum, and 0.015 inch thick, minimum; with steel banding clips.
2. Insulation Pins: Copper-coated steel impalement pins, minimum 12 gages, for welded attachment, with galvanized steel self-locking washers, 1-1/2 inch square or diameter; or equivalent sized cup-head pins.

C. Access Panel Hardware: Galvanized threaded rods, sleeves, washers, and wing nuts as specified in manufacturer's instructions.

D. Tape: Aluminum foil tape for sealing exposed fiber edges and repairing tears in facing.

E. Fire-stopping: Material tested in conjunction with wrap in accordance with ASTM E 814 to achieve fire rated penetration seal at penetrations through fire rated assemblies.

1. Fire Rating: Same or greater than rating of penetrated assembly.
2. Acceptable Products: 3M Fire Barrier 1000 N/S, 1003 S/L, and 2000+ Silicone Sealants, as required by tested assembly

PART 3 - EXECUTION

3.1 REFRIGERANT PIPE & EQUIPMENT INSULATION SCHEDULE

A. Insulation Application Types Items noted "NIC" (Not in Contract) will be furnished and installed by Owner or under separate contract.

1. Type P-1A Refrigerant Piping: Cover with foamed plastic of closed cell structure ¾ inch thick. Armstrong Armaflex or Imcolock.
2. Type P-2
   a. Molded fiberglass
   b. All-service jacket
3. Type P-2A
   a. Molded fiberglass
   b. Aluminum preformed jacket or PVC jacket
4. Type P-3: Flexible elastomeric insulation
5. Type P-4
   a. Calcium silicate insulation
   b. Aluminum preformed jacket
6. Type E-1
   a. Fiberglass board
   b. 3 pounds per cubic foot density
   c. Foil-scrim-kraft facing
   d. Vapor-sealed
7. Type E-2
   a. Fiberglass board
   b. 6 pounds per cubic foot density
   c. Segmented or scored for curved surfaces
8. Type E-3: Flexible cellular foam insulation

B. Application Schedule

| Service | Type | Size | Thickness |
|---|---|---|---|
| Refrigerant Piping | P-1A | All | ¾ inch |
| | | | |
| Concealed horizontal condensate drains | P-3 | All | ½ inch |

3.2 INSTALLATION

A. Install materials in accordance with manufacturer's instructions

B. Coordinate with work of other trades

C. Deliver material to job site in original non-broken factory packaging, labeled with manufacturer's density and thickness

D. Install insulation where it cannot become wet. If insulation becomes wet, remove, and dispose of properly and replace with new, dry insulation. Wetted insulation is not acceptable. Ensure insulation is dry before and during installation.

E. Insulate all piping, valves, fittings, flanges, and accessories.

F. On piping exposed to public view, locate insulation and cover seams in least visible locations

G. Continue insulation through walls, sleeves, pipe hangers and other pipe penetrations

H. Finish insulation at supports, protrusions and interruptions. No hangers or supports shall be embedded in insulation. Do not insulate expansion bellows.

I. Elastomeric Tubing

1. Provide insulation
2. Butt edges neatly. Seal longitudinal and transverse joints with adhesive to maintain minimum vapor permeance. Adhesive shall be selected and applied in accordance with insulation manufacturer's recommendations.
3. Apply additional jacket as specified

J. For exterior applications, provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and

finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

K. Perform work at ambient and equipment temperatures as recommended by adhesive manufacture

L. Protection: Protect against dirt, water, chemical, or mechanical damage before, during, and after installation. Repair or replace damaged insulation at no additional cost

M. Paint all insulation exposed to ultraviolet light (sunlight); see Paragraph 1.7J.2

N. All vapor barriers shall be continuous. Tears, holes, staples, etc. shall be coated with vapor barrier mastic and patch with facing or tape.

O. Joints between insulation and access shall be sealed with vapor barrier mastic

P. See Section 23 31 17 – Ducts

3.3 EQUIPMENT INSULATION

A. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Secure insulation to equipment with bands, welded-on anchors, ties or adhesive. Where access to equipment is required for testing or maintenance the insulation shall be installed so that it is removable and so that the vapor barrier can be remade after access.

B. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor barrier cement.

C. For cold equipment or equipment containing fluids below ambient temperature

1. Insulate entire system
2. Provide vapor barrier jackets, factory applied or field applied.
3. Finish with glass cloth and vapor barrier adhesive
4. Cover with aluminum jacket where specified

D. For equipment containing fluids above ambient temperature

1. Insulate entire system
2. Provide standard jackets, with or without vapor barrier, factory applied, or field applied.
3. Finish with glass cloth and adhesive
4. Cover with aluminum jacket where specified
5. For hot equipment containing fluids 140 degrees Fahrenheit or less, do not insulate flanges and unions, but bevel and seal ends of insulation
6. For hot equipment containing fluids over 140 degrees Fahrenheit, insulate flanges and unions with removable sections and jackets

E. Finish insulation at supports, protrusions, and interruptions

F. For equipment in mechanical equipment rooms or in finished spaces, finish with aluminum jacket

G. Do not insulate over nameplate or ASME stamps; bevel and seal insulation around such

H. General

1. Apply insulation with edges tightly butted
   a. Joints staggered and secured in place by steel bands
   b. Where necessary weld on suitable anchors
2. Seal with 520 adhesives.

I. Special considerations

1. Chiller heads: removable and replaceable covers to allow tube removal
2. Strainers and suction diffusers: removable and replaceable covers to allow strainer removal
3. Pumps: removable and replaceable covers to allow impeller replacement
4. Provide sufficient clearance around openings for normal operation of equipment

## 3.4 DUCT & PLENUM INSULATION

A. Duct Insulation Type and Thickness Schedule

| Location | Cooling or Heat/Cool Supply | Heating-only Supply | Return |
|---|---|---|---|
| Outdoors | 2 inches 1.5 pounds per cubic foot AL or RAL | 2 inches 1.5 pounds per cubic foot AL or RAL | 2 inches 1.5 pounds per cubic foot AL or RAL |
| Concealed in ceiling or return air plenum | 1.5 inches DW-V | 1.5 inches DW-V | – |
| In unconditioned spaces | 1.5 inches DW-V | 1.5 inches DW-V | 1.5 inches DW-V |
| Exposed within conditioned space | – | – | – |
| Lined duct on drawings (unless otherwise noted) | 1 inch 1.5 pounds per cubic foot AL or RAL | 1 inch 1.5 pounds per cubic foot AL or RAL | 1 inch 1.5 pounds per cubic foot AL or RAL |

| Location | Cooling or Heat/Cool Supply | Heating-only Supply | Return |
|---|---|---|---|
| Terminal cans | 0.5 inches 1.5 pounds per cubic foot AL | 0.5 inches 1.5 pounds per cubic foot AL | 0.5 inches 1.5 pounds per cubic foot AL |
| Flex duct | By manufacturer | By manufacturer | By manufacturer |

## 3.5 NON-INSULATED DUCTWORK

A. No insulation required for ducts so indicated in Duct Insulation Type and Thickness Schedule, plus

1. Exhaust ducts, unless shown to be lined
2. Return air ducts in conditioned spaces, unless shown to be lined
3. Outside air ducts

B. Do not line ducts

1. Where prohibited by codes
2. Shower exhaust

## 3.6 INSULATION INSTALLATION

A. General

1. Ensure that insulation is continuous through inside walls: See Section 23 05 48- Vibration and Seismic Controls for HVAC Piping & Equipment
2. Finish insulation neatly at hangers, supports and other protrusions
3. Locate insulation joints or cover seams in least visible locations
4. Where ducts run in groups too close to be individually insulated and finished
   a. Completely fill all spaces between ducts with rigid or flexible insulating material
   b. Insulate and finish exterior surfaces of group as specified for particular service
5. Where ducts cannot be insulated after erection, insulate prior to installation
6. Where specified thickness of insulation and/or lining exceeds available thickness in single layer, provide insulation and/or lining in 2 or more layers with joints staggered
7. Preparation
   a. Do not install covering before ductwork and equipment has been tested and reviewed

b. Ensure surface is clean and dry prior to installation
c. Ensure insulation is dry before and during application

8. Mechanical fasteners
   a. Use spot weld anchors in all shop fabricated internally lined ducts
   b. Adhered anchors
   c. Clip off pin penetrations flush with insulation surface or facing
   d. Seal pins and washers where pins penetrate vapor barriers
      1) With 4 inch square pieces of vapor barrier material to match facing
      2) Adhere with vapor seal adhesive
   e. Spacing on rectangular ducts
      1) Typical of horizontal and vertical, unless otherwise specified
      2) Duct board
         a) 3 inches in from edges
         b) Intermediate fasteners: 12 inches on counter maximum spacing all directions
         c) Not less than four pins per surface
      3) Duct wrap

| Side Dimension | Maximum Spacing |
|---|---|
| 24 inches and under | None required. |
| 25 to 32 inches | Horizontal - none.<br>Vertical: 1 row centered, 12 inches on center |
| 33 to 48 inches | 2 rows, 12 inches on center. |
| 49 to 60 inches | 3 rows, 12 inches on center. |
| 61 inches and over | 16 inches on center, all directions. |

      4) Duct wrap spacing applicable to flat surfaces of flat oval ducts
9. Provide 24 gauge sheet metal Z section frames over edges of duct and plenum lining
   a. At access openings and doors
   b. Along edges exposed to air flow

B. Rectangular Duct Wrap

1. Without vapor barrier
   a. Comply with published recommendations of manufacturer and with following
   b. Secure with 4 inch strips of adhesive, 8 inches on center
   c. For rectangular ducts 24 inches and wider, secure to bottom of duct with mechanical fasteners 18 inches on center
   d. Wrap with 18 gauge galvanized wire, 16 inches on center
2. With Vapor Barrier

a. Vapor barrier and sealing continuous without breaks. Vapor proof seal around supports and bracing
b. 2 inches lap strip at one end
c. Peel insulation for 2 inch lap strip along longitudinal joints
d. Seal lap strips with vapor seal adhesive; Foster's 85-60 or equal

C. Round Duct Wrap

1. General
   a. Adhere flexible insulation to ductwork with adhesive applied in 6 inch wide strips on 16 inch centers
   b. Provide 16 gauge annealed tie wire tied, spiral wound or half hitched at 16 inch centers
   c. Overlap insulation 2 inches and seal joints and breaks with 2 inch lap of foil adhered over joint
2. Apply duct wrap with vapor barrier as specified above for rectangular ducts

D. Duct Board

1. Comply with published recommendations of manufacturer
2. Secure on top, sides and bottom of duct with mechanical fasteners, spacing as scheduled
3. Secure with 4 inch strips of adhesive, 8 inch on center

E. Rectangular Duct and Plenum Lining

1. Comply with SMACNA Duct Liner Application Standard, published recommendations of manufacturer, and following:
2. Apply adhesive over 100 percent of surfaces to be lined
3. The coated surface shall face air stream
4. Surface adjacent to air flow, including at joints, to be uniformly flat
5. Insulation on floors of plenums and large ducts where access is required shall be protected by wire mesh so that lining is not damaged when walked or crawled on.
6. Blank-Off Panels: Insulation, enclosed with sheet metal on all sides; all joints with vapor barrier mastic and taped
7. Volume Dampers: Where volume dampers do not allow for continuous insulation, terminate insulation clear of handle sweep and finish edges to maintain vapor barrier and to prevent damage to the insulation
8. Seal butt joints and exposed edges of liner to prevent erosion
9. Edges at terminal points shall be provided with metal beading and heavily coated with adhesive
10. Damaged areas replaced or heavily coated with adhesive
11. Mechanical fasteners
    a. Use weld pins
    b. Install mechanical fasteners

1) Weld pins flush with liner surface. Weld pins spaced maximum of 12-inch on center in both directions and within 2 inches of all corners and joints, except where SMACNA Standard requires closer spacing
2) Within 2 inches of all edges
3) Minimum 4 pins per side
4) For field alterations of lined ducts, install adhesive and glued pins with washers. Clip-off pins after washers installed. Field installed pins shall be used for unusual conditions only and shall not exceed 1 percent of total pins.

3.7 PENETRATIONS THROUGH RATED WALLS

A. Refer to drawings for penetrations of rated assemblies.

B. Install per manufacturer's installation and listing requirements.

3.8 FIELD QUALITY CONTROL

A. Repair separation of joints or cracking of insulation due to thermal movement or poor workmanship

B. All vapor barriers shall be continuous; tears, holes, staples, etc. shall be coated with vapor barrier mastic and patch with facing or tape.

END OF SECTION 23 07 00

**SECTION 23 08 00**
**COMMISSIONING OF HVAC**

PART 1 - GENERAL

1.1 SUMMARY

A. Commissioning of selected systems and equipment specified under Division 23 Mechanical

B. Acceptance Testing per California Title 24, Part 6 Building Energy Efficiency Standards

C. Related Sections

1. Section 23 05 93 –Testing, Adjusting and Balancing for HVAC

1.2 COMMISSIONING SCOPE

A. Fully commission the following equipment and systems

1. Fan-coils
2. Air distribution systems
3. Exhaust fans

1.3 TITLE 24 ACCEPTANCE TESTING SCOPE

A. Provide acceptance testing and documentation for the following tests and systems.

1. Constant Volume Systems Outdoor Air Acceptance
   a. All constant volume packaged single zone units
   b. All fan-coil units
2. Air Distribution Acceptance – Duct Construction
   a. All duct systems
3. Air Distribution Acceptance – Duct Leakage Testing
   a. All duct systems

1.4 RESOURCES

A. Provide required personnel with tools and equipment necessary to perform testing specified in this Section.

B. Provide equipment factory representative for startup work as necessary or as specified.

1. For Products specified by association or trade standards, comply with requirements of referenced standard, except when more rigid requirements are specified or are required by applicable codes.
2. Applicable date of each standard is that in effect as of date on proposal or date on Contract where no proposal is available, except when a specific date is specified.

PART 2 - PRODUCTS

2.1 GENERAL

A. Products and materials shall be as described in related sections.

PART 3 - EXECUTION

3.1 GENERAL

A. All tests and readings during the equipment and system start ups shall be recorded with signature of the Contractor's technician performing work and date work was performed.

B. Verify that operational manual/procedures are complete, on-site, and fully reviewed by Contractor's start-up technician prior to start-up and testing.

3.2 START-UP & INITIAL CHECKOUT

A. The Contractor shall follow the start-up and initial checkout procedures specified for each system and piece of equipment.

B. Inspect equipment and confirm that it is clean and ready for operation with all shipping tags and restraints removed.

C. This work shall be performed by the Contractor with the assistance of factory personnel where specified.

D. All tests and readings during the equipment and system start ups shall be recorded with signature of the Contractor's technician performing work and date work was performed.

3.3 COMMISSIONING

A. Participate as a member of the Commissioning Team

1. Commissioning Team, Commissioning Coordinator, Commissioning Schedule, and System/Equipment Matrix are defined in Section 23 0800 – Commissioning of HVAC
2. Assist the Commissioning Coordinator in the creation and maintenance of the Commissioning Schedule and System/Equipment Matrix.

3. Provide regular feedback to the Commissioning Coordinator as to the status of tasks identified in the Commissioning Schedule.
4. Attend Commissioning Team Meetings.

B. Pre-Functional Tests

1. Prepare pre-functional checklists for each piece of equipment and each system listed in Paragraph 1.13 using forms listed at the end of this Section. Where forms are not provided, prepare appropriate forms and submit to the Owner's Representative for review. Contractor may also use their own forms if they are submitted and approved by the Owner's Representative.
2. Verify that pre-functional testing is complete prior to startup.
3. Provide all materials and labor, including testing and inspection, to complete the pre-functional checklists.
4. Collect checklists and submit to the Owner's Representative for review and approval.
5. Address Owner's Representative punch list items before functional testing begins.

C. Startup: Start and test all equipment per manufacturers' installation instructions

D. Testing, Adjusting and Balancing:

1. See Section 23 05 93 – Testing, Adjusting and Balancing.
2. Complete test and balance of all air or hydronic systems, including spot checks, with discrepancies and problems remedied before functional testing begins.

E. Functional Testing

1. Review functional test procedures to ensure feasibility, safety and equipment protection and provide revisions deemed to be necessary in writing to Commissioning Coordinator.

3.4 TITLE 24 ACCEPTANCE TESTING

A. The Contractor shall be responsible for providing all necessary instrumentation, measurement, and monitoring, and performing all required acceptance requirement procedures in accordance with Title 24 Building Energy Efficiency Standards and Appendix NJ of the Title 24 Non-Residential ACM Manual.

B. The Contractor shall be responsible for correcting all performance deficiencies and again implementing the acceptance requirement procedures until all specified systems and equipment are performing in accordance with the Standards.

C. The Contractor shall be responsible for documenting the results of the acceptance requirement procedures including paper and electronic copies of all measurement and monitoring results. The Contractor shall be responsible for performing data analysis, calculation of performance indices and crosschecking results with the requirements of the Standard.

D. The Contractor shall be responsible for preparing and issuing a Certificate of Acceptance for each test for each system. Each Certificate of Acceptance shall include the Contractor's signature and California License number.

E. For test procedures, see Appendix NJ of the Title 24 Non-Residential ACM Manual. For test forms, see the 2005 Nonresidential Compliance Manual. Both are available at: http://www.energy.ca.gov/title24/2005standards/index.html

3.5 TRAINING

A. General:

1. Comply with Training section in Division 1.
2. Training shall cover all systems and equipment that require expertise to operate and maintain including but not limited to training specified under individual Division 15 Sections.

B. Training Sessions

1. Engage a qualified trade or manufacturer's representative to provide the instructions on each major piece of equipment. This trainer may be the start-up technician for the piece of equipment, the installing contractor, or a manufacturer's representative. Where required by individual Division 23 Sections, trainers shall be factory-trained and authorized. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment is required. More than one party may be required to execute the training.
2. Start training with classroom sessions followed by hands-on training on each piece of equipment.
    a. Classroom training shall use slides, drawings, and O&M manuals to cover as a minimum:
        1) The equipment's specific location in the building and in the mechanical system
        2) Purpose and mechanical function of the equipment
        3) A brief working knowledge of the operating theory of the equipment
        4) Submittal drawings, catalog data, and O&M manual content and organization
        5) Available parts lists, including recommendations regarding parts that should be readily available and stored on site

6) Local representatives for service, parts, and repair, including contact information
7) Startup, shutdown, normal operation, and emergency operating procedures
8) Safety and emergency procedures including proper precautions when around equipment
9) Daily, weekly, monthly, quarterly, semiannual and annual routine preventative maintenance requirements and procedures
10) Required equipment exercise procedures and intervals
11) Normal and major repair procedures
12) Equipment inspection and troubleshooting procedures including the use of applicable test instruments
13) Routine and long-term calibration procedures

b. Hands-on training shall be on-site and use O&M manuals as a guide to cover as a minimum:
1) Location of equipment
2) Piping connections and flow directions
3) Valves, including control and flow balancing valves, and their purpose
4) Instrumentation and controls, and interpretation of displayed information
5) Perform startup and shutdown procedures
6) Identify location of all related equipment power disconnect switches, fuses and circuit breakers
7) Perform required equipment exercise procedures
8) Demonstrate and perform standard operating procedures and checks
9) Perform routine preventative maintenance activities including mechanical and electrical adjustments and calibration
10) Perform routine disassembly and assembly of equipment if applicable
11) Identify and review safety items and perform safety procedures

C. Training Duration and Schedule

1. The length and quantity of training sessions will depend on the complexity of the system and equipment. Minimum training shall be 40 hours, but period shall be longer if required to complete the training tasks described herein and in individual Division 23 Sections.
2. Training sessions shall be scheduled with classroom sessions interspersed with hands-on field instruction in logical sequence.
3. Unless otherwise approved by Owner’s Representative, training for a given system or piece of equipment shall be conducted on consecutive days with no more than 6 hours of training scheduled for any one day.
4. Training Plan Submittals & Timing

a. Develop a preliminary training plan outline and schedule of training dates and submit to the Owner's Representative for review and approval a minimum of 60 days before the planned training sessions.
b. Once the training plan outline is approved, submit one complete set of lesson plans, training manuals, handouts, visual aids and reference material organized in tabbed binder(s) to the Owner's Representative for review and approval a minimum of 30 days before the planned training sessions.
c. Provide training materials to Owner's Representative 7 days before the planned training sessions. Provide one set of materials for each trainee as directed by Owner, up to a maximum of 10 copies. Additional copies shall be provided at the cost of reproduction without mark-up if requested by Owner's Representative.

5. Provide final training materials in electronic format.

3.6 COMMISSIONING REPORTS

A. For each piece of equipment or system listed in paragraph 1.13 of this Section, provide the following where applicable

1. Duct Pressure Test Reports. See Section 23 31 17 – Ducts
2. Pre-Functional Test Reports
3. Start-up and Factory Test Reports
4. Testing, Adjusting, and Balancing Report. See Section 23 05 93 – Testing, Adjusting and Balancing for HVAC
5. Training Manuals: See Division 1 – Training

B. Provide reports to Owner's Representative in quantities and format specified in Section 23 08 00 – Commissioning of HVAC.

PUMP PRE-FUNCTIONAL TEST DATA SHEET PUMP TAG _____

DUCT SYSTEM PRE-FUNCTIONAL TEST DATA SHEET

DUCT SYSTEM NAME _____

| DUCT SYSTEM DATA | | | | |
|---|---|---|---|---|
| | AS DESIGNED | AS FOUND/ TESTED | ACTION REQUIRED | DONE |
| DUCT MATERIAL | | | | |
| INSULATION MATERIAL | | | | |
| INSULATION THICKNESS | | | | |

| DUCT SYSTEM DATA | | | | |
|---|---|---|---|---|
| | AS DESIGNED | AS FOUND/ TESTED | ACTION REQUIRED | DONE |
| LEAKAGE TEST PRESSURE | | | | |
| PRESSURE TEST FAN Hz | | | | |

| INSTALLATION | | | |
|---|---|---|---|
| | AS FOUND | ACTION REQUIRED | DONE |
| SPRING HANGERS WHERE SPECIFIED | | | |
| SEISMIC SUPPORTS INSTALLED PER SPEC'S | | | |
| LONGITUDINAL DUCT JOINTS SEALED | | | |
| TRANSVERSE DUCT JOINTS SEALED | | | |
| DUCT PENETRATIONS SEALED | | | |
| DUCT INSULATION COMPLETED AND VAPOR BARRIERS SEALED | | | |
| FLEXIBLE DUCT CONNECTIONS INSTALLED PROPERLY | | | |
| FLEXIBLE DUCTS INSTALLED WITH NO KINKS | | | |
| MANUAL DAMPERS LEFT OPEN PRIOR TO BALANCE | | | |
| DUCT PRESSURE TESTS PERFORMED AND PASSED | | | |
| DUCT LEAKAGE TESTS PERFORMED AND PASSED | | | |

| | | | |
|---|---|---|---|
| AS FOUND CHECKED BY | | DATE: | |
| REMEDIAL ACTION CHECKED BY | | DATE: | |

FAN COIL UNITS PRE-FUNCTIONAL TEST DATA SHEET UNIT TAG _____

| FAN COIL UNITS DATA | | | | |
|---|---|---|---|---|
| | AS DESIGNED | AS FOUND | ACTION REQUIRED | DONE |
| MANUFACTURER | | | | |
| MODEL NO. / SIZE | | | | |
| SERIAL NO. | | | | |
| VIBRATION ISOL MANUF. | | | | |
| VIBRATION ISOLATION TYPE/DEFLECTION | | | | |

| MOTOR DATA (FAN POWERED) | | | | |
|---|---|---|---|---|
| | AS DESIGNED | AS FOUND | ACTION REQUIRED | DONE |
| MANUFACTURER/MODEL | | | | |
| SERIAL NO. | | | | |
| TYPE | | | | |
| H.P./RPM | | | | |
| VOLTS/PHASE | | | | |

END OF SECTION 23 08 00

**SECTION 23 09 00**
**INSTRUMENTATION & CONTROL FOR HVAC**

PART 1 - GENERAL

1.1 SUMMARY

A. General:

1. Provide labor, equipment, and materials for a complete installation and property operating control system. Temperature control systems shall be designed and provided by temperature control contractor, Automatic Control & Engineering, Inc., Johnson Controls, or equal. Provide complete engineering/detailed control drawings showing all devices, terminal numbers, schedules, legends, labels, etc., as required to properly display the systems to be installed and to allow easy troubleshooting in the future. The diagrams shall also indicate set points, throttling range, integral setting, ratios, and all other switch settings and adjustments.
2. Apartment Thermostat Garden/High-density Wood Frame: Honeywell Pro 2000 Programmable thermostats. Mount thermostats at 46" max. to the top.
3. Common Area Thermostats Provide lock boxes over common area thermostats.

1.2 ELECTRICAL CHARACTERISTICS

A. General:

1. Automatic temperature controls, control and instrumentation equipment, automation equipment, and installation of electric/electronic control. Provide system of controls that will completely accomplish implied or intended functions of control system as shown on Drawings and as specified.

1.3 SUBMITTALS

A. Include manufacturer's certified rating data, description literature, catalog cuts, and shop drawings, for proposed:

1. Control devices and equipment.
2. Control dampers and valves.
3. Control panels.
4. Programmable Thermostat.

B. Include control and interlock wiring diagrams and descriptions on operation of all control systems and their effect on other equipment and systems.

C. A review of any submittal, which results in a requirement for Contractor to resubmit, shall not be justified basis for work delay or additional compensation.

D. Arrange a non-disclosure agreement with the manufacturers to permit the Owner to obtain and use documentation on the system of software.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Honeywell.

B. Johnson Controls.

C. KELE.

D. Or Equal.

2.2 MATERIALS

A. It is the intention of this portion of the specifications to set a minimum standard of quality for all equipment and devices used in the control system and at the various control panels. All hardware employed within this system shall be of the "first quality" grade. Equipment shall be selected on the basis of durability, serviceability and function. Provide only UL listed equipment.

B. The equipment furnished under this section of the specifications shall be supplied as a complete system produced under the responsibility of the controls contractor utilizing all the various components specified to meet the function and accuracies described within this section of the specifications.

C. All conduit required for controls shall be furnished and installed by the controls contractor. All wiring required for controls shall be furnished and installed by the controls contractor.

2.3 AUTOMATIC TEMPERATURE CONTROL EQUIPMENT

A. Programmable Thermostats:

All programmable thermostats are required to have the capability to be programmed for temperature operation in the occupied mode and the unoccupied mode. Separate heating and cooling set points and auto-changeover capability allow occupied and unoccupied programming for extreme temperature control and for energy savings.

The occupied mode is required to be activated before heating and cooling set points can be maintained.

Both the heating and cooling set points shall be independently adjustable in such a manner that the temperature difference between heating and cooling set points develops an energy dead band of 5 degrees. When the space temperature is within the dead band, neither heating nor cooling energy is added to the space. The supply fan runs continuously during occupied mode.

B. Electric solid state microcomputer based wall mounted room thermostat, located as indicated at a height of 46 inches to top above the floor.

C. Room thermostat shall incorporate:

1. Automatic switching from cooling to heating.
2. Short cycle protection.
3. Programming based on weekdays, Saturday, and Sunday.
4. Switch selection features including fan-on auto switch.

D. Protective Guards: Provide on all controllers or transmitters in corridors, lobbies, meeting rooms, common areas accessible to all residents, instruction rooms and similar areas with vandal proof screws and finished in clear plastic.

E. Smoke Detectors: Powered by Division 16 furnished and installed in ducts or equipment by Division 15.

F. Electrical Wiring: Beyond that furnished under Division 16, provide herein as necessary to accomplish the intent and operations called out. All conduit required for controls shall be furnished and installed by the controls contractor. All wiring required for controls shall be furnished and installed by the controls contractor.

G. Nameplates: Secure to all switches, indicating lights and control devices (self-tapping screws or bolts) to identify the items. Provide engraved laminated plastic, black nameplates with white letters.

2.4 TRAINING

A. Provide two hours of operation and maintenance training for Owner's personnel.

PART 3 – EXECUTION (Not Used)

END OF SECTION 23 09 00

# SECTION 23 21 55
# REFRIGERANT PIPING

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES

A. Piping.

B. Refrigerant.

C. Moisture and liquid indicators.

D. Valves.

### 1.2 RELATED SECTIONS

A. Section 23 33 00 Air Duct Accessories

### 1.3 REFERENCES

A. UL - Underwriters Laboratory.

### 1.4 SUBMITTALS

A. Include product data on pipe materials, pipe fittings, valves and accessories.

B. Include schedule indicating manufacturer, model number, size, location, rated capacity and features for each specialty.

### 1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver and store piping and specialties in shipping containers with labeling in place.

B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until use.

## PART 2 - PRODUCTS

### 2.1 PIPING

A. Copper Tubing: Type ACR, hard drawn.

1. Fittings: Wrought copper with long radius elbows.
2. Joints: Solder, Grade 95TA.

### 2.2 REFRIGERANT

A. R-410A.

2.3 MOISTURE AND LIQUID INDICATORS

A. Single port type, UL listed with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap.

2.4 REFRIGERANT FILTER DRIER

A. One direction flow for air conditioners with molded porous core to remove moisture and foreign matter from the refrigerant stream.

2.5 VALVES

A. Diaphragm Packless Valves (Sizes 1-1/8 Inch and Smaller): UL listed, globe or angle pattern, forged brass body and bonnet, phosphor bronze and stainless-steel diaphragms, rising stem and handwheel, stainless steel spring, nylon seat disc, solder or flared ends with positive back-seating; for maximum working pressure of 500 pounds per square inch and maximum temperature of 275 degrees F.

B. Packed Angle Valves (Sizes Over 1-1/8 Inch): Forged brass, forged brass seal caps with copper gasket, rising stem and seat with back-seating, molded stem packing, solder, or flared ends; for maximum working pressure of 500 pounds per square inch and maximum temperature of 275 degrees F.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs and clean joints bright with fine sandpaper and steel wool.

B. Remove scale and dirt on inside and outside before assembly.

3.2 INSTALLATION

A. Install refrigeration specialties in accordance with manufacturer's instructions.

B. Route piping in an orderly manner, plumb and parallel to building structure and maintain gradient. Install piping in accordance with the recommendations of the refrigeration equipment manufacturer, including pipe sizes, refrigerant system evacuation and leak testing.

C. Install piping to conserve building space and not interfere with use of space.

D. Group piping whenever practical at common elevations and locations. Slope piping 1 percent in direction of oil return.

E. Provide non conducting dielectric connections when joining dissimilar metals.

F. Install piping to allow for expansion and contraction without stressing pipe, joints or connected equipment.

G. Provide clearance for installation of insulation and access to valves and fittings.

H. Provide access to concealed valves and fittings.

I. Prepare pipe, fittings, supports and accessories not prefinished ready for finish painting.

J. Insulate all liquid and suction piping.

3.3 APPLICATION

A. Provide line size liquid indicators in main liquid line leaving condenser, or if receiver is provided, in liquid line leaving receiver.

B. Provide replaceable cartridge filter driers vertically in liquid line adjacent to receivers with three valve bypass assembly to permit isolation of driers for servicing.

C. Provide refrigerant charging (packed angle) valve connections in liquid line between receiver shut off valve and expansion valve.

D. Utilize flexible connectors at or near compressors where piping configuration does not absorb vibration.

END OF SECTION 23 21 55

**SECTION 23 31 17**
**DUCTS**

PART 1 - GENERAL

1.1 SUMMARY

A. Work included in this section: materials, equipment, fabrication, installation, and tests in conformity with applicable codes and authorities having jurisdiction for the following:

1. Ductwork
2. Plenums
3. Fasteners and Sealants
4. Exceptions: Where integral with manufactured piece of equipment

B. Related Sections

1. Section 23 00 50 – Basic Mechanical Materials and Methods
2. Section 23 08 00 – Commissioning of HVAC.

1.2 REFERENCE STANDARDS

A. SMACNA HVAC Duct Construction Standards, latest edition

1.3 DEFINITIONS

B. Seam: locks or weld applied longitudinally to close section of duct, for example longitudinal seam, spiral seam.

C. Joint: abutting connection between duct sections for continuity of air passage, for example cross joint, transverse joint, coupling.

D. Reinforcement: hardware applied to strengthen duct, for example girth angles, tie rods, fasteners (not connectors), and the like.

E. Stiffening: folding, bending, beading, cross breaking or corrugating of sheets to achieve strength through shape, for example pocket lock secures joint and is transverse stiffener, with girth angle and fasteners applied (not connectors), joint or stiffener is reinforced.

F. Duct Classification

1. Velocity
   a. Low: to 1750 feet per minute
   b. High: above 1750 feet per minute

2. Pressure classification: except as indicated on the Drawings
   a. Low: to 2 inches water gage

b. Medium: above 2 inches to 6 inches water gageUL - Underwriters Laboratory.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements

1. Entire ductwork system, including materials and installation, installed in accordance with NFPA 90A
2. Ductwork and components shall be listed as U.L. 181, 181A and 181B, Class I air duct, flame rating not to exceed 25 and smoke rating not to exceed 50.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Named manufacturer model numbers used as example of item and establish minimum level of quality and minimum standard options. Equivalent models of listed manufacturers are acceptable.

B. Spiral oval and round ducts

1. United Sheet Metal Division, United McGill
2. Semco Manufacturing, Inc.
3. Metco
4. Contractor fabricated
5. Or equal

C. Duct Connection Systems

1. Ductmate Industries, Inc.
2. Fabriduct Transverse Duct Connection system
3. Ward Industries, Inc.
4. Or equal

D. Flexible Connections

1. Ventfabrics
2. Duro Dyne
3. Or equal

E. Flexible Ducts

1. Thermaflex
2. ATCO Rubber Products, Inc.
3. Hart & Cooley

F. Or equal

G. Duct Sealants

1. Minnesota Mining and Manufacturing Company
2. Foster Products Corporation
3. Miracle Adhesive Corporation
4. United Sheet Metal Division United McGill Corporation
5. Hardcast Corporation, Inc.
6. Mon Eco Industries
7. Nashua
8. 3M
9. Or equal

H. Flexible Duct Clamps

1. Panduit
2. Aeroquip Corporation
3. Ideal Division Parker Hannifin Corporation
4. Tridon Corporation
5. Young Regulator Company
6. Or equal

I. Spin-in Fittings

1. Young & Company, Manufacturing
2. Modular Metals
3. Or equal

J. Flue

1. Selkirk Metalbestos
2. Ampco
3. Metal-Fab, Inc.
4. American Metal Products Amerivent
5. Simpson Dura-Vent
6. Or equal

2.2 MATERIALS

A. Galvanized Steel Sheet Metal

1. Cold rolled soft steel sheets
2. ASTM 526-64T
3. Galvanizing: 1-1/4 ounces per square foot, total both sides
4. Lock-forming quality

B. Miscellaneous Products

1. Screws and rivets
   a. Same material as sheet, except as indicated on the Drawings
   b. On aluminum sheets, provide cadmium plated or stainless steel
   c. Zinc or cadmium plated, permitted on galvanized sheets
   d. Minimum screw size: No. 10
   e. Minimum rivet size: 4 pound

2. Duct Sealants
   a. Sealing compound: Safetee Duct Sealant 32-17, Foster Products Corporation, Design Polymerics DP-1010, or equal
   b. Tape: Nashua or equal, comply with UL 181B
   c. Gaskets
      1) Continuous, reinforced, inert self-conforming type
      2) 1/8 inch thick
      3) Width: to match angle connection.
      4) 3M Weatherban Ribbon Sealant PF5422 or equal

3. Hard-setting joint tape, two-part
   a. Two part tape
   b. Mineral impregnated woven fiber tape
   c. Impregnated with activator/adhesive of polyvinyl acetate type
   d. UL Listed
   e. Flame spread: 10
   f. Smoke contributed: 0
   g. Equal to Hardcast RTA-50 sealant and DT-5400 4 inch tape

4. Spring Fasteners
   a. Oval head stud and receptacle
   b. Screwdriver slot
   c. Self-ejecting
   d. Dzus or equal

5. Angles, tie rod and shapes for reinforcing ducts: In accordance with SMACNA HVAC Duct Construction Standards, except as indicated on the Drawings

6. Duct connection system
   a. Transverse bolted duct joints
   b. Flanges with permanent, non-hardening sealant
   c. Ductmate Industries Ductmate 25 and 35, Fabriduct TDC, or equal

C. Flexible Connections

1. Conforming to UL Standard No. 214 and NFPA 90A

2. SMACNA HVAC Duct Construction Standards, except as indicated on the Drawings

3. With metal edges at each end: No. 24 USSG galvanized steel

4. Length of fabric connections
   a. Minimum: 4 inch
   b. Maximum: 10 inch

5. Materials
   a. Coated glass fabric
   b. Flame spread rating: 25
   c. Smoke development rating: 50
   d. 30 ounces per sq yard
   e. Sewed and cemented seams
   f. Indoors
      1) Neoprene
      2) Ventfabrics, Inc. Ventglas or equal
   g. Outdoors
      1) Weather-resistant
      2) Fiberglass with Hypalon
      3) UV, sunlight, and ozone resistant
      4) Ventfabrics, Inc. Ventlon or equal
   h. Fume Hood
      1) Fabric coated with Teflon fluorocarbon resins
      2) Meets UL Standard #214 for flammability and NFPA 102 requirements
      3) Ventfabrics, Inc. Ventel or equal

D. Turning vanes

1. Galvanized steel ductwork: galvanized steel or painted black steel, except as indicated on the Drawings

2. Other ductwork: same material as ductwork

3. Construction per SMACNA HVAC Duct Construction Standards for
   a. Single wall vanes with 3/4 inch trailing edge
   b. Double wall vanes: Not acceptable
   c. Vane length: Provide separate equal size sections for vane length greater than those indicated in referenced Standards.
   d. Vane runners: Type 1 or 2 acceptable

4. Vane radius
   a. 2 inch radius: duct width up to 36 inches
   b. 4-1/2 inch radius: duct with 36 inches or larger

E. Low pressure round duct take-off fittings in rectangular duct

1. Factory-fabricated spin-in fitting

2. Die-formed galvanized steel

3. Balancing damper
   a. Spring loaded
   b. Locking regulator
   c. Sealed at both ends to prevent leakage
   d. No scoop allowed for any application
   e. Noll Manufacturing, Young Manufacturing or equal

## 2.3 ROUND AND OVAL DUCTWORK

A. General

1. Factory- or shop-fabricated spiral lock seam duct
   a. No snap lock
   b. Factory-fabricated longitudinal seam acceptable for ducts larger than standard factory sizes

2. Fittings
   a. Same material and construction as duct in which installed
   b. For ductwork exposed to occupant view, do not use fabricated fitting at taps to VAV boxes and outlets. Instead use saddle tap cut into continuous spiral duct. Intent is for spiral duct to be continuous for aesthetic reasons.
   c. Tees
      1) 45 degree conical tap
      2) Center-line take-off, unless otherwise indicated on the Drawings
   d. Elbows
      1) Seams
         a) 4 inch and higher pressure class and all ducts exposed to occupant view: continuously welded seams
         b) 1 inch to 3 inch pressure: spot welded with bonded seams
         c) Adjustable elbows with sealed gores acceptable 1 inch pressure class and below and where concealed from occupant view
      2) Gores
         a) 2 gores - less than 35 degrees
         b) 3 gores - 36 degrees through 71 degrees
         c) 5 gores - over 71 degrees

## 2.4 FLEXIBLE DUCTS

A. Flexible ducts

1. Use only where indicated on the Drawings

2. UL 181, Class I Air Duct

3. Labeled for compliance with CMC

4. Minimum working pressure
   a. 0 to 4 inch positive static pressure class: 4 inches
   b. 0 to 1 inch negative static pressure class: 1 inch

5. Insulated Flexible Duct
   a. Chlorinated polyethylene (CPE) inner liner duct permanently bonded to a vinyl or zinc coated spring steel wire helix
   b. Fiberglass insulating blanket; minimum R-value
      1) Ducts outside the conditioned space and in conditioned envelope: 4.2
      2) Ducts outside conditioned space and conditioned envelope: 8.0
   c. Low permeability outer vapor barrier of fiberglass bi-directional reinforced metallized film laminate
   d. Thermaflex M-KE or equal

6. Uninsulated Flexible Duct
   a. Woven fiberglass fabric with flame retardant coating permanently bonded to a vinyl or zinc coated spring steel wire helix
   b. Thermaflex S-LP-10 or equal

B. Flexible ductwork clamps

1. Straps listed for use with flexible ductwork

2. 2 inches and greater SP Class: Galvanized steel strap
   a. Adjustable toggle type
   b. Young Quick-Clamps or equal

3. Less than 2 inches SP class: Adjustable nylon strap
   a. With factory furnished installed tool
   b. Panduit PAN-TY Cable Ties, Heat Stabilized Nylon 6/6

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Coordinate with work of other trades

B. See Section 23 09 00 – Instrumentation and Control for HVAC

C. See Section 23 08 00 – Commissioning of HVAC

### 3.2 MOUNTING AND ALIGNMENT

A. See Section 23 05 48 – Vibration and Seismic Controls for HVAC Piping and Equipment.

## 3.3 DUCT CLASSIFICATION

A. Minimum operating pressure for each duct system, general

1. Scheduled static pressure for each fan or unit, positive or negative, unless otherwise indicated on the Drawings

2. Adjust upward to nearest pressure class tabulated in SMACNA HVAC Duct Construction Standards

B. Static pressure class, unless otherwise indicated on the Drawings

| Application | SMACNA Pressure Class |
|---|---|
| Discharge of air handlers through shaft fire/smoke damper | 3 inches |
| Air distribution duct on each floor | 2 inches |
| Toilet exhaust | -2 inches |
| Other fans systems | Per fan static |
| Return air transfers | 1/2 inch |

## 3.4 DUCTWORK INSTALLATION

A. General

1. Install ducts in accordance with manufacturer's written installation instructions

2. Ductwork exposed to occupant view shall be run straight and true, in line with building elements. No sagging or out-of-true straight runs shall be acceptable. Sidewall taps and duct joints shall be clean and free of visual blemishes. Ducts shall have no external markings or tags.

3. Construct with gages, joints, bracing, reinforcing, and other details per latest CMC, ASHRAE, SMACNA and NFPA, unless specified otherwise
   a. Comply with most stringent
   b. Provide ducts with CMC gages or thicker when traversing rated corridors

4. Construct of galvanized sheet metal, except where otherwise indicated herein or on Drawings

5. Provide for duct rigidity by either of these methods
   a. Beading at 12 inches on center, maximum
   b. Crossbreak outward in ducts having positive internal pressure
   c. Crossbreak inward in ducts having negative internal pressure
      1) Exception: All ducts exposed to rain shall outward crossbreak on top of the duct.

6. Duct dimensions indicated are outside duct dimensions (OD) unless indicated on the Drawings as inside dimension (ID or net, clear dimension).

7. Alter duct sizes on basis of equal friction where required to facilitate installation. Reflect changes in shop drawings for review by Owner's Representative.

8. At duct penetrations of walls, floors and ceilings where exposed to occupant view, provide sheet metal angle type escutcheons with no sharp corners or edges.
   a. Clearance from duct to opening shall not exceed 2 inches
   b. Escutcheons shall overlap wall, floor, or ceiling surface by ½ inch minimum

9. Frame, trim, caulk and seal all duct penetrations through acoustical walls and partitions

10. Tapers
    a. Pitch sides of duct in diverging or converging airflow maximum of 1 to 4 taper
    b. Abrupt, bushing type fitting not allowed

11. Duct openings
    a. Provide openings where required to accommodate thermometers, smoke detectors, controllers, and the like. Insert through airtight rubber grommets.
    b. Where openings are provided in insulated ductwork for insertion of instruments, install insulation material inside metal ring for use as plug.
    c. At fire dampers allow adequate length of duct to install access door.

12. Avoid penetration of ducts; provide airtight seal at unavoidable penetrations of hanger rods

13. No exposed sharp metal allowed
    a. All exposed pins, screws and sharp objects shall be covered with hardening silicon
    b. All exposed sheet metal edges shall be hemmed with exposed corners rounded smooth
    c. Remove all sheet metal fish hooks

14. Install lining in ducts and plenums as specified in Section 23 0700 – HVAC Insulation.

15. Flexible Connections
    a. Coated glass fabric
    b. For indoor or outdoor use

c. Use diaphragm type at plug fan inlets
d. Install at connections to fans and air handling units and as indicated on Drawings
e. 2 inch slack in fabric; install to allow minimum movement of 1 inch in both tension and compression
f. Protect from direct solar and rain exposure with sheet metal shroud where outdoors

16. Volume dampers: Install dampers as specified in Section 23 3300 – Duct Accessories

B. Elbows and Splits

1. Use radius elbows in rectangular ducts unless otherwise indicated on the Drawings: Centerline radius dimension shall not be less than 1-1/2 duct width

2. Where space does not permit duct radius specified above install short radius splitter vanes per SMACNA HVAC Duct Construction Standard
   a. Number of vanes determined by ratio of inner radius (R) to duct width in plane of radius (W)
   b. One vane: Radius to width ratio above 0.3
   c. Two vanes: Radius to width ratio between 0.1 to 0.3
   d. Three vanes: Radius to width ratio 0.1 and smaller

3. Use square turns with turning vanes in rectangular ductwork, unless otherwise indicated on the Drawings, at following locations
   a. Use only where full radius elbow cannot fit
   b. Use only in ducts with 2000 fpm or less design velocity
   c. In medium pressure ductwork spot weld turning vane to duct

C. Rectangular Duct Joints

1. Transverse Joints
   a. In medium pressure ductwork shall be Fabriduct TDC or Ductmate or equal
   b. In low pressure ductwork shall be Fabriduct TDC or equal except that ducts under 19 inches longest side may be slip & drive (S&D)

2. Longitudinal seams shall be Pittsburgh. Snap lock not allowed

D. Round and oval ductwork

1. Joints between ducts
   a. Made with beaded sleeve joints as scheduled
   b. Duct sealer applied to male end
   c. Mechanically fastened with sheet metal screws or pop rivets
   d. Over joint and screw or rivet heads, apply coating of duct sealer.

1) Duct where exposed to occupant view: Sealant shall be within joint only and not visible

2. Joints, duct and fitting
   a. Slip projecting collar of fittings into duct: Per SMACNA HVAC Duct Construction Standard
   b. Apply duct sealer: Seal and tape as specified above
   c. Mechanically fasten: Fastening schedule: Per SMACNA HVAC Duct Construction Standard

3. Junctions between ducts
   a. Branch take-off: 45 degrees or conical 90 degrees
   b. Branch connections to low pressure rectangular ducts may be made with spin-in fittings

4. Horizontal supports
   a. One or two piece clamp band strap
   b. Minimum: one per section
   c. Support fittings as required to prevent sagging

5. Vertical Supports: one of the following
   a. Clamp bands with extended ends supported by floor
   b. Clamp bands with knee bracing
   c. Pedestal at base of vertical

E. Flexible ductwork

1. Continuous, single pieces

2. Length
   a. Medium and high pressure: Not allowed
   b. Low pressure
      1) Maximum 7 feet, except where longer lengths are indicated on drawings. Where longer lengths are shown, the last 3 feet to 7 feet shall be wire flex duct and remaining ductwork shall be aluminum flex duct.
      2) Minimum length: 3 feet

3. End Connections
   a. Connect to duct collars, terminal unit connections and round air outlets per manufacturer's instructions
   b. Secure with strap clamps specified above

4. Installation
   a. Support adequately to avoid excessive droop
   b. Minimum inside bending radius not less than one duct diameter
   c. Install as straight as possible except as shown on drawings for sound attenuation

d. Cut ducts to lengths required rather than create bends to take up excess lengths except as shown on drawings for sound attenuation

F. Grille connections

1. Provide at entry to diffuser collar either
   a. Straight duct for 1 duct diameters or greater
   b. Full radius elbow
   c. Side inlet plenum
      1) Height: 4 inches minimum taller than top of grille to provide room for uniform airflow to grille
      2) Width/length: 2 inches wider than duct or round diffuser collar, whichever is larger
      3) Internal surfaces lined with minimum 1/2 inch thick Type AL duct liner as specified under Section 23 0700 – HVAC Insulation
      4) At contractor's option, where plenum is required at round neck diffuser, square neck diffuser with length and width equal to diffuser diameter may be substituted
   d. Thermaflex FlexFlow Elbow or equal

2. Connections at grilles shall be insulated to the extent the duct is insulated including the final register box.

3. Seal connections at grilles per seal class of upstream ductwork.

G. Duct hangers and supports

1. General
   a. Support horizontal ducts with hangers of size and spacing as indicated in pertinent SMACNA HVAC Duct Construction Standards
   b. Attachment to structure: See Section 23 05 29 – Hangers and Supports
   c. Seismic restraints: See Section 23 05 48 Vibration and Seismic Controls for HVAC Piping and Equipment.

2. Horizontal Duct Supports
   a. Install hangers at each change in direction of duct
   b. Strap hangers
      1) Extend strap down both sides of ducts
      2) Turn under bottom one inch minimum
      3) Metal screw hangers to
         a) Bottom of duct
         b) Upper and lower sides of ducts
         c) Not more than 12 inches on center
   c. Angle hangers
      1) Provide angle hangers formed by extended vertical bracing angles

2) Or by rods connecting to bottom angles if size or bracing angles conform to hanger schedule

d. Vertical duct supports
   1) Support vertical ducts at every floor
   2) Use angles or channels mechanically fastened to ducts with screws or pop rivets.
   3) Set angles or channels on floor slab or structural steel members placed in opening, unless otherwise indicated on the Drawings

H. Ducts exposed to weather

1. Make ducts subject to rain watertight.
2. Construct as follows to assure water run-off
   a. Arrange standing seams to not act as dams
   b. Longitudinal seams at bottom of duct
   c. Construct all ducts subject to rain watertight and to insure water runoff by one or more of following techniques
      1) Slope entire top of duct down toward side.
      2) Vertical struts within duct to bow top panels of duct into convex shape

3. Seal as specified herein.

I. Sound-rated duct packing

1. Wherever possible avoid duct penetrations through sound-rated walls, floors and ceilings.
2. Provide packing for unavoidable duct penetrations per Section 23 05 48 Vibration and Seismic Controls for HVAC Piping & Equipment

J. Joint Sealing

1. Seal ducts per the Seal Levels tables below
   a. Provide more stringent sealing if required to meet requirements of Paragraph 3.6 and 3.7.

| Seal Level Requirement | | | | |
|---|---|---|---|---|
| Duct Location | Duct Type | | | |
| | Supply | | Exhaust | Return |
| | ≤2 in. water column[b] | >2 in. water column[b] | | |
| Outdoors | A | A | C | A |
| Unconditioned Spaces | A | A | C | A |
| Return Air Plenums | A | A | A | C |
| Conditioned Spaces | C | A | A | C |

[b]Duct design static pressure classification.

| Seal Level Definitions | |
|---|---|
| Seal Level | Sealing Requirements |
| A | All transverse joints, longitudinal seams, and duct wall penetrations |
| B | All transverse joints and longitudinal seams |
| C | Transverse joints only |

Longitudinal seams are joints oriented in the direction of airflow. Transverse joints are connections of two duct sections oriented perpendicular to airflow. Duct wall penetrations are openings made by any screw fastener, pipe, rod or wire. Spiral lock seams in round and flat oval duct need not be sealed. All other connections are considered transverse joints, including but not limited to spin-ins, taps and other branch connections, access door frames and jambs, duct connections to equipment, etc.

2. Ducts not exposed to weather: Seal using one of the following:
   a. Duct sealer per Paragraph 2.2D.2.a
   b. Gasketted TDC or Duct-Mate
   c. Flexible duct
      1) Secure with straps or clamps as specified herein.
      2) Supplement with duct tape, both inner and outer liner.

3. Duct exposed to weather

   a. TDC or Duct-Mate joints: Utilize interior joint gasket material plus a bead of butyl rubber sealant at the joint and continuous metal clip or cleat over the top of all four joints (top bottom and sides).

   b. Apply two part hard-setting joint tape to
      1) Horizontal joints
      2) Transverse joints
      3) TDC or Duct-Mate joints
      4) Duct penetrations
      5) Screws through duct

4. Indoor duct where exposed to occupant view: Sealant shall be within joint only and not visible

5. Fire and fire/smoke dampers: Sealant shall be listed as approved on manufacturer's UL installation sheet.
6. Seal punched holes and corner cracks
7. Seal all factory fabricated ducts, including transverse joints on gored elbows
8. Seal end caps
9. After installation and testing reseal joints found to be leaking at no additional cost to the Owner. See Paragraph 3.7.

## 3.5 DUCT PRESSURE TESTING

A. Scope of Testing

1. HVAC Ductwork and Plenums
   a. Supply
      1) Test only 2-inch pressure class and greater Standard 90.1 requires 3 inches and above.
      2) Test representative sections totaling no less than 25% of the total installed duct area for the designated pressure class in each system: Duct sections to be tested are to be chosen by Owner's Representative. Do not proceed with tests until test sections are designated.
      3) Test field installed supply fan plenums
   b. Return: Not required
   c. Exhaust: Not required
   d. Outdoor air: Not required

B. General

1. Tests conducted in presence of Owner's Representative
2. Use portable high pressure blower and necessary instruments to indicate amount of leakage
3. See Section 23 0593 Testing, Adjusting and Balancing for testing procedures and accuracy of test instruments
4. Conduct tests as prescribed in SMACNA HVAC Air Duct Leakage Test Manual, and make test before duct sections are concealed
5. Procedure
   a. Seal openings in ducts and plenums to be tested.
   b. Connect test apparatus to test section using flexible duct connection or hose.
   c. Close damper on blower suction side, to prevent excessive buildup of pressure.
   d. Start blower and gradually open damper on suction side of blower.
   e. Build up pressure in test section equal to static pressure class.
   f. Noise generated from duct leakage not acceptable. Seal as required.
   g. Determine amount of air leakage by makeup air flow measurements:
      1) Maximum permitted leakage for HVAC ductwork shall be:

CFMmax = (A/100) CL P0.65
where
CFMmax = the maximum permitted leakage, cubic feet per minute (cfm).
A = surface area of the tested duct sections, square feet.
CL = duct leakage class, cfm/100 square feet at 1 inch water column.
= 6 for rectangular sheet metal, rectangular fibrous ducts, and round flexible ducts
= 3 for round/flat oval sheet metal or fibrous glass ducts
P = test pressure which shall be equal to the design duct pressure class rating, inches water column.

2) Maximum permitted leakage for life safety ductwork shall be per CMC 905.
3) If leakage exceeds allowable limit, expand testing to include 100% of duct system at no additional cost to the Owner.
4) If leakage exceeds permitted limit, repair leaks and retest duct sections at no additional cost to the Owner until permitted leakage limits are obtained.

6. Visually mark tested sections with certification sticker and initials of field test inspector.

C. Documentation

1. Submit certification of test results of compliance to Commissioning Authority.
2. Include certified test results showing compliance per Section 23 0050 – Basic Mechanical Materials and Methods.

3.6 SYSTEM LEAK TESTING

A. Scope of Testing

1. Supply: Systems greater than 5,000 cfm design capacity
2. Return: Not required
3. Exhaust: Systems greater than 10,000 cfm design capacity
4. Outdoor air: Not required

5. Seal Class B and C ducts not required to be tested

B. General

1. See Section 23 0593 – Testing, Adjusting and Balancing for testing procedures and accuracy of test instruments
2. Tests shall be done after air balancing; see 230593 – Testing, Adjusting and Balancing for HVAC

3. Determine the maximum allowable leakage per system using the methodology in Paragraph 3.6B.5.g. The duct surface area shall be all ductwork downstream of the fan through the air outlets.

C. Test conditions

1. Fan balance complete and operating at design airflow conditions
2. For variable volume fans, set all the variable volume boxes to design maximum airflow rates and operate the fan at optimum static pressure setpoint; (see 230593 Testing, Adjusting and Balancing); fan and boxes to remain in a static state during the testing

D. Leakage testing

1. Collect the following information from air balance reports for each tested fan system. (This work is already required in Section 23 0593 Testing, Adjusting and Balancing, so no new work is required.)
   a. Pitot traverse in the supply (exhaust) duct downstream, positive pressure side (downstream, negative pressure side) of the fan, and
   b. Totaling the readings of individual air outlets or terminals

2. Subtract the readings in Paragraph 3.7D.1. If the difference in the readings, accounting for the accuracy of the test instruments, is greater than the amount allowed in Paragraph 3.7B.3, repair air leaks as required and retest.
3. If leakage exceeds permitted limit, repair leaks and retest duct sections at no additional cost to the Owner until permitted leakage limits are obtained.

E. Documentation

1. Submit certification of test results of compliance to Commissioning Authority

2. Include certified test results showing compliance per Section 23 00 50 – Basic Mechanical Materials and Methods

## 3.7 PROTECTION

A. Adhere to SMACNA Duct Cleanliness for New Construction Guidelines for Intermediate Level Duct Cleanliness unless more stringent requirements are indicated herein.

B. Storage: Porous materials, such as lined and flexible duct, shall be stored where they will not be exposed to rain or other moisture sources.

C. Temporary closure: Provide temporary closure of polyethylene film or other covering which will prevent entrance of dust and debris at the following conditions:

1. Exposed ends of unlined installed ducts at the end of each day
2. Exposed ends of lined ducts or plenums whether in storage or installed

D. Duct cleaning

1. Using the connected fan(s) force air at high velocity through duct to remove accumulated dust
2. Protect equipment and spaces, which may be harmed by excessive dirt with filters, or bypass during cleaning
3. In areas, which must be kept dust free, seal all outlets duct tight. When closures are removed avoid spilling dust in room

3.8 INSPECTION

A. Verify that adequate clearance between ducts and adjacent walls or equipment is available to permit proper sealing, maintenance and repairs.

3.9 PRE-OPERATING CHECKS

A. Before operating the duct systems: Set all manual dampers in full open position

B. Complete the attached Pre-Functional Test Data Sheet, Appendix 15810 A, for each duct system.

3.10 TESTING AND ADJUSTING

A. Before starting the duct systems

1. Clean the duct system. See Paragraph 3.8D
2. See Section 23 08 00 – Commissioning of HVAC

B. After starting the duct systems: Check for noise and leakage. See Paragraphs 3.6 and 3.7. Repair as required at no additional cost to the Owner.

C. See Section 23 05 93 – Testing, Adjusting, and Balancing for HVAC: Coordination with Balance Agency:

1. Provide services of a sheet metal installer familiar with the system ductwork to provide assistance to the balancing agency during the initial phases of air balancing in locating all sheet metal dampers
2. Install missing dampers

D. See Section 23 08 00 – Commissioning of HVAC

END OF SECTION 23 31 17

**SECTION 23 33 00**
**AIR DUCT ACCESSORIES**

PART 1 - GENERAL

1.1 SUMMARY

A. Work included in this section: materials, equipment, fabrication, installation and tests in conformity with applicable codes and authorities having jurisdiction for the following

1. Access Doors
2. Balancing Dampers
3. Backdraft Dampers
4. Fire dampers
5. Fire and Smoke Dampers
6. Drain Pans
7. Belt Guards
8. All duct accessories except, where integral with manufactured piece of equipment.

B. Related Sections

1. Section 23 00 50 – Basic Mechanical Materials and Methods
2. Section 23 08 00 – Commissioning of HVAC
3. Section 26 27 26– Wiring Devices

1.2 QUALITY ASSURANCE

A. Fire, smoke, and fire/smoke dampers shall be UL listed and constructed in accordance with UL Standard 555 Fire Dampers and UL Standard 555S.

B. Demonstrate operation of smoke dampers to authorities having jurisdiction and Owner's representative as part of life safety testing.

C. Access doors shall be UL labeled.

D. Damper pressure drop and leakage ratings shall be based on tests and procedures performed in accordance with AMCA 500 - Test Methods for Louvers, Dampers and Shutters.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Named manufacturer model numbers used as example of item and establish minimum level of quality and minimum standard options. Equivalent models of listed manufacturers are acceptable.

B. Access Doors, Ducts

1. Ventfabrics, Inc.
2. Duo Dyne, Corporation
3. Ruskin Mfg. Company
4. PCI Industries – Pottorff
5. Ductmate
6. Or equal

C. Access Doors, Plenum

1. Ventfabrics, Inc.
2. Duo Dyne, Corporation
3. Elgen Manufacturing Company
4. Or equal

D. Multi-blade Volume Dampers

1. Ruskin Manufacturing Company
2. Air Balance Inc.
3. American Warming and Ventilating Inc.
4. Johnson Controls
5. PCI Industries - Pottorff
6. Or equal

E. Backdraft Dampers

1. Greenheck Fan Corp
2. Ruskin Manufacturing Company
3. Air Balance, Inc.
4. American Warming and Ventilating Inc.
5. Or equal

F. Damper Hardware

1. Ventfabrics, Inc.
2. Duo Dyne, Corporation
3. Young Regulator Company
4. Or equal

G. Fire Dampers and Combination Smoke and Fire Dampers

1. Ruskin Manufacturing Company
2. Air Balance Inc.
3. PCI Industries - Pottorff
4. Or equal

H. Acoustical Plenums

1. Aerosonics, Inc.
2. Industrial Acoustics Inc.
3. Rink
4. Environmental Elements Corporation, Koppers Company
5. United McGill Corporation
6. Or equal.

## 2.2 DUCT ACCESS DOORS

A. In accordance with SMACNA Duct Construction Manuals, except as indicated in the Drawings

B. In ductwork

1. Construction
   a. Galvanized steel
   b. Rating same as duct pressure class
   c. Where duct is insulated
      1) Fiberglass insulation, thickness to match duct insulation installed R-value, see 23 07 00 - HVAC Insulation
      2) Double wall
   d. Removable type with safety chain linking door permanently to frame
   e. Positive seal polyethylene gasket
   f. Paired progressive cam-locks, quantity as required for tight, low leakage fit
   g. No tools required for opening and closing
2. Size
   a. 20 inches x 14 inches unless otherwise indicated in the Drawings
   b. Ducts less than 16 inches: one dimension 20 inches; other dimension 2 inch less than duct width
   c. Larger sizes where required for access
3. Provide in following locations
   a. Coils in ducts
      1) Entering and leaving side for cooling coils
      2) Entering side for heating coils
   b. Automatic dampers: linkage side
   c. Smoke dampers
   d. Fire dampers
   e. Smoke detection heads
   f. At the top of each lined duct riser accessible from the fan room floor (for inspection of duct liner)
   g. Fan bearings enclosed in ducts
   h. Sprinkler heads in ducts
   i. Motors, actuators or other accessories that require access or service inside ducts
   j. Outdoor air plenums as required to clean plenum from dirt and debris.
   k. Where otherwise indicated on the Drawings

## 2.3 DAMPERS

A. Volume Dampers

1. Conform to requirements of SMACNA HVAC Duct Construction Standards.
2. General
   a. Blades of same material as duct where damper is located
   b. Damper Hardware
      1) Ventlok 400 and 4000 series or equal; for low pressure systems 2 inch SMACNA pressure class and less
      2) Ventlok HiVel hardware or equal; for greater than 2 inch SMACNA pressure class
   c. Actuating quadrants typical for single and multi-blade dampers; provide closed bearing on opposite end from quadrant to prevent air leakage: Ventlok No. 609 or equal
   d. Bearing at one end of damper rod: Ventlok No. 609 or equal
   e. Sealed bushings installed at both ends to avoid duct leakage
   f. Accessible quadrant at other end of damper rod
      1) With lever and lock screw: Ventlok No. 635 or equal
      2) Insulated ducts
         a) Quadrants mounted on collar to clear insulation
         b) Ventlok Nos. 637, 638, or 639 or equal
         c) Selection based on insulation thickness
   g. For dampers above non-removable ceilings and without ceiling access panels provide Ventlok No. 677 or equal concealed damper regulator
      1) With paintable cover plate
      2) Required interconnecting hardware
3. Single blade dampers
   a. Galvanized steel ductwork: galvanized steel, except as indicated in the Drawings
   b. Blade: Two gages heavier than duct gage, or 18 gage, whichever is lighter
4. Multi-blade Dampers
   a. Low Pressure/Low Velocity Systems (2 inch water column or less static pressure class and 1500 fpm or less face velocity)
      1) Opposed blade damper
      2) Ruskin Model CD35 or equal
   b. High Pressure/High Velocity Systems (greater than 2 inch water column static pressure class or greater than 1500 fpm face velocity):
      1) Rectangular
         a) Opposed blade damper
         b) Ruskin Model CD60 or equal
      2) Round and Oval
         a) Oval: Ruskin Model CDR25 and DO25 or equal
         b) Round: Up to 20 inch diameter: Ruskin Model MDRS25 or equal

c) Round: Larger than 20 inch diameter: Ruskin Model CDRS25 or equal

B. Backdraft Dampers

1. Required locations
   a. Where indicated on the Drawings
   b. In suction or discharge of all exhaust fans as listed in equipment schedule
      1) Integral, heavy-duty factory-installed type acceptable unless otherwise scheduled
2. General Applications
   a. Construction
      1) Extruded aluminum construction
      2) Vinyl blade edge seals
      3) Blade ends overlapping frame
   b. Ruskin Series BD2 or equal
3. Discharge of air handlers (and other high velocity or pressure sensitive locations)
   a. Frame
      1) Minimum 12 gauge galvanized steel channel
      2) Bolt Holes: Both flanges
   b. Blades
      1) Airfoil-shaped with integral structural reinforcing tube running full length of each blade
      2) Material: 7 inches x minimum 0.080 inch Alloy 6063-T5 extruded aluminum
   c. Axles: Minimum 3/4 inch (19 mm) diameter plated steel
   d. Bearings: Ball bearings pressed into frame
   e. Linkage
      1) 3/16 inch thick x 3/4 inch plated steel tie bar with minimum 16 gauge plated steel linkage arms; stainless steel pivot pins
      2) Located out of airstream (side or external linkage)
   f. Counterbalance: Located out of airstream
   g. Seals
      1) Blade
         a) Mechanically attach blade seals to blade
         b) Silicone rubber, rated for 300 degrees Fahrenheit
      2) Jamb: Vinyl
   h. Greenheck model HB-240 or equal

2.4 FIRE DAMPERS

A. Ratings (test conditions and label) per UL Standard 555
   1. 250 degrees Fahrenheit minimum
   2. 1-1/2 hour fire rating, unless otherwise indicated in the Drawings
   3. Dynamic (closes against air flow)

B. Factory sleeve

C. Damper

1. Curtain Type, dynamic, equipped with fusible link, spring loaded type
2. Style
   a. As indicated on the Drawings
   b. Ducted, rectangular duct: Style B (out of airstream)
   c. Ducted, round duct: Style A (in airstream) with damper sleeve 2” in each dimension larger than duct; plus cap and collar.
   d. Unducted: Style A (in airstream)

D. Fusible link

1. UL listed.
2. Fusible links on fire dampers shall be constructed to UL Standard 33 – Fusible Links for Fire Protection Service
3. Temperature rating: Per code

E. Type: as indicated on the Drawings

F. Type:

1. Rectangular type up to 1000 feet per minute: Ruskin DIBD20 Style A or equal
2. Rectangular type 1000 feet per minute and higher: Ruskin DIBD20 Style B or equal

2.5 COMBINATION SMOKE AND FIRE DAMPERS

A. Fire ratings (test conditions and label) per UL Standard 555

1. 250 degrees Fahrenheit minimum
2. 1-1/2 hour fire rating, unless otherwise indicated in the Drawings

B. Factory sleeve

C. Damper

1. Parallel blade
2. Leakage class as scheduled, minimum Class 2, rated per UL 555S
3. 120 volt actuator
4. Locate damper in sleeve starting at approximately 3” from end of the sleeve opposite the damper actuator end. (Damper shall be installed with this end protruding 3 inches out from inside surface of wall.)

D. Controls

1. Heat-actuated electric release
2. Controlled closure to prevent duct and HVAC component damage
3. Time to drive from full closed to open and or spring from full open to closed shall not exceed the following:
   a. Dampers used as part of UBC 905 Smoke Control System (those listed as having end switches in FSD schedule): 15 seconds
   b. All others: 75 seconds.
4. Damper to automatically reopen after a test, smoke detection or power failure condition. In the event of heat activated closure, the damper must be manually reset at the damper.
   a. Release temperature: 165 degrees Fahrenheit.
5. Ruskin EFL or equal

E. Status end switches: None required.

F. Type

1. Ruskin Type FSD36 or equal for 1800 feet per minute and below
2. Ruskin Type FSD60 or equal for 1800 feet per minute and above

G. Smoke Detector

1. Detects presence of smoke in the airstream of ductwork in HVAC systems without a minimum operating velocity
2. UL Listed
3. CSFM Listing
4. Ruskin DSDN or equal

2.6 DRAIN PANS

A. Field Installed Drain Pans

1. Required at field installed
   a. Cooling coils
   b. Humidifiers
2. Pan material
   a. 20 gauge stainless steel
   b. No. 18 B SG aluminum
   c. 20 gauge galvanized steel with epoxy coating
3. Supports: galvanized steel
4. Extend under coil casing
   a. Upstream: minimum 3 inches
   b. Downstream: minimum 18 inches or half the coil finned-height, whichever is larger
5. Provide additional intermediate pans for coils mounted more than one section high
   a. Minimum 3 inches upstream

b. Minimum 8 inches downstream of eliminators
6. Extend on sides
   a. To wall of casing
   b. To receive condensate from piping and controls
7. Drain connection:
   a. Size per Uniform Mechanical Code based on coil capacity
   b. Mounted in bottom of pan at lowest point or out side with a flush mount that allows complete draining

B. Auxiliary drain pans
1. For units with cooling, above furred ceilings where required by California Mechanical Code paragraph 1205 – Condensate Control
2. Construction: galvanized steel
3. Size to capture any overflow from unit condensate drain pan
4. With separate drain from main drain pan

2.7 BELT GUARDS

A. Fabricated per SMACNA Duct Construction Standards

PART 3 - EXECUTION

3.1 INSTALLATION

A. Coordinate with work of other trades

B. Install duct accessories in accordance with manufacturer's written installation instructions

C. See Section 23 31 17 – Ducts

D. Volume dampers

1. Provide at locations indicated on the Drawings
   a. Volume dampers shall be installed as far away from air outlets as functionally reasonable to avoid noise in the occupied space.
   b. Provide also in wyes and spin-ins to outlets whether indicated on the Drawings or not, except
      1) Where dampers are not indicated on the Drawings above inaccessible ceilings
      2) To sidewall outlets in exposed ducts (opposed blade dampers in outlets shall be provided)
2. Additional locations where dampers appear to be required for balancing, place request for information with Engineer prior to construction.
3. For ductwork exposed to occupant view, volume damper handles shall be on top of duct or otherwise concealed from occupant view.

E. Fire and smoke dampers

1. Provide in ducts and openings as indicated in the Drawings
2. Provide access door in duct adjacent to each in location where damper may be inspected and internal fusible link or fire-stat may be replaced
3. Install duct smoke detector provided by Division 16 if required; see Division 26 drawings
4. Smoke and fire dampers installed in tunnel corridors shall have weight of damper supported from structure above.

F. Control dampers

1. Field mounted control dampers installed with concealed linkage shaft accessible on side of damper with space for direct-coupled actuator
2. Actuator installation: See Section 23 -Control Systems

G. Install belt guards at all exposed belts

H. Drain pans

1. Condensate drain pans
   a. Slope to drain connection to allow complete draining of pan
   b. Piping from intermediate drain pan to lowest pan
      1) See Section 22 13 16 – Sanitary Waste and Pipe Venting
      2) Pipe to within 1 inch of and discharge into lowest drain pan
   c. Piping from lowest pan drain connection to sewer
      1) See Section 22 13 16 – Sanitary Waste and Pipe Venting
      2) Trap height and offset must allow water seal to remain and to allow complete drainage of pan both when fan is operating or not
   d. Field test
      1) Test all drain pans after installation to ensure proper slope and drainage and to prevent conditions of water stagnation that result in microbial growth.
      2) Drainage shall be considered acceptable if after covering the entire pan with 1/2 inch water, the pan drains within 3 minutes to leave puddles no more than 2 inch in diameter and no more than 1/8 inch deep.
      3) Test with the fan system in operation for pans on the suction side of the fan, and with the fan off for pans on the discharge side of the fan.
      4) Document tests: See Section 23 00 50 – Basic Mechanical Materials and Methods
2. Auxiliary drain pans
   a. Piping: See Section 22 13 16 – Sanitary Waste and Pipe Venting
   b. Discharge where readily observed

## 3.2 MOUNTING AND ALIGNMENT

A. Install all accessories to prevent air leakage.

B. Install closed bearing end on all damper blades that penetrate duct to prevent air leakage.

C. Support extra weight of duct accessories. See Section 23 05 48 – Vibration and Seismic Control for HVAC Piping and Equipment.

3.3 INSPECTION

A. Verify that adequate clearance between duct accessories and adjacent walls or equipment is available to permit maintenance and repairs.

3.4 PRE-OPERATING CHECKS

A. Before operating duct accessories: Set all components in normal operating condition

3.5 TESTING AND ADJUSTING

A. Before operating duct accessories see Section 23 08 00 – Commissioning of HVAC

B. After starting duct accessories

1. Check for noise and leakage; repair as required at no additional cost to the Owner.
2. Operation test: Test each piece of equipment to show that it will operate in accordance with requirements.

C. See Section 23 05 93 – Testing, Adjusting, and Balancing

D. See Section 23 08 00 – Commissioning of HVAC

END OF SECTION 23 33 00

**SECTION 23 34 15**
**FANS**

PART 1 - GENERAL

1.1 SUMMARY

A. Work included in this section: materials, equipment, fabrication, installation, and tests in conformity with applicable codes and authorities having jurisdiction for the following:

1. Centrifugal fans
2. Centrifugal inline fans
3. Ceiling exhaust fans
4. Wall mounted fans
5. All fans except where integral with manufactured piece of equipment

B. Related Sections

1. Section 23 08 00 – Commissioning of HVAC
2. Section 23 00 50 – Basic Mechanical Materials and Methods

1.2 REFERENCE STANDARDS

A. ANSI/AFBMA Standard 9 – Load Rating and Fatigue Life for Ball Bearings

B. AMCA 99 – Standards Handbook

C. AMCA 210 – Laboratory Methods of Testing Fans for Aerodynamic Performance Rating

D. AMCA 300 – Reverberant Room Method for Sound Testing of Fans

E. AMCA 301 – Methods for Calculating Fan Sound

F. ANSI/AFBMA 11 – Load Ratings and Fatigue Life for Roller Bearings

1.3 QUALITY ASSURANCE

A. AMCA certified ratings per applicable AMCA standard based on the testing conducted in an independent laboratory

B. Performance Ratings: Conform to AMCA 210 and bear the AMCA Certified Rating Seal

C. Sound Ratings: AMCA 301; tested to AMCA 300 and bear the AMCA Certified Sound Rating Seal

D. Fabrication: Conform the AMCA 99

E. Conform to AMCA Bulletins regarding construction and testing

1. Fans shall bear AMCA certified rating seal

F. Scheduled equipment performance is minimum capacity required.

G. Scheduled electrical capacity shall be considered as maximum available.

1.4 SUBMITTALS

A. See Section 23 00 50 – Basic Mechanical Materials and Methods

B. Include

1. Complete graph of fan curves, not just curve for design conditions
2. Sound power levels
   a. Fans 1 horsepower and larger: dB by octave bands
   b. Fans less than 1 horsepower: sones

PART 2 –PRODUCTS

2.1 MANUFACTURERS

A. Named manufacturer model numbers used as example of item and establish minimum level of quality and minimum standard options. Equivalent models of listed manufacturers are acceptable.

B. Greenheck Fan Corporation

C. Air King

D. Fantech

E. Penn Ventilator Company, Inc.

F. Loren Cook Company

G. Acme Engineering & Manufacturing Company

H. Or equal

2.2 GENERAL

A. AMCA certification in accordance with ARI Standard 210 and 211, and AMCA Standard 2408 for centrifugal fans

B. Fans used shall not increase motor size, increase noise level, or increase tip speed by more than 10 percent, or increase inlet air velocity by more than 20 percent, from specified criteria.

C. Performance

1. See fan schedule on the Drawings.
2. Capacities: minimum as scheduled on the Drawings.
3. Brake horsepower rating: Maximum 10 percent above that scheduled on the Drawings.
4. Fans and drives shall be capable of accommodating static pressure variations of plus or minus 10 percent.
5. Motor horsepower: No larger than that scheduled on the Drawings, or compensate Division 23 contractor for any associated cost to increasing motor size.

D. Wheels

1. Class as indicated on the Drawings
2. Formed steel or extruded aluminum
3. Statically and dynamically balanced in its own bearings with a maximum full amplitude shaft deflection at bearings not to exceed 0.001-inch at 1200 RPM
4. Exposed fan wheels protected by finger proof screen

E. Motors: See Section 23 05 13 – Common Motor Requirements for HVAC equipment.

F. Housing

1. Heavy gauge steel, spot welded for AMCA 99 designated Class I and II fans, and continuously welded for Class III, adequately braced, designed to minimize turbulence with spun inlet bell and shaped cut-off.
2. Factory finish before assembly with enamel or prime coat
3. Provide bolted construction
4. Weatherproof motor and drive covers at utility sets
5. Provide inspection access panels at the wheels of all blowers
6. Externally paint fans exposed to weather to provide corrosion resistance to the environment
7. Provide 3/4-inch threaded scroll drain where indicated on the Drawings and where drainage is required

G. Direct Drive

1. Less than 1 horsepower: Internal thermally protected motor

H. Belt Drive

1. Matched, multiple V-belt
2. Capacity: minimum 1.5 times motor horsepower
3. Pulleys
   a. Cast iron

b. Variable pitch diameter
    1) Except motors with variable speed drives
    2) Fans up to 7-1/2 hp motor
    3) Fans from 10 hp to 25 hp, under 1000 rpm
c. Fixed pitch diameter
    1) All motors with variable speed drives
    2) Fans 10 hp and over 1000 rpm
d. Select at mid-point of range
e. For fans that operate as part of the life safety system, provide a minimum of two belts

4. Companion sheaves to maintain belts parallel
5. Drive guards
    a. Comply with requirements of State COSHA
    b. Provide holes in belt guards for tachometer readings
    c. Indoor Belt Drives: 16 gauge expanded metal or wire screen enclosure with 70 percent free area and steel frame
    d. Outdoor Belt Drives: 16 gauge solid galvanized sheet metal with stamped louvers near top and bottom for ventilation

I. Bearings

1. Ball, roller or taper
    a. Pressure type lubricating fittings with pressure relief fittings
        1) Extended to accessible locations
        2) Lubricating fittings: Equal to Alemite
        3) Pressure relief fittings: Equal to Keystone.
2. Life rating: minimum 200,000 hours per AFBMA Standard 9 L-50 rating, at maximum catalog rating

J. Painting

1. Prime coat fan wheels and housing factory inside and outside: Prime coating on aluminum parts is not required
2. Provide two additional coats of paint on fans handling air downstream of humidifiers
3. Finish painting not required for fans with corrosion resistant coatings

K. Discharge: As indicated on the Drawings

L. Removable flanged screens at inlets or outlets where no connecting ductwork is indicated: Exclude inlets to fans in field erected casings

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Coordinate with work of other trades

B. Install fans in accordance with manufacturer's written installation instructions.

C. See Section 23 31 17 – Ducts for duct connections

D. See Section 23 08 00 – Commissioning of HVAC

E. Flexible duct connection at inlet and outlet: See Section 23 31 17 – Ducts

F. Backdraft Dampers

1. Comply with Title 24 Energy Standards and CMC
2. Provide backdraft or shutoff dampers for suction or discharge of every exhaust fan as scheduled on the Drawings
3. See schedules on the Drawings and Section 23 33 00 – Air Duct Accessories for where fan manufacturer may provide dampers and when specialty damper manufacturer must provide them.

G. Propeller Fans

1. Secure housing or sleeve to wall
2. Provide additional support from overhead construction or floor by steel rods or angles if fan extends more than approximately 24 inches from wall.

H. Roof Mounted Fans

1. Install on factory fabricated curbs
   a. Exception: Install Utility fans as indicated on the Drawings
2. See Division 7 Thermal and Moisture Protection for waterproofing and roofing.
3. Roof curbs
   a. Secured to structure with hold down methods as detailed
   b. Made fully weatherproof

I. Pipe scroll drains to code compliant waste receptacle

3.2 MOUNTING AND ALIGNMENT

A. See Section 23 05 48 – Vibration and Seismic Controls for HVAC Piping and Equipment.

3.3 INSPECTION

A. Verify that adequate clearance between fans and adjacent walls or equipment is available to permit maintenance and repairs.

3.4 PRE-OPERATING CHECKS

A. Before operating fans

1. See Section 23 08 00 – Commissioning of HVAC
2. Complete the attached Pre-Functional Test Data Sheet, Appendix 15830 A, for each fan

B. Do not operate fans for any purpose, temporary or permanent, until

1. Ductwork is clean
2. Filters in place
3. Bearings lubricated

3.5 TESTING AND ADJUSTING

A. Before starting fans

1. See Paragraph 3.4B
2. See Section 23 08 00 – Commissioning of HVAC
3. Install belt and motor guards.

B. Start and test fans in accordance with manufacturers written installation instructions.

C. Start up and adjust fans to insure proper operation.

D. The submitted sound power level shall be verified through actual measurements and calculations in accordance with AMCA standards 300 and 301.

1. In the event the sound power level data measured or being submitted exceeds the designed level, provide additional sound traps or other sound attenuating devices to supplement the design in order to comply with sound power level specifications. Perform this work, including the additional noise control and any increase in motors Hp and increase in electrical service at no additional cost to the Owner. Submit calculations or measurement results to the Owner's Representative, which substantiate that sound power level produced by the submitted equipment and any required sound attenuating devices do not exceed the specified sound power levels.

E. After starting fans: Check for objectionable noise or vibration. Correct as needed at no additional cost to the Owner.

F. Balancing: See Section 23 05 93 – Testing, Adjusting and Balancing for HVAC

G. Commissioning: See Section 23 08 00 – Commissioning of HVAC

3.6 TRAINING

A. See Section 23 08 00 – Commissioning of HVAC

END OF SECTION 23 34 15

# SECTION 23 37 13
# DIFFUSERS, REGISTERS AND GRILLES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Work included in this section: materials, equipment, fabrication, installation and tests in conformity with applicable codes and authorities having jurisdiction for the following: All air outlets, inlets, grilles, registers and diffusers except where integral with manufactured piece of equipment.

B. Related Sections

C. Section 23 08 00 – Commissioning of HVAC

### 1.2 QUALITY ASSURANCE

A. Comply with ARI Standard 650 – Air Outlets and Inlets

B. Comply with ASHRAE Standard 70 – Methods of Testing for Rating the Airflow Performance of Outlets and Inlets

C. Comply with AMCA Standard 500 – Laboratory Methods of Testing dampers for Rating.

D. Comply with NFPA Standard 90A – Installation of Air Conditioning and Ventilating Systems

E. Comply with BSR/NFPA 90B – Standard for the Installation of Warm Air Heating and Air Conditioning Systems

F. Provide outlets and inlets that have, as minimum, throw and noise criteria ratings for each size device as listed in manufacturer's current data, rated as required by the above standards.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Named manufacturer model numbers used as example of item and establish minimum level of quality and minimum standard options. Equivalent models of listed manufacturers are acceptable.

1. Titus
2. Krueger
3. MetalAire

4. Tuttle & Bailey

5. Price
6. Or equal

2.2 GENERAL

A. Manufacturer shall examine and approve of application of each outlet.

B. Noise level at design capacities: no larger than diffuser selection indicated on the drawings.

C. Volume dampers

1. Do not provide dampers built into grille or directly attached to the grille unless specifically called out on drawings or in this Section.
2. Volume damper key-operated adjustable from face of diffuser on register except as noted.
3. Opposed blade.

D. Diffuser frame

1. Frame type shall be coordinated with ceiling type. Refer to architectural reflected ceiling Drawings.
2. Plaster or drywall ceilings: lay-in diffuser with drywall frame (to allow for ceiling access through grille). Drywall frame to match diffuser color.
3. No visible screw allowed on diffusers or frames, unless otherwise indicated on the Drawings.

E. Outlets may be steel or aluminum unless otherwise indicated on the Drawings.

F. Color

1. Face and frame: Factory-baked #26 white enamel unless otherwise indicated on the Drawings.
2. Internal parts of grille visible from occupied space, including all parts behind perforated face diffusers and visible parts of plenums: flat black

2.3 STYLES

A. General

1. See diffuser schedule on the Drawings for outlet style and size.
2. Throw pattern per the Drawings.
3. Specific frame, border, and other product references refer to Titus Products

B. Star-pattern perforated diffuser equal to Titus PSS

1. Deflectors adjusted for corner blow pattern unless otherwise indicated.

C. Plenum Slot

1. Integral insulated plenum, minimum 1/2-inch-thick equal to Titus Type AL duct liner as specified under Section 230700 – HVAC Insulation
2. Middle tees included, match ceiling

D. Slot

1. Integral insulated plenum, minimum 1/2-inch-thick equal to Titus Type AL duct liner as specified under Section 230700 – HVAC Insulation
2. Border equal to Titus 2A
3. Mitered corners
4. Equal to Titus X-X end border and end cap

E. Flow Bar

1. Integral insulated plenum, minimum 1/2-inch-thick equal to Titus Type AL duct liner as specified under Section 230700 – HVAC Insulation
2. Equal to Titus border 22
3. Mitered corners
4. Returns to have light shield.

F. Sidewall

1. Double deflection: vertical blades on room side
2. Drywall frame with recessed screw holes, face mounting allowed.
3. Register (WSR, WER, etc.) to have opposed blade damper unless otherwise indicated on the Drawings.

G. Bar

1. Sidewall

   a. Equal to Titus border Type 13, 1 inch
   b. Equal to Titus Type C concealed fastening

2. Floor

   a. Heavy duty core with reinforcing
   b. Lay-in removable core
   c. Border/Frame equal to Titus Type 5

2.4 SCREENED OPENINGS

A. Mesh

1. 3/4 in. square pattern
2. No. 16 galvanized wire

3. Interwoven
4. Welded or secured to frame.

B. Frames: Optional

1. 1 inch by 1 inch by 1/8-inch galvanized steel angles
2. Continuous around perimeter of screen.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Coordinate with work of other trades.

B. Install air outlets and inlets in accordance with manufacturer's written installation instructions and Section 233112 – Ducts.

C. Return and exhaust registers: Install with blades oriented to prevent sight through outlets.

D. Grille backs or plenums visible through grilles painted flat black.

E. Transfer grilles

1. See indications on the Drawings.
2. Wall installations, unless otherwise indicated, provide two grilles.

a. One on each side of wall, except where open to return air plenum.
b. Connecting sheet metal collar with 18-inch elevation offset for sound and light attenuation.

F. Provide duct screens at termination ducts as indicated on the Drawings.

3.2 MOUNTING AND ALIGNMENT

A. See Section 230548 – Vibration and Seismic Controls for HVAC Piping and Equipment.

B. All air outlets and inlets shall be secured to the building.

1. Ceiling grilles shall be secured to prevent falling from ceiling during construction or service with minimum of two 16-gage ceiling wires, two 22-gage by 1-inch galvanized sheet metal strap or two #10 sheet metal screws.
2. Comply with CBC Section 25.214

C. Mount directional grilles as indicated on the Drawings.

D. Adjust grille throw patterns.

1. As indicated on the Drawings
2. For double-deflection grilles, adjust rear blades horizontal and front blades in 45-degree pattern at each end gradually rotating to be almost straight at blades in center of grille.
3. Prior to test and balance

3.3 INSPECTION

A. Verify mounting, direction and adjustments are installed as indicated on the Drawings.

3.4 TESTING AND ADJUSTING

A. See Section 23 08 00 – Commissioning of HVAC

B. See Section 23 05 93 – Testing, Adjusting and Balancing for HVAC

C. See Section 23 08 00 – Commissioning of HVAC.

END OF SECTION 23 37 13

**SECTION 26 05 00**
**COMMON WORK RESULTS FOR ELECTRICAL**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

J. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

J. This Section includes the following:
1. Electrical equipment coordination and installation.
2. Sleeves for raceways and cables.
3. Sleeve seals.
4. Grout.
5. Common electrical installation requirements.

1.3 DEFINITIONS

J. EPDM: Ethylene-propylene-diene terpolymer rubber.

J. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

J. Product Data: For sleeve seals.

1.5 COORDINATION

J. Coordinate arrangement, mounting, and support of electrical equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.

2. To provide for ease of disconnecting the equipment with minimum interference to other installations.

3. To allow right of way for piping and conduit installed at required slope.

4. Connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

J. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

J. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section 08 11 13 “Hollow Metal Doors and Frames”

J. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section 07 84 00 “Firestopping and Smoke Sealants”

## PART 2 - PRODUCTS

### 2.1 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel:

1. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches and no side more than 16 inches, thickness shall be 0.052 inch.
b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches and 1 or more sides equal to, or more than, 16 inches, thickness shall be 0.138 inch.

### 2.2 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway 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 Co.
d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.

2.3 SLEEVES FOR CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

J. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section 07 84 00 “Firestopping and Smoke Sealants”

PART 2 - PRODUCTS

B.

2.4 GROUT

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange, and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways, cables, wireways, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors 2 inches above finished floor level.

G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry.

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section 07 84 00 “Firestopping and Smoke Sealants”

K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

L. 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.

M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space

between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section 07 84 00 “Firestopping and Smoke Sealants”

END OF SECTION 26 05 00

# 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. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.
3. Sleeves and sleeve seals for cables.

### 1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

### 1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Qualification Data: For testing agency.

C. Field quality-control test reports.

### 1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

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. Comply with NFPA 70.

1.6 COORDINATION.

A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but not limited to, the following:

1. Alcan Products Corporation; Alcan Cable Division.
2. American Insulated Wire Corp.; a Leviton Company.
3. General Cable Corporation.
4. Senator Wire & Cable Company.
5. Southwire Company.

2.2 CONNECTORS AND SPLICES

C. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.

A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SLEEVE FOR CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

2.4 SLEEVE SEALS

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. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex Co.
4. Pipeline Seal and Insulator, Inc.

B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.

1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
2. Pressure Plates: Plastic. Include two for each sealing element.

## 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. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

C. Panel Feeders: Aluminum is acceptable.

### 3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN-THWN, single conductors in raceway, MC cable and NMC as acceptable by code.

B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-THWN, single conductors in raceway, MC cable and NMC as acceptable by code.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway, MC cable.

E. Exposed Branch Circuits, Including in Crawlspaces: Type THHN-THWN, single conductors in raceway, Metal-clad cable, Type MC.

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway, Metal-clad cable, Type MC and NMC.

G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway and PVC coated MC cable. ENT is allowed in concrete.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. 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.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems."

F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

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 and UL 486B.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

3.5 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both wall surfaces.

F. Extend sleeves installed in floors 2 inches above finished floor level.

G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint according to Division 07 Section "Joint Sealants."

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at cable penetrations. Install sleeves and seal with firestop materials according to Division 07 Section 07 84 00 “Firestopping and Smoke Sealants”

K. Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work.

L. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch annular clear space between cable and sleeve for installing mechanical sleeve seals.

3.6 SLEEVE-SEAL INSTALLATION

A. Install to seal underground exterior-wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for cable material and size. Position cable in center of sleeve. Assemble

mechanical sleeve seals and install in annular space between cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

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 Division 07 Section 07 84 00 “Firestopping and Smoke Sealants”

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Perform tests and inspections and prepare test reports.

C. 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 visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

D. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test 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. This Section Includes: Grounding systems and equipment, plus the following special applications:

1. Overhead-line grounding.
2. Underground distribution grounding Owner furnished Contractor installed (OFCI) products.

### 1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:

C. Ground rods.

D. Qualification Data: For qualified testing agency and testing agency's field supervisor.

E. Field quality-control reports.

F. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Instructions for periodic testing and inspection of grounding features at test wells.

    a. Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
    b. Include recommended testing intervals.

1.4 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.

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 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. Solid Conductors: ASTM B 3.

2. Stranded Conductors: ASTM B 8.

3. Tinned Conductors: ASTM B 33.

4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.

5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.

6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 in 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. Lexan or PVC, impulse tested at 5000 V. Tin plated aluminum bussing is also allowed:

2.2 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, pressure type with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Bus-bar Connectors: Mechanical type, cast silicon bronze, solderless type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet in diameter.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 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.

C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

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 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.

3.3 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 one rod 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.

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.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.

3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

E. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart.

F. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70; use a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG.

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.

## 3.4 LABELING

A. Comply with requirements in Division 26 Section "Identification for Electrical Systems" Article for instruction signs. The label or its text shall be green.

B. Install labels at the telecommunications bonding conductor and grounding equalizer and at the grounding electrode conductor where exposed.

1. Label Text: "If this connector or cable is loose or if it must be removed for any reason, notify the facility manager."

## 3.5 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 inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. 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.

D. 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.

E. Prepare test and inspection reports."

END OF SECTION 26 05 26

# 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. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. Related Sections include the following:

1. Division 26 Section "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction:

### 1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. ENT: Electrical nonmetallic tubing.

C. EPDM: Ethylene-propylene-diene terpolymer rubber.

D. FMC: Flexible metal conduit.

E. IMC: Intermediate metal conduit.

F. LFMC: Liquidtight flexible metal conduit.

G. LFNC: Liquidtight flexible nonmetallic conduit.

H. NBR: Acrylonitrile-butadiene rubber.

I. RNC: Rigid nonmetallic conduit.

### 1.4 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.

1.5 QUALITY ASSURANCE

A. 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.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following.

1. AFC Cable Systems, Inc.
2. Alflex Inc.
3. Allied Tube & Conduit; a Tyco International Ltd. Co.
4. Anamet Electrical, Inc.; Anaconda Metal Hose.
5. Electri-Flex Co.
6. Manhattan/CDT/Cole-Flex.
7. Maverick Tube Corporation.
8. O-Z Gedney; a unit of General Signal.
9. Wheatland Tube Company.

B. Rigid Steel Conduit: ANSI C80.1.

C. Aluminum Rigid Conduit: ANSI C80.5.

D. IMC: ANSI C80.6.

E. EMT: ANSI C80.3.

F. FMC: Zinc-coated steel.

G. LFMC: Flexible steel conduit with PVC jacket.

H. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
2. Fittings for EMT: Steel, set-screw type.
3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness, 0.040 inch, with overlapping sleeves protecting threaded joints.

I. Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.2 NONMETALLIC CONDUIT AND TUBING

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corporation.
4. CANTEX Inc.
5. CertainTeed Corp.; Pipe & Plastics Group.
6. Condux International, Inc.
7. ElecSYS, Inc.
8. Electri-Flex Co.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT/Cole-Flex.
11. RACO; a Hubbell Company.
12. Thomas & Betts Corporation.

B. ENT: NEMA TC 13.

C. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.

D. LFNC: UL 1660.

E. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.

F. Fittings for LFNC: UL 514B.

2.3 METAL WIREWAYS

A. Manufacturers: Subject to compliance with requirements, 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.
3. Square D; Schneider Electric.

B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1 for indoor and 3R for outdoor, unless otherwise indicated.

C. Fittings and Accessories: Include 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: Screw-cover type.

E. Finish: Manufacturer's standard enamel finish.

2.4 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. EGS/Appleton Electric.
3. Erickson Electrical Equipment Company.
4. Hoffman.
5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
6. O-Z/Gedney; a unit of General Signal.
7. RACO; a Hubbell Company.
8. Robroy Industries, Inc.; Enclosure Division.
9. Scott Fetzer Company, Adalet Division.
10. Spring City Electrical Manufacturing Company.
11. Thomas & Betts Corporation.
12. Walker Systems, Inc.; Wiremold Company (The).
13. Woodhead, Daniel Company; Woodhead Industries, Inc. subsidiary.

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, aluminum, Type FD, with gasketed cover.

D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.

E. Metal Floor Boxes: Cast metal, fully adjustable, rectangular.

F. Nonmetallic Floor Boxes: Nonadjustable, round.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

I. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.

J. Cabinets:

1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

2.5 SLEEVES FOR RACEWAYS

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

2.6 Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section 07 84 00 “Firestopping and Smoke Sealants”

2.7 SLEEVE SEALS

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. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex Co.
4. Pipeline Seal and Insulator, Inc.

B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.

1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
2. Pressure Plates: Carbon steel. Include two for each sealing element .

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed Conduit: RGS and IMC (below 8 ft.), EMT, RGS or IMC above 8 ft.
2. Concealed Conduit, Aboveground: Rigid steel conduit and EMT and IMC.
3. Underground Conduit: RNC, Type EPC-80-PVC, direct buried. In concrete – ENT is allowed.
4. Connection to Vibrating Equipment: LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
6. Application of Handholes and Boxes for Underground Wiring:

    a. Handholes and Pull Boxes in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Polymer concrete, SCTE 77, Tier 15 structural load rating.
    b. Handholes and Pull Boxes in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Polymer-concrete units, SCTE 77, Tier 8 structural load rating.
    c. Handholes and Pull Boxes Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested according to SCTE 77 with 3000-lbf (13 345-N) vertical loading.

B. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Concealed in Ceilings and Interior Walls and Partitions: EMT or ENT.
4. Connection to Vibrating Equipment: FMC, except use LFMC in damp or wet locations.
5. Damp or Wet Locations: Rigid steel conduit or IMC.
6. Raceways for Optical Fiber or Communications Cable in Spaces Used for Environmental Air: EMT.
7. Raceways for Concealed General-Purpose Distribution of Optical Fiber or Communications Cable: EMT.
8. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 3R in damp or wet locations.

C. Minimum Raceway Size:1/2 inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

E. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

F. 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.

G. Do not install aluminum conduits in contact with concrete.

3.2 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

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. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."

E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.

G. Conceal conduit, EMT and NMC within finished walls, ceilings, and floors, unless otherwise indicated.

H. 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.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Change from ENT to RNC, Type EPC-40-PVC, rigid steel conduit, or IMC before rising above the floor.

I. 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.

J. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

K. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.

L. Raceways for Optical Fiber and Communications Cable: Install raceways, metallic and nonmetallic, rigid, and flexible, as follows:

1. 3/4-Inch Trade Size and Smaller: Install raceways in maximum lengths of 50 feet.
2. 1-Inch Trade Size and Larger: Install raceways in maximum lengths of 75 feet.
3. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

M. Install raceway sealing fittings at suitable, approved, and accessible locations 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 at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where otherwise required by NFPA 70.

N. Expansion-Joint Fittings for RNC: Install in each run of aboveground conduit that is located where environmental temperature change may exceed 30 deg F, and that has straight-run length that exceeds 25 feet.

1. Install expansion-joint fittings for each of the following locations, and provide type and quantity of fittings that accommodate temperature change listed for location:

    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
    c. Indoor Spaces: Connected with the Outdoors without Physical Separation: 125 deg F temperature change.
    d. Attics: 135 deg F temperature change.
2. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change.

3. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.

O. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for recessed and semirecessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

P. 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.

Q. Set metal floor boxes level and flush with finished floor surface.

R. Set nonmetallic floor boxes level and flush with finished floor surface or wall.

S. Outlet boxes in sound-rated construction are to be wrapped with putty pads and sealed to the gypsum board with acoustical sealant (see Figure 8). Additionally, outlet boxes on opposite sides of sound-rated construction are to be places a minimum of 16-inches away from each other. Low-voltage devices should also be placed in outlet boxes and treated as such.

## 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 Division 31 Section 31 11 00 “Clearing & Grubbing” for pipe less than 6 inches in nominal diameter.
2. Install backfill as specified in Division 31 Section 31 11 00 “Clearing & Grubbing”

## 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. 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 INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section 07 84 00 “Firestopping and Smoke Sealants”

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors 2 inches above finished floor level.

G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway unless sleeve seal is to be installed.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway, using joint sealant appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway penetrations. Install sleeves and seal with firestop materials. Comply with Division 07 Section 07 84 00 “Firestopping and Smoke Sealants”

K. Roof-Penetration Sleeves: Seal penetration of individual raceways with flexible, boot-type flashing units applied in coordination with roofing work.

L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm)

annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Underground, Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch annular clear space between raceway and sleeve for installing mechanical sleeve seals.

3.6 SLEEVE-SEAL INSTALLATION

A. Install to seal underground, exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway material and size. Position raceway in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.7 FIRESTOPPING

N. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section 07 84 00 “Firestopping and Smoke Sealants”

3.8 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 26 05 33

# SECTION 26 05 53
# IDENTIFICATION FOR ELECTRICAL SYSTEMS

## PART 1 GENERAL

### 1.1 SUMMARY

A. The extent of the electrical systems and equipment requiring identification is shown on the drawings, and the extent of identification required is specified herein and in individual sections of work requiring identification. The types of electrical identification specified in this section include the following:
   1. Exposed conduit color banding.
   2. Cable/conductor identification.
   3. Operational instructions and warnings.
   4. Equipment/system identification signs.

### 1.2 REFERENCES- CODES AND STANDARDS

A. ANSI Z535.1 - Safety Color Code

B. APWA ULCC - Uniform Color Code for Buried Utilities.

C. CEC California Electrical Code (CEC). Latest approved edition.

### 1.3 SYSTEM DESCRIPTION

A. Label the following electrical equipment with nameplates which clearly identify each item, the function or use of the item, and the circuit identification of the feed to the item:

1. All transformers shall be identified by 1-inch high block letters cut in stencil and applied with yellow paint on a flat-black background. The transformer number, primary and secondary voltages, and the kVA shall be shown.

2. All Distribution Panelboards, Power and Lighting Panels, Local Control Panels, Terminal Cabinets and all electrical equipment enclosure shall be identified using laminated plastic nameplates. The equipment number, voltage rating, current rating, number of phases, connection type, short circuit interrupting rating, and circuit number shall be shown.

3. All motors, starters, disconnect switches, Time Switches, Special Function Pushbuttons and Switches, and miscellaneous control devices shall be identified by function and circuit number, with 1/4-inch high black characters on a ½-inch wide white stick-on tape where installed indoors and engraved plastic nameplates where installed outdoors.

4. All underground raceway or cable shall be marked with buried warning tape along its entire length.

5. All exposed raceway longer than 10 feet in length shall be identified.

6. Panelboard Directories: Furnish all panelboards with a complete typewritten directory mounted in the inner door under a clear plastic cover set in a metal frame.

B. Branch circuits and devices:

1. Label all individual receptacle outlets and light switches at their faceplate to indicate the panelboard of origin and branch circuit number, as shown on drawings. Labels shall be self adhesive, thermal machine printed type such as Brothers, Panduit, or T&B and shall be clear plastic with black lettering.

2. All branch circuits in outlet boxes shall be identified with circuit number using wrap-around labels (T&B, BRADY or 3M).

3. As an alternative to separate nameplates, device plates may be engraved directly with lettering filled with black enamel.

1.4 SUBMITTALS

A. Catalog data for nameplates, labels, and markers.

B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under regulatory requirements. Include instructions for storage, handling, protection, examination, preparation and installation of product.

1.5 REGULATORY REQUIREMENTS

A. Conform to requirements of CEC – California Electrical Code.

B. Furnish products listed and classified by Underwriters' Laboratories, Inc. (UL), Electrical Testing Laboratories, Inc. (ETL), or other recognized, approved testing and listing agencies as suitable for the purpose specified and shown.

PART 2 PRODUCTS

1.6 NAMEPLATES AND LABELS

A. Nameplates

1. Engraved three-layer laminated plastic, white letters on black background for normal power and white letters on red background for emergency power. Communications and control cabinets shall be labeled with white letters on green background.

2. Locations

a. Each electrical distribution board, panelboard and control equipment enclosure.

b. Communication cabinets.

3. Letter Size

a. Use 1/8-inch letters for identifying individual equipment and loads.

b. Use ¼-inch letters for identifying grouped equipment, loads, panelboards, and transfer switches.

c. Use ½-inch letters for identifying the main switchboard, motor control centers, transformers and large distribution switchboards.

B. Labels

1. Embossed adhesive tape, with 3/16-inch white letters on colored background to match color scheme of plastic laminate labels in 2.1.1. Use only for identification of individual wall switches and receptacles, control device stations, and multi-outlet devices.

2. Thickness

a. 1/16-inch for units up to 20 square inches or 8-inch length; 1/8-inch for larger units.

1.7 WIRE MARKERS

A. Manufacturers

1. Brady

2. Thomas & Betts

3. 3-M Co.

B. Description: Cloth, tape, split sleeve, or tubing type wire markers, self-adhesive.

C. Locations: Each conductor at panelboard gutters, pull boxes, outlet and junction boxes, control panels, motor controllers and starters, and each load connection.

D. Legend

1. Power and Lighting Circuits: Branch circuit or feeder feed from.

2. Control Circuits: Control wire number indicated on shop drawings.

3. Neutral Conductors: Clearly indicate the branch circuit or feeder number the neutral serves. In multi-wire circuits where the neutral is shared, mark the neutral with the circuit number of the “A” phase.

1.8 CONDUIT MARKERS

A. Provide manufacturer's standard preprinted, flexible or semi-rigid, permanent, plastic-sheet conduit markers, minimum of 3 mils thick and 1-1/2-inch wide extending 360 degrees around conduits; designed for self-adhesive attachment to

conduit. Except as otherwise indicated, provide lettering that indicates the voltage of the conductor(s) in the conduit. Provide 8-inch minimum length for 2-inch and smaller conduit, 12-inch minimum length for larger conduit.

A. Location: Furnish markers for each conduit longer than 10 feet.

B. Spacing: 20 feet on center.

C. Color: Unless otherwise indicated or required by governing regulation, provide orange markers with black letters.

1. Fire Alarm System: Red w/black letters.

2. Telephone System: Green w/yellow letters.

3. Data/Communication. System: White w/black letters.

4. Emergency System: Orange w/black letters.

D. Legend:

1. 208 Volt System: Normal 208/120-volts.

2. Fire Alarm System: Fire alarm.

3. Telephone System: Telephone.

4. Data/Communication System: Data/communications.

1.9 FASTENERS

A. Secure all labels and nameplates with self-tapping stainless steel screws. Use contact type permanent adhesive where screws cannot or should not penetrate the substrate.

1.10 LETTERING AND GRAPHICS

A. Coordinate names, abbreviations and other designations used in the electrical identification work, with the corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of the electrical systems and equipment.

1.11 UNDERGROUND WARNING TAPE

A. Three-inch minimum width, 5 mil thickness, foil bonded polyethylene tape, detectable type, with suitable continuous warning legend describing buried electrical lines. Tape color shall conform to APWA uniform color code using ANSI Z535.1 safety colors. Text shall be black, 2-inch minimum letters.

B. Identify underground conduits using underground warning tape. Install one tape per trench at 3 inches below finished grade.

PART 3 EXECUTION

1.12 PREPARATION

A. Degrease and clean surfaces to receive nameplates and labels.

B. Coordination: Where identification is to be applied to surfaces that require finish, install identification after completion of painting.

C. Regulations: Comply with governing regulations and the requests of governing authorities for the identification of electrical work.

1.13 APPLICATION

A. Install nameplate and label parallel to equipment lines.

B. Secure nameplate to equipment front using screws, rivets, or adhesive.

C. Secure nameplate to outside moveable surface of door on panelboard.

D. Conduit Identification:
1. Where electrical conduit is exposed in spaces with exposed mechanical piping, which is identified by a color-coded method, apply color-coded identification on the electrical conduit in a manner similar to the piping identification. Except as otherwise indicated, use orange as the coded color for conduit.
2. Paint red band or provide red tape on each fire alarm conduit longer than 10 feet, minimum 20 feet on center.

E. Cable/Conductor Identification:
1. Apply cable/conductor identification on each cable and conductor in each box/enclosure/cabinet where the wires of more than one circuit or communication/signal system are present, except where another form of identification (such as color-coded conductors) is provided.
2. Match identification with marking system used in panelboards, shop drawings, contract documents, and similar previously established identification for project electrical work.

F. Operational Identification and Warnings
1. Wherever reasonably required to ensure safe and efficient operation and maintenance of the electrical systems, and electrically connected mechanical systems and general systems and equipment, including the prevention of misuse of electrical facilities by unauthorized personnel, install self-adhesive plastic signs or similar equivalent identification, instruction or warnings on switches, outlets and other controls, devices and covers of electrical enclosures. Where detailed instructions or explanations are needed, provide plasticized tags with clearly written messages adequate for the intended purposes.

END OF SECTION 26 05 53

# SECTION 26 09 23
# LIGHTING CONTROL 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. Time switches.
2. Outdoor and indoor photoelectric switches.
3. Indoor occupancy sensors.
4. Outdoor motion sensors.
5. Lighting contactors.

B. Related Sections:

1. Division 26 Section "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

### 1.3 DEFINITIONS

A. LED: Light-emitting diode.

B. PIR: Passive infrared.

### 1.4 SUBMITTALS

A. Product Data For each type of product indicated.

B. Shop Drawings: Show installation details for occupancy and light-level sensors.

1. Interconnection diagrams showing field-installed wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.

### 1.5 QUALITY ASSURANCE

A. 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.

1.6 COORDINATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 TIME 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:

1. Area Lighting Research, Inc.; Tyco Electronics.
2. Grasslin Controls Corporation; a GE Industrial Systems Company.
3. Intermatic, Inc.
4. Leviton Mfg. Company Inc.
5. Lightolier Controls; a Genlyte Company.
6. Lithonia Lighting; Acuity Lighting Group, Inc.
7. Paragon Electric Co.; Invensys Climate Controls.
8. Square D; Schneider Electric.
9. TORK.
10. Touch-Plate, Inc.
11. Watt Stopper (The).

B. Electromechanical-Dial Time Switches: Type complying with UL 917 and 2019CEC Title 24.

1. Contact Configuration: DPST or as required.
2. Contact Rating: 30-A inductive or resistive, 240-V ac.
3. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program.
4. Astronomic time dial.
5. Eight-Day Program: Uniquely programmable for each weekday and holidays.
6. Skip-a-day mode.
7. Wound-spring reserve carryover mechanism to keep time during power failures, minimum of 16 hours.
8. Capable of receiving and automatically responding to a demand response signal.

## 2.2 OUTDOOR PHOTOELECTRIC 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:

1. Area Lighting Research, Inc.; Tyco Electronics.
2. Grasslin Controls Corporation; a GE Industrial Systems Company.
3. Intermatic, Inc.
4. Lithonia Lighting; Acuity Lighting Group, Inc.
5. Novitas, Inc.
6. Paragon Electric Co.; Invensys Climate Controls.
7. Square D; Schneider Electric.
8. TORK.
9. Touch-Plate, Inc.
10. Watt Stopper (The).

B. Description: Solid state, with DPST dry contacts rated for 1800-VA tungsten or 1000-VA inductive, to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A.

1. Light-Level Monitoring Range: 1.5 to 10 fc (16.14 to 108 lx), with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of photocell to prevent fixed light sources from causing turn-off.
2. Time Delay: 15-second minimum, to prevent false operation.
3. Surge Protection: Metal-oxide varistor, complying with IEEE C62.41.1, IEEE C62.41.2, and IEEE 62.45 for Category A1 locations.
4. Mounting: Twist lock complying with IEEE C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure.

## 2.3 INDOOR OCCUPANCY SENSORS

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. Hubbell Lighting.
2. Leviton Mfg. Company Inc.
3. Lithonia Lighting; Acuity Lighting Group, Inc.
4. Novitas, Inc.
5. RAB Lighting, Inc.
6. Sensor Switch, Inc.
7. TORK.
8. Watt Stopper (The).

B. General Description: Wall- or ceiling-mounting, solid-state units with a separate relay unit.

1. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied; with a time-delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
3. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.

4. Mounting:

    a. Sensor: Suitable for mounting in any position on a standard outlet box.
    b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
    c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
6. Bypass Switch: Override the on function in case of sensor failure.
7. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc (21.5 to 2152 lx); keep lighting off when selected lighting level is present.

C. Dual-Technology Type: Ceiling mounting; detect occupancy by using a combination of PIR and ultrasonic detection methods in area of coverage. Particular technology or combination of technologies that controls on-off functions shall be selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.
2. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s).
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling

## 2.4 LIGHTING CONTACTORS

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. Allen-Bradley/Rockwell Automation.
2. ASCO Power Technologies, LP; a division of Emerson Electric Company.
3. Eaton Electrical Inc.; Cutler-Hammer Products.
4. GE Industrial Systems; Total Lighting Control.
5. Grasslin Controls Corporation; a GE Industrial Systems Company.
6. Hubbell Lighting.
7. Lithonia Lighting; Acuity Lighting Group, Inc.
8. MicroLite Lighting Control Systems.
9. Square D; Schneider Electric.
10. TORK.
11. Touch-Plate, Inc.
12. Watt Stopper (The).

B. Description: Electrically operated and mechanically held, complying with NEMA ICS 2 and UL 508.

1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
3. Enclosure: Comply with NEMA 250

2.5 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables.".

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

A. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 CONTACTOR INSTALLATION

A. Mount electrically held lighting contactors with elastomeric isolator pads, to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.3 WIRING INSTALLATION

A. Wiring Method: Comply with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size shall be 1/2 inch (13 mm).

B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.4 IDENTIFICATION

A. Identify components and power and control wiring according to Division 26 Section "Identification for Electrical Systems."

1. Identify controlled circuits in lighting contactors.
2. Identify circuits or luminaries controlled by photoelectric and occupancy sensors at each sensor.

B. Label time switches and contactors with a unique designation.

3.5 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
2. Operational Test: Verify operation of each lighting control device, and adjust time delays.

B. Lighting control devices that fail tests and inspections are defective work.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

END OF SECTION 26 09 23

**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. Disconnecting and overcurrent protective devices.
3. Accessory components and features.
4. Identification

1.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Switchboards shall withstand the effects of earthquake motions for seismic Zone 4.

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."

1.4 SUBMITTALS

A. Product Data: For each type of switchboard, overcurrent protective device, ground-fault protector, accessory, and component indicated. 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. Detail utility company's metering provisions with indication of approval by utility company.
6. Include evidence of NRTL listing for series rating of installed devices.

7. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

C. Qualification Data: For qualified Installer.

D. Seismic Qualification Certificates: Submit certification that switchboards, overcurrent protective devices, accessories, and components will withstand seismic Zone 4. Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Field Quality-Control Reports:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

F. Operation and Maintenance Data: For switchboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Routine maintenance requirements for switchboards and all installed components.
2. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
3. 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.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2.1 and trained in electrical safety as required by NFPA 70E.

1. Testing Agency Qualifications: Member company of NETA or an NRTL.

B. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

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.

1.6 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 in Division 03.

1.7 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

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. 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.

B. Front-Connected, Front-Accessible Switchboards:

1. Main Devices: Panel mounted.
2. Branch Devices: Panel mounted.
3. Sections front and rear aligned.

C. Nominal System Voltage: 208Y/120 V.

D. Main-Bus Continuous: as indicated on plans.

E. Seismic Requirements: Fabricate and test switchboards according to IEEE 344 to withstand seismic Zone 4.

F. Indoor Enclosures: Steel, NEMA 250, Type 1.

G. Enclosure Finish for Indoor Units: Factory-applied finish in manufacturer's standard gray finish over a rust-inhibiting primer on treated metal surface.

H. Barriers: Between adjacent switchboard sections.

I. Insulation and isolation for main bus of main section and main and vertical buses of feeder sections.

J. Utility Metering Compartment: Fabricated, barrier compartment and section complying with utility company's requirements; hinged sealed 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.

K. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.

L. Buses and Connections: Three phase, four wire unless otherwise indicated.

1. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent conductivity, with tin-plated aluminum or copper feeder circuit-breaker line connections (aluminum is acceptable).
2. Load Terminals: Insulated, rigidly braced, runback bus extensions, of same material as through buses, equipped with mechanical connectors for outgoing circuit conductors. Provide load terminals for future circuit-breaker positions at full-ampere rating of circuit-breaker position.
3. Ground Bus: 1/4-by-2-inch- hard-drawn copper of 98 percent conductivity, equipped with mechanical connectors for feeder and branch-circuit ground conductors. For busway feeders, extend insulated equipment grounding cable to busway ground connection and support cable at intervals in vertical run.

4. 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.
5. Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with mechanical connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.
6. Isolation Barrier Access Provisions: Permit checking of bus-bolt tightness.

M. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.

N. Bus-Bar Insulation: Factory-applied, flame-retardant, tape wrapping of individual bus bars or flame-retardant, spray-applied insulation. Minimum insulation temperature rating of 105 deg C.

2.2 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. 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. 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 time adjustments.
    d. Ground-fault pickup level, time delay, and I2t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
6. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

    a. Standard frame sizes, trip ratings, and number of poles.
    b. Lugs: Mechanical 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. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
e. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
f. 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.
g. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.

B. Fused Switch: NEMA KS1, Type HD; clips to accommodate specified fuses; lockable handle.

C. Fuses are specified in Division 26, Section 26 28 13 - Fuses.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store switchboards according to NECA 400 and NEMA PB 2.1.

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.

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 Division 03 Section "Cast-in-Place Concrete."

1. 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.
2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

4. Install anchor bolts to elevations required for proper attachment to switchboards.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from switchboard units and components.

D. Comply with mounting and anchoring requirements specified for seismic Zone 4.

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. filler plates in unused spaces of panel-mounted sections.

G. Install overcurrent protective devices, transient voltage suppression devices, and instrumentation.

1. Set field-adjustable switches and circuit-breaker trip ranges.

H. Install spare-fuse cabinet.

I. Comply with NECA 1.

3.3 CONNECTIONS

A. Comply with requirements for terminating cable trays specified in Division 26 Section "Cable Trays for Electrical Systems." Drawings indicate general arrangement of cable trays, fittings, and specialties.

3.4 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

B. Switchboard Nameplates: Label each switchboard compartment with a nameplate complying with requirements for identification specified in Division 26 Section "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 Division 26 Section "Identification for Electrical Systems."

## 3.5 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 inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. 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.

D. Acceptance Testing Preparation:

1. Test insulation resistance for each switchboard bus, component, connecting supply and feeder.
2. Test continuity of each circuit.

E. 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.

F. Switchboard will be considered defective if it does not pass tests and inspections.

G. 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 required.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to maintain switchboards and overcurrent protective devices.

END OF SECTION 26 24 13

**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. Distribution panelboards.

2. Lighting and appliance branch-circuit panelboards.

3. Load centers.

1.3 DEFINITIONS

A. SVR: Suppressed voltage rating.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to SEI/ASCE 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.

1.5 SUBMITTALS

A. Product Data: For each type of panelboard, switching and overcurrent protective device, accessory and component indicated. 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. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types and details for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Include evidence of NRTL listing for series rating of installed devices.

6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.
8. 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.

C. Qualification Data: For qualified testing agency.

D. Seismic Qualification Certificates: Submit certification that panelboards, overcurrent protective devices, accessories, and components will withstand seismic Zone 4. Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Field Quality-Control Reports:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

F. Panelboard Schedules: For installation in panelboards.

G. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "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.

1.6 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.

B. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

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

1.7 COORDINATION

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. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03Cord and Plug Sets: Match equipment requirements.

1.8 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Keys: Two spares for each type of panelboard cabinet lock.
2. Circuit Breakers Including GFCI Types: Two spares for each panelboard.
3. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

B. Enclosures: Flush- and surface-mounted 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. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
3. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
4. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
5. Finishes:

    a. Panels and Trim: Steel and galvanized 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.

6. Directory Card: Inside panelboard door, mounted in transparent card holder.

C. Incoming Mains Location: Top and bottom.

D. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.Tin-plated aluminum is allowed.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
3. Neutral Bus: Neutral bus rated 100 percent of phase bus.

E. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Mechanical type.
3. Ground Lugs and Bus-Configured Terminators: Mechanical type.

F. Service Equipment Label: NRTL labeled for use as service equipment for panelboards or load centers with one or more main service disconnecting and overcurrent protective devices.

G. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

H. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include size and type of allowable upstream and branch devices, listed and labeled for series-connected short-circuit rating by an NRTL.

I. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 DISTRIBUTION 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:

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.

B. Panelboards: NEMA PB 1, power and feeder distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inches (914 mm) high, provide two latches, keyed alike.

D. Mains: Circuit breaker or Lugs only as indicated on plans.

E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

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:

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.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: Circuit breaker or lugs only as indicated on plans.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

F. Column-Type Panelboards: Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses.

2.4 LOAD CENTERS

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. 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.

B. Load Centers: Comply with UL 67.

C. Mains: Lugs only or as indicated on plans.

D. Branch Overcurrent Protective Devices: Plug-in circuit breakers, replaceable without disturbing adjacent units.

E. Conductor Connectors: Mechanical type for main, neutral, and ground lugs and buses.

F. Load Centers are required to be primed - to be painted out with the wall.

2.5 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:

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.

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with series-connected rating to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. 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. 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 time adjustments.
    d. Ground-fault pickup level, time delay, and I2t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
6. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
7. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

    a. Standard frame sizes, trip ratings, and number of poles.
    b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
    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. Shunt Trip: 120V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
    e. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
    f. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.
    g. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
    h. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

1. Fused Switch Features and Accessories: Standard ampere ratings and number of poles.
2. Auxiliary Contacts: One normally open and normally closed contact(s) that operate with switch handle operation.

2.6 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

B. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store panelboards according to NECA 407.

B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install panelboards and accessories according to NECA 407.

B. Equipment Mounting: Install panelboards on walls or mounting support as required.

1. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to panelboards.
3. Attach panelboard to the vertical finished or structural surface behind the panelboard.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

D. Comply with mounting and anchoring requirements for seismic Zone 4.

E. Mount top of trim 72 inches above finished floor unless otherwise indicated.

F. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

G. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.

H. Install filler plates in unused spaces.

I. Comply with NECA 1.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 26 Section 26 05 53 “Identification For Electrical Systems."

B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Division 26 Section 26 05 53 “Identification For Electrical Systems."

D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Division 26 Section 26 05 53 “Identification For Electrical Systems."

3.4 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 inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. 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.

D. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

E. 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.

F. Panelboards 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.

B. Set field-adjustable circuit-breaker trip ranges as required.

END OF SECTION 26 24 16

**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. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Twist-locking receptacles.
3. Wall-box motion sensors.
4. Snap switches and wall-box dimmers.
5. Solid-state fan speed controls.
6. Wall-switch and exterior occupancy sensors.
7. Communications outlets.
8. Pendant cord-connector devices.
9. Cord and plug sets.
10. Floor service outlets and poke-through assemblies.

B. Related Sections:

1. Division 26 Section "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
2. Division 26 Section "Wiring Devices" for manual wall-box dimmers for incandescent lamps.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. RFI: Radio-frequency interference.

E. UTP: Unshielded twisted pair.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Samples: One for each type of device and wall plate specified, in each color specified.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.

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. Comply with NFPA 70.

1.6 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1. Cord and Plug Sets: Match equipment requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Copper Wiring Devices; a division of Cooper Industries, Inc. (Cooper) – Decora style – white.
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell) – Decora style - white.
3. Leviton Mfg. Company Inc. (Leviton) – Decora style - white.
4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour) – Decora style - white.

2.2 STRAIGHT BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper; 5351 (Single), 5352 (Duplex). Decora style – white.
b. Hubbell; HBL5351 (single), CR5352 (duplex). Decora style – white.
c. Leviton; 5891 (single), 5352 (duplex). Decora style – white.
d. Pass & Seymour; 5381 (single), 5352 (duplex). Decora style – white.

2.3 GFCI RECEPTACLES

A. General Description: Straight blade, non-feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper, GF20, white.
b. Pass & Seymour; 2084, white.

2.4 CORD AND PLUG SETS

A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.

1. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent.
2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.5 WALL-BOX DIMMERS

A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.

B. Control: Continuously adjustable slider with single-pole or three-way switching. Comply with UL 1472.

C. Incandescent Lamp Dimmers: 120 V; control shall follow square-law dimming curve. On-off switch positions shall bypass dimmer module.

1. 600 W; dimmers shall require no derating when ganged with other devices.

2.6 FAN SPEED CONTROLS

A. Modular, 120-V, full-wave, solid-state units with integral, quiet on-off switches and audible frequency and EMI/RFI filters. Comply with UL 1917.

1. Continuously adjustable slider 5 A or 1.5 A.
2. Three-speed adjustable slider, 1.5 A.

2.7 OCCUPANCY SENSORS

A. Wall-Switch Sensors:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper; 6111 for 120 V, 6117 for 277 V.
b. Hubbell; WS1277.
c. Leviton; ODS 10-ID.
d. Pass & Seymour; WS3000.
e. Watt Stopper (The); WS-200.

2. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 180-degree field of view, with a minimum coverage area of 900 sq. ft.

B. Wall-Switch Sensors:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Hubbell; AT120 for 120 V, AT277 for 277 V.
b. Leviton; ODS 15-ID.

2. Description: Adaptive-technology type, 120/277 V, adjustable time delay up to 20 minutes, 180-degree field of view, with a minimum coverage area of 900 sq. ft.

C. Long-Range Wall-Switch Sensors:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Hubbell; ATP1600WRP.

b. Leviton; ODWWV-IRW.
c. Pass & Seymour; WA1001.
d. Watt Stopper (The); CX-100.

2. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 110-degree field of view, with a minimum coverage area of 1200 sq. ft.

D. Long-Range Wall-Switch Sensors:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Hubbell; ATD1600WRP.
b. Leviton; ODW12-MRW.
c. Watt Stopper (The); DT-200.

2. Description: Dual technology, with both passive-infrared- and ultrasonic-type sensing, 120/277 V, adjustable time delay up to 30 minutes, 110-degree field of view, and a minimum coverage area of 1200 sq. ft).

E. Wide-Range Wall-Switch Sensors:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Hubbell; ATP120HBRP.
b. Leviton; ODWHB-IRW.
c. Pass & Seymour; HS1001.
d. Watt Stopper (The); CX-100-3.

2. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 150-degree field of view, with a minimum coverage area of 1200 sq. ft.

F. Exterior Occupancy Sensors:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Leviton; PS200-10.
b. Watt Stopper (The); EW-100-120.

2. Description: Passive-infrared type, 120/277 V, weatherproof, adjustable time delay up to 15 minutes, 180-degree field of view, and 110-foot

detection range. Minimum switch rating: 1000-W incandescent, 500-VA fluorescent.

2.8 COMMUNICATIONS OUTLETS

A. Telephone Outlet:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper; 3560-6, white.
b. Leviton; 40649, white.

2. Description: Single RJ-45 jack for terminating 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with Category 5e. Comply with UL 1863.

B. Combination TV and Telephone Outlet:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper; 3562, white.
b. Leviton; 40595, white.

2. Description: Single RJ-45 jack for 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with Category 5e; and one Type F coaxial cable connector, white.

2.9 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
3. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant, die-cast aluminum with lockable cover.

2.10 FLOOR SERVICE FITTINGS

A. Type: Modular, flush-type, dual-service units suitable for wiring method used.

B. Compartments: Barrier separates power from voice and data communication cabling.

C. Service Plate: Rectangular, solid brass with satin finish.

D. Power Receptacle: NEMA WD 6 configuration 5-20R, gray finish, unless otherwise indicated.

E. Voice and Data Communication Outlet: Two modular, keyed, color-coded, RJ-45 Category 5e jacks for UTP cable.

2.11 POKE-THROUGH ASSEMBLIES

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. Hubbell Incorporated; Wiring Device-Kellems.
2. Pass & Seymour/Legrand; Wiring Devices & Accessories.
3. Square D/ Schneider Electric.
4. Thomas & Betts Corporation.
5. Wiremold Company (The).

B. Description: Factory-fabricated and -wired assembly of below-floor junction box with multichanneled, through-floor raceway/firestop unit and detachable matching floor service outlet assembly.

1. Service Outlet Assembly: Flush type with two simplex receptacles and space for two RJ-45 jacks.
2. Size: Selected to fit nominal 4-inch and matched to floor thickness.
3. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.
4. Closure Plug: Arranged to close unused 4-inch cored openings and reestablish fire rating of floor.
5. Wiring Raceways and Compartments: For a minimum of four No. 12 AWG conductors and a minimum of two, 4-pair, Category 5e voice and data communication cables.

2.12 FINISHES

A. Color: Wiring device catalog numbers in Section Text do not designate device color.

1. Wiring Devices Connected to Normal Power System: White or as selected by Architect, unless otherwise indicated or required by NFPA 70 or device listing.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.

B. Coordination with Other Trades:

1. Take steps to ensure that devices and their boxes are protected. 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 the 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 just 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.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they 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 conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
6. Tighten unused terminal screws on the device.
7. 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 left.

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. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. 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, multi-gang wall plates.

I. Adjust locations of floor service outlets to suit arrangement of partitions and furnishings.

3.2 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

B. 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 not acceptable.
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. The 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.

END OF SECTION 26 27 26

**SECTION 26 28 13**
**FUSES**

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. Cartridge fuses rated 600-V ac and less for use in control circuits, enclosed switches, panelboards, switchboards, enclosed controllers, and motor-control centers.
2. Spare-fuse cabinets.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material, dimensions, descriptions of individual components, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:

1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.

a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.

2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
3. Current-limitation curves for fuses with current-limiting characteristics.
4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.
5. Coordination charts and tables and related data.
6. Fuse sizes for elevator feeders and elevator disconnect switches.

B. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Ambient temperature adjustment information.
2. Current-limitation curves for fuses with current-limiting characteristics.
3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.
4. Coordination charts and tables and related data.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

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 NEMA FU 1 for cartridge fuses.

D. Comply with NFPA 70.

E. Comply with UL 248-11 for plug fuses.

1.5 PROJECT CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.6 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

1.7 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper Bussmann, Inc.
2. Edison Fuse, Inc.
3. Ferraz Shawmut, Inc.
4. Littelfuse, Inc.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

2.3 SPARE-FUSE CABINET

A. Characteristics: Wall-mounted steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.

1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
2. Finish: Gray, baked enamel.
3. Identification: "SPARE FUSES" in 1-1/2-inch- high letters on exterior of door.
4. Fuse Pullers: For each size of fuse, where applicable and available, from fuse manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.

B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.

C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Cartridge Fuses:

B. Feeders: Class L, fast acting, Class L, time delay, Class RK1, time delay, Class J, time delay.

C. Motor Branch Circuits: Class RK1, time delay.

D. Other Branch Circuits: Class RK1, time delay, Class J, fast acting.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

B. Install spare-fuse cabinet(s).

3.4 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Division 26 Section 26 05 53 “Identification For Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION 26 28 13

**SECTION 26 51 00**
**LED INTERIOR LIGHTING**

PART 1 - GENERAL

1.1 REFERENCES

A. CEC Title 20 (2019) Appliance Efficiency Regulations / Public Utilities and Energy Division 2. State Energy Resources Conservation and

B. CEC Title 24 (2022) Building Energy Efficiency Standards for Residential and Nonresidential Buildings

C. CAL Green (2022) California Building Standard Code

D. IES HB-10 IES Lighting Handbook

E. IES LM-79 Electrical and Photometric Measurements of Solid-State Lighting Products

F. IES LM-80 Measuring Lumen Maintenance of LED Light Sources

G. IES TM-15-11 Luminaire Classification System for Outdoor Luminaires

H. IES TM-21 Projecting Long Term Lumen Maintenance of LED Light Sources

I. IEEE C62.41 (1991; R 1995) Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits

J. NFPA 70 National Electrical Code

K. NFPA 101 Life Safety Code

L. UL 924 UL Standard for Safety Emergency Lighting and Power Equipment

M. UL 1472 UL Standard for Safety Solid-State Dimming Controls

N. UL 1598 Luminaires.

1.2 DEFINITIONS

A. For LED luminaire light sources, "Useful Life" is the operating hours before reaching 70 percent of the initial rated lumen output (L70) with no catastrophic failures under normal operating conditions. This is also known as 70 percent "Rated Lumen Maintenance Life" as defined in IES LM-80.

B. For LED luminaires, "Luminaire Efficacy" (LE) is the appropriate measure of energy efficiency, measured in lumens/watt.This is gathered from LM-79 data for the luminaire, in which absolute photometry is used to measure the lumen output of the luminaire as one entity, not the source separately and then the source and housing together.

C. Total harmonic distortion (THD) is the root mean square (RMS) of all the harmonic components divided by the total fundamental current

1.3 SUBMITTALS

A. Shop Drawings

1. Luminaire Drawings
2. Occupancy/Vacancy Sensor Coverage Layout
3. Lighting Control System One-Line Diagram
4. Sequence of Operation for Lighting Control System

B. Product Data

1. Luminaires
2. Light Sources
3. LED Drivers
4. Luminaire Warranty
5. Exit Signs
6. Emergency Drivers
7. Linear LED Lamps

C. Test Reports

1. IES LM-79 Test Report
2. IES LM-80 Test Report
3. IES TM-21 Test Report

D. Operation and Maintenance Data

1. Lighting System
2. Lighting Control System

1.4 QUALITY ASSURANCE

A. Data, drawings, and reports must employ the terminology, classifications and methods prescribed by the IES HB-10 as applicable, for the lighting system specified.

1. Luminaire Drawings

a. Include dimensions, accessories installation details, and construction details. Photometric data, including CRI, CCT, LED driver type, [ aiming diagram,] zonal lumen data, and candlepower distribution data must accompany shop drawings.

2. Luminaire Design Data

   a. Provide safety certification and file number for the luminaire family that must be listed, labeled, or identified in accordance with the NFPA 70. Applicable testing bodies are determined by the US Occupational Safety Health Administration (OSHA) as Nationally Recognized Testing Laboratories (NRTL) and include: CSA (Canadian Standards Association), ETL (Edison Testing Laboratory), and UL (Underwriters Laboratories).

   b. Provide long term lumen maintenance projections for each LED luminaire in accordance with IES TM-21.Data used for projections must be obtained from testing in accordance with IES LM-80.

3. IES LM-79 Test Report

   a. Submit test report on manufacturer's standard production model of specified luminaire. Testing must be performed at the same operating drive current as specified luminaire. Include all applicable and required data in IES format as outlined under "14.0 Test Report" in IES LM-79.

4. IES LM-80 Test Report

   a. Submit report on manufacturer's standard production LED light source (package, array, or module) of specified luminaire. Testing must be performed at the same operating drive current as specified luminaire. Include all applicable and required data as outlined under "8.0 Test Report" in IES LM-80.

5. IES TM-21 Test Report

   a. Submit test report on manufacturer's standard production LED light source (package, array, or module) of specified luminaire. Testing must be performed at the same operating drive current as specified luminaire. Include all applicable and required data, as well as required interpolation information as outlined under "7.0 Report" in IES TM-21.

6. LED Driver and Dimming Switch Compatibility Certificate

   a. Submit certification from the luminaire, driver, or dimmer switch manufacturer that ensures compatibility and operability between devices without flickering and to specified dimming levels.

B. Test Laboratories

1. Test laboratories for the IES LM-79 and IES LM-80 test reports must be one of the following:

   a. National Voluntary Laboratory Accreditation Program (NVLAP) accredited for solid-state lighting testing as part of the Energy-Efficient Lighting Products laboratory accreditation program for both LM-79 and LM-80 testing.
   b. One of the qualified labs listed on the Department of Energy - LED Lighting Facts Approved Testing Laboratories List for LM-79 testing.
   c. One of the EPA-Recognized Laboratories listed for LM-80 testing.

C. Regulatory Requirements

1. Equipment, materials, installation, and workmanship must be in accordance with the mandatory and advisory provisions of NFPA 70, unless more stringent requirements are specified or indicated. Provide luminaires and assembled components that are approved by and bear the label of UL for the applicable location and conditions unless otherwise specified.

D. Standard Products

1. Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design, and workmanship. Products must have been in satisfactory commercial or industrial use for six months prior to bid opening.

   The six-month period must include applications of equipment and materials under similar circumstances and of similar size. The product must have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the six-month period. Where two or more items of the same class of equipment are required, these items must be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.

   a. Alternative Qualifications

      1) Products having less than a six-month field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.

   b. Material and Equipment Manufacturing Date

      1) Do not use products manufactured more than six months prior to date of delivery to site, unless specified otherwise.

1.5 WARRANTY

A. Support all equipment items by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

B. Luminaire Warranty

1. Provide a written five-year minimum replacement warranty for material, luminaire finish, and workmanship. Provide written warranty document that contains all warranty processing information needed, including customer service point of contact, whether or not a return authorization number is required, return shipping information, and closest return location to the luminaire location.

    a. Finish warranty must include failure and substantial deterioration such as blistering, cracking, peeling, chalking, or fading.
    b. Material warranty must include:

        1) All LED drivers and integral control equipment.
        2) Replacement when more than 10 percent of LED sources in any lightbar or subassembly(s) are defective, non-starting, or operating below 70 percent of specified lumen output.
        3) Replacement when more than 10 percent of LED sources in any lightbar or subassembly(s) show a color shift greater than 0.003 delta u'v' from the zero hour measurement stated in the IES LM-79 Test Report.

2. Warranty period must begin in accordance with the manufacturer's standard warranty starting date.
3. Provide replacements that are promptly shipped, without charge, to the using Government facility point of contact and that are identical to or an improvement upon the original equipment. All replacements must include testing of new components and assembly.

PART 2 - PRODUCTS

2.1 PRODUCT COORDINATION

A. LUMINAIRES

1. Provide luminaires as indicated in the luminaire schedule complete with light source, wattage, and lumen output indicated. All luminaires of the same type must be provided by the same manufacturer. Luminaires must be specifically designed for use with the driver and light source provided.
2. For all luminaires, provide:

a. Complete system with LED drivers and light sources.
b. Housings constructed of non-corrosive materials. All new aluminum housings must be anodized or powder coated. All new steel housings must be treated to be corrosion resistant.
c. IES TM-21, IES LM-80. Minimum L70 lumen maintenance value of 50,000 hours unless otherwise indicated in the luminaire schedule. Luminaire drive current value must be identical to that provided by test data for luminaire in question.
d. UL listed for dry or damp location typical of interior installations. Any luminaire mounted on the exterior of the building must be UL listed for wet location typical of exterior installations.
e. LED driver and light source package, array, or module are accessible for service or replacement without removal or destruction of luminaire.
f. Lenses constructed of heat tempered borosilicate glass, UV-resistant acrylic, or silicone. Provide polycarbonate vandal-resistant lenses as indicated. Sandblasting, etching and polishing must be performed as indicated in the luminaire description.
g. Provide exterior building-mounted luminaires that do not exceed the BUG ratings as shown on Table 5.106.8 of Cal Green or comply with a local ordinance whichever is more stringent.
h. For all recessed luminaires that are identified to be in contact with insulation, provide luminaires that are IC-rated.

B. Luminaires for Hazardous Locations

1. In addition to requirements stated herein, provide LED luminaires for hazardous locations which conform to UL 844 or which have Factory Mutual certification for the class and division indicated.

2.2 LIGHT SOURCES

A. Provide type, delivered lumen output, and wattage as indicated in the luminaire schedule on project plans.

B. LED Light Sources

1. Provide LED light sources that meet the following requirements:

a. Emit white light and have a nominal CCT of 3000 Kelvin.
b. Minimum Color Rendering Index (CRI) of 90 with an R9 value of 95. [ Fidelity index greater than or equal to 80, gamut index between 97 and 110, determined in accordance with IES TM-30.]
c. Restriction of Hazardous Substances (RoHS) compliant.
d. Light source color consistency by utilizing a binning tolerance within a 3-step McAdam ellipse.
e. Color maintenance value of no greater than 0.003 (delta u'v') at 6000 hours as listed in IES LM-79 Test Report.

## 2.3 LED DRIVERS

A. Provide LED drivers that are electronic, UL Class 1 or Class 2, constant-current type and that comply with the following requirements:

1. The combined driver and LED light source system does not exceed the minimum luminaire efficacy values as listed in the luminaire schedule provided.
2. Operates at a voltage of 120-277 volts at 60 hertz, with input voltage fluctuations of plus/minus 10 percent.
3. Power Factor (PF) greater than or equal to 0.90 at full input power and across specified dimming range.
4. Maximum Total Harmonic Distortion (THD) less than 20 percent at full input power and across specified dimming range.
5. Operates for at least 50,000 hours at maximum case temperature and 90 percent non-condensing relative humidity.
6. Withstands Category A surges of 4 kV without impairment of performance. Provide surge protection that is integral to the driver.
7. Integral thermal protection that reduces the output power to protect the driver and light source from damage if the case temperature approaches or exceeds the driver's maximum operating temperature.
8. Class A sound rating.
9. Restriction of Hazardous Substances (RoHS) compliant.
10. Provide dimming capability as indicated in the luminaire schedule on project plans. Dimmable drivers must dim down to 1 percent. Dimmable drivers must be controlled by a Class 2 low voltage 0-10VDC controller dimming signal protocol unless otherwise specified. LED drivers of the same family/series must track evenly across multiple luminaires at all light levels.

B. Remote LED Drivers

1. Provide remote LED Drivers that are UL listed for dry locations typical of interior installations. Provide LED driver in junction box or housing with mounting plate. Housing must allow for field connections to occur inside the housing or must contain mechanical connections.

## 2.4 EXIT AND EMERGENCY LIGHTING EQUIPMENT

A. Exit Signs

1. UL 924, NFPA 101. Provide wattage as indicated in the luminaire schedule on project plans. Provide LED Exit Signs that meet the following criteria:

a. Housing constructed of [UV-stable, thermo-plastic] [clear polycarbonate housing] [painted, die-cast aluminum] [painted steel]. [Edge-lit type with clear acrylic, edge-lit face and aluminum trim having [clear aluminum] [white][chrome][brass] finish.

b. UL listed for [damp][wet] location.
c. Configured for [universal][ceiling][wall][end] mounting.
d. 6-inch-high, 3/4-inch stroke [red][green] lettering on face of sign with chevrons on either side of lettering to indicate direction.
e. [Single face] [Double face] [Single or double face as indicated in project plans and luminaire schedule].

B. Exit Signs with Battery Backup

1. Equip with automatic power failure device, test switch, and pilot light, and fully automatic high/low trickle charger in a self-contained power pack. Battery must be sealed, maintenance free nickel-cadmium type, and must operate unattended for a period of not less than five years. Emergency run time must be a minimum of 1-1/2 hours. LEDs must have a minimum rated life of 10 years. [ Provide self-diagnostic circuitry integral to emergency LED driver.]

C. Remote-Powered Exit Signs

1. Provide exit sign that contains provision for [120-277 VAC] [120 VAC] [6-48 VDC] input from remote source.

D. Emergency Lighting Unit (ELU)

1. UL 924, NFPA 101. Provide emergency lighting units (ELUs) completely assembled with wiring and mounting devices, ready for installation at the locations indicated.
2. Provide in [UV-stable, thermo-plastic] [painted, die-cast aluminum] [painted steel] housing with [UL damp label] [UL wet label] as indicated.
3. Emergency lighting units must be rated for 12 volts, except units having no remote-mounted light sources and having no more than two unit-mounted light sources may be rated six volts.
4. Equip units with brown-out sensitive circuit to activate battery when input voltage falls to 75 percent of normal. Equip with two LED light sources, automatic power failure device, test switch, and pilot light, and fully automatic high/low trickle charger in a self-contained power pack.
5. Battery must be sealed, maintenance free [lead-calcium] [nickel-cadmium] type, and must operate unattended for a period of not less than five years.
6. Emergency run time must be a minimum of 90 minutes. LEDs must have a minimum rated life of 10 years. Provide self-diagnostic circuitry integral to emergency LED driver.

E. LED Emergency Drivers

1. UL 924, NFPA 101. Provide LED emergency driver with automatic power failure detection, test switch and LED indicator (or combination

switch/indicator) located on luminaire exterior, and fully-automatic solid-state charger, battery and inverter integral to a self-contained housing.
2. Provide self-diagnostic function integral to emergency driver.] Integral nickel-cadmium[lead-calcium] battery is required to supply a minimum of 90 minutes of emergency power, constant output.
3. Driver must be RoHS compliant, rated for installation in plenum-rated spaces and damp locations, and be warranted for a minimum of five years.

F. Self-Diagnostic Circuitry for LED Drivers

1. UL 924, NFPA 101. Provide emergency lighting unit with fully-automatic, integral self-testing/diagnostic electronic circuitry.
2. Circuitry must provide for a one-minute diagnostic test every 28 days, and a 30-minute diagnostic test every six months, minimum. Any malfunction of the unit must be indicated by LED(s) visible from the exterior of the luminaire.
3. A manual test switch must also be provided to perform a diagnostic test at any given time.

## 2.5 LUMINAIRE MOUNTING ACCESSORIES

A. Suspended Luminaires

1. Provide hangers capable of supporting twice the combined weight of luminaires supported by hangers.
2. Hangers must allow luminaires to swing within an angle of 45 degrees. Brace pendants 4 feet or longer to limit swinging.
3. Provide with swivel hangers to ensure a plumb installation for rigid stem pendants.
4. Provide cadmium-plated steel with a swivel-ball tapped for the conduit size indicated.]
5. Single-unit suspended luminaires must have [cable][twin-stem] hangers. Multiple-unit or continuous row luminaires with a separate power supply cord must have a tubing or stem for wiring at one point and a tubing or rod suspension provided for each unit length of chassis, including one at each end.
6. Provide all linear pendent and surface mounted luminaires with two supports per four-foot section or three per eight-foot section unless otherwise recommended by manufacturer.
7. Provide rods in minimum 0.18-inch diameter.

B. Recess and Surface Mounted Luminaires

1. Provide access to light source and LED driver from bottom of luminaire. Provide trim [and lenses] for the exposed surface of flush-mounted luminaires as indicated on project drawings and specifications.

2. Luminaires recessed in ceilings which have a fire resistive rating of one hour or more must be enclosed in a box which has a fire resistive rating equal to that of the ceiling. For surface mounted luminaires with brackets, provide flanged metal stem attached to outlet box, with threaded end suitable for supporting the luminaire rigidly in design position.
3. Flanged part of luminaire stud must be of broad base type, secured to outlet box at not fewer than three points.

C. Luminaire Support Hardware

1. Wire

a. ASTM A641/A641M. Galvanized, soft tempered steel, minimum 0.11 inches in diameter, or galvanized, braided steel, minimum 0.08 inches in diameter.

2. Threaded Rods

a. Threaded steel rods, 3/16-inch diameter, zinc or cadmium coated.

3. Straps

a. Galvanized steel, one by 3/16 inch, conforming to

b. ASTM A653/A653M, with a light commercial zinc coating or ASTM A1008/A1008M with an electrodeposited zinc coating conforming to ASTM B633, Type RS.

D. Power Hook Luminaire Hangers

1. UL 1598. Provide an assembly consisting of through-wired power hook housing, interlocking plug and receptacle, power cord, and luminaire support loop.
2. Power hook housing must be cast aluminum having two 3/4-inch threaded hubs.
3. Support hook must have safety screw.
4. Luminaire support loop must be cast aluminum with provisions for accepting 3/4-inch threaded stems.
5. Power cord must include 16 inches of 3 conductor No. 16 Type SO cord. Assembly must be rated 120 volts or 277 volts, 15 amperes.

2.6 EQUIPMENT IDENTIFICATION

A. Manufacturer's Nameplate

1. Each item of equipment must have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a

conspicuous place; the nameplate of the distributing agent will not be acceptable.

B. Labels

1. UL 1598. All luminaires must be clearly marked for operation of specific light sources and LED drivers. The labels must be easy to read when standing next to the equipment, and durable to match the life of the equipment to which they are attached. Note the following light source characteristics in the format "Use Only":

   a. Correlated Color Temperature (CCT) and Color Rendering Index (CRI) for all luminaires.
   b. Driver and dimming protocol.

2. All markings related to light source type must be clear and located to be readily visible to service personnel, but unseen from normal viewing angles when light sources are in place. LED drivers must have clear markings indicating dimming type and indicate proper terminals for the various outputs.

2.7 FACTORY APPLIED FINISH

A. This paragraph covers only the basic painting requirements for most electrical equipment. Include any special finishes for high or low temperatures and corrosive atmospheres.

B. Provide all luminaires and lighting equipment with factory-applied painting system that as a minimum, meets requirements of corrosion-resistance testing.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Light Sources.

1. When light sources are not provided as an integral part of the luminaire, deliver light sources of the type, wattage, lumen output, color temperature (CCT), color rendering index (CRI), and voltage rating indicated to the project site and install just prior to project completion, if not already installed in the luminaires from the factory.

B. Luminaires

1. Set luminaires plumb, square, and level with ceiling and walls, in alignment with adjacent luminaires and secure in accordance with manufacturers' directions and approved drawings.
2. Provide accessories as required for ceiling construction type indicated on Finish Schedule.
3. Luminaire catalog numbers do not necessarily denote specific mounting accessories for type of ceiling in which a luminaire may be installed.
4. Provide wires, straps, or rods for luminaire support in this section.
5. Install luminaires with vent holes free of air blocking obstacles.

C. Suspended Luminaires

1. Measure mounting heights from the bottom of the luminaire for ceiling-mounted luminaires and to center of luminaire for wall-mounted luminaires. Obtain architect approval of the exact mounting height on the job before commencing installation and, where applicable, after coordinating with the type, style, and pattern of the ceiling being installed. Support suspended luminaires from structural framework of ceiling or from inserts cast into slab.

    a. Provide suspended luminaires with 45-degree swivel hangers so that they hang plumb and level.
    b. Locate so that there are no obstructions within the 45-degree range in all directions.
    c. The stem, canopy and luminaire must be capable of 45-degree swing.
    d. Rigid pendent stem, aircraft cable, rods, or chains 4 feet or longer excluding luminaire must be braced to prevent swaying using three cables at 120-degree separation.
    e. Suspended luminaires in continuous rows must have internal wireway systems for end to end wiring and must be properly aligned to provide a straight and continuous row without bends, gaps, light leaks or filler pieces.
    f. Utilize aligning splines on extruded aluminum luminaires to assure minimal hairline joints.
    g. Support steel luminaires to prevent "oil-canning" effects.
    h. Match supporting pendants with supported luminaire. Aircraft cable must be stainless steel.
    i. Match finish of canopies to match the ceiling, and provide low profile canopies unless otherwise shown.
    j. Maximum distance between suspension points must be 10 feet or as recommended by the manufacturer, whichever is less.

D. Recessed and Semi-Recessed Luminaires

1. Support recessed and semi-recessed luminaires independently from the building structure by a minimum of two wires, straps or rods per luminaire and located near opposite corners of the luminaire. Secure horizontal

movement with clips provided by manufacturer. Ceiling grid clips are not allowed as an alternative to independently supported luminaires.

2. Support round luminaires or luminaires smaller in size than the ceiling grid independently from the building structure by a minimum of four wires, straps or rods per luminaire, spaced approximately equidistant around.
3. Do not support luminaires by acoustical tile ceiling panels.
4. Where luminaires of sizes less than the ceiling grid are indicated to be centered in the acoustical panel, support each independently and provide at least two 3/4-inch metal channels spanning, and secured to, the ceiling tees for centering and aligning the luminaire.
5. Luminaires installed in suspended ceilings must also comply with the requirements of Section 09 51 00 ACOUSTICAL CEILINGS.
6. Adjust aperture rings on all applicable ceiling recessed luminaires to accommodate various ceiling material thickness. Coordinate cut-out size in ceiling to ensure aperture covers cut-out entirely. Install aperture rings such that the bottom of the ring is flush with finished ceiling or not more than 1/16 inch above. Do not install luminaires such that the aperture ring extends below the finished ceiling surface.
7. For luminaire recessed in plaster ceilings, provide plaster frames for setting. Install setting such that the bottom of the frame is flush with finished ceiling. Support luminaires with plaster frames utilizing yokes or leveling lugs. Do not mount luminaires or support elements to ducts or pipes. Yokes must support a luminaire by no fewer than two bolts each.

E. Field Applied Painting

1. Provide field applied painting for luminaire type.
2. Paint lighting equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria. Provide painting as specified in Section 09 91 01 Painting.

F. LED Drivers

1. Provide LED drivers integral to luminaire as constructed by the manufacturer.

G. Remote LED Drivers

1. Locate Remote LED Drivers within the maximum distance allowed to minimize voltage drop.
2. Do not locate remote LED drivers further from the light source than specified by the manufacturer. Locate remote LED drivers in dry, well-ventilated, and accessible location, above accessible ceilings or behind a removable wall or ceiling panel.
3. Mount housing or junction box so that it is rigidly and securely fastened in place.

4. Install LED drivers such that components are not in contact with combustible materials unless listed for such condition.
5. Remote LED drivers must be grounded in accordance with NFPA 70.
6. Provide separate compartments for Class 2 wiring connections and for Class 1 wiring connections. Separation must be barrier-type within the same box or separate boxes with close connector conduit fittings.
7. Field connections must be inside housing or junction box or secured by a quick disconnect wire connector.

H. Exit Signs

1. NFPA 101. Wire exit signs and emergency lighting units ahead of the local switch, to the normal lighting circuit located in the same room or area.
2. Connect exit signs on separate circuits and serve from [an emergency panel] [a separate circuit breaker] [a fused disconnect switch].
3. Provide only one source of control, which would be [the circuit breaker in the emergency panel] [the separate circuit breaker] [the fused disconnect switch].
4. Paint source of control red and provide lockout capability.

END OF SECTION 26 51 00

# 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. Exterior luminaires with lamps and driver

2. Luminaire-mounted photoelectric relays.

B. Related Sections:

1. Division 26 Section "Interior Lighting" for exterior luminaires normally mounted on exterior surfaces of buildings.

### 1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color-rendering index.

C. LED: Light Emitting Diode

D. LER: Luminaire efficacy rating.

E. Luminaire: Complete lighting fixture, including ballast housing if provided.

### 1.4 SUBMITTALS

A. Product Data: For each luminaire, 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. LED Test Report

6. 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.

7. Photoelectric relays.

8. Lamps, including life, output, CCT, CRI, lumens, and energy-efficiency data.

9. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.

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. Design calculations, certified by a qualified professional engineer, indicating strength of screw foundations and soil conditions on which they are based.

    3. Wiring Diagrams: For power, signal, and control wiring.

C. Qualification Data: For qualified agencies providing photometric data for lighting fixtures.

D. Field quality-control reports.

E. Operation and Maintenance Data: For luminaires and poles to include in emergency, operation, and maintenance manuals.

F. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.

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 IEEE C2, "National Electrical Safety Code."

E. Comply with NFPA 70.

F. IES LM-79 Test Report

1. Submit test report on manufacturer's standard production model of specified luminaire. Testing must be performed at the same operating drive current as specified luminaire. Include all applicable and required data in IES format as outlined under "14.0 Test Report" in IES LM-79.

G. IES LM-80 Test Report

1. Submit report on manufacturer's standard production LED light source (package, array, or module) of specified luminaire. Testing must be performed at the same operating drive current as specified luminaire. Include all applicable and required data as outlined under "8.0 Test Report" in IES LM-80.

H. IES TM-21 Test Report

1. Submit test report on manufacturer's standard production LED light source (package, array, or module) of specified luminaire. Testing must be performed at the same operating drive current as specified luminaire. Include all applicable and required data, as well as required interpolation information as outlined under "7.0 Report" in IES TM-21.

I. LED Driver and Dimming Switch Compatibility Certificate

1. Submit certification from the luminaire, driver, or dimmer switch manufacturer that ensures compatibility and operability between devices without flickering and to specified dimming levels.

1.2 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.

1. Warranty Period for Luminaires: Five years from date of Substantial Completion.

2. Warranty Period for Metal Corrosion: Five years from date of Substantial Completion.

3. Warranty Period for Color Retention: Five years from date of Substantial Completion.

4. Warranty Period for Poles: Repair or replace lighting poles and standards that fail in finish, materials, and workmanship within manufacturer's standard warranty period, but not less than three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide product indicated on Drawings, provide one of the products indicated on Drawings.

2.2 GENERAL REQUIREMENTS FOR LUMINAIRES

A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.

B. Lateral Light Distribution Patterns: Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.

C. Metal Parts: Free of burrs and sharp corners and edges.

D. Sheet Metal Components: Corrosion-resistant aluminum unless otherwise indicated. Form and support to prevent warping and sagging.

E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.

F. 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. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.

G. Exposed Hardware Material: Stainless steel.

H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

I. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.

J. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:

1. White Surfaces: 85 percent.

2. Specular Surfaces: 83 percent.

3. Diffusing Specular Surfaces: 75 percent.

K. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

L. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

M. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."

2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.

a. Color: As selected from manufacturer's standard catalog of colors.
b. Color: Match Architect's sample of manufacturer's standard color.
c. Color: As selected by Architect from manufacturer's full range.

N. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp and ballast characteristics:

a. "USES ONLY" and include specific lamp type.

(1) Correlated Color Temperature (CCT) and Color Rendering Index (CRI) for all luminaires.
(2) Driver and dimming protocol.

2. All markings related to light source type must be clear and located to be readily visible to service personnel, but unseen from normal viewing angles when light sources are in place. LED drivers must have clear markings indicating dimming type and indicate proper terminals for the various outputs.

2.3 LED DRIVERS

A. Provide LED drivers that are electronic, UL Class 1 or Class 2, constant-current type and that comply with the following requirements:

1. The combined driver and LED light source system does not exceed the minimum luminaire efficacy values as listed in the luminaire schedule provided.
2. Operates at a voltage of 120-277 volts at 60 hertz, with input voltage fluctuations of plus/minus 10 percent.
3. Power Factor (PF) greater than or equal to 0.90 at full input power and across specified dimming range.
4. Maximum Total Harmonic Distortion (THD) less than 20 percent at full input power and across specified dimming range.

a) Operates for at least 50,000 hours at maximum case temperature and 90 percent non-condensing relative humidity.
b) Withstands Category A surges of 4 kV without impairment of performance. Provide surge protection that is integral to the driver.
c) Integral thermal protection that reduces the output power to protect the driver and light source from damage if the case temperature approaches or exceeds the driver's maximum operating temperature.
d) Class A sound rating.
e) Restriction of Hazardous Substances (RoHS) compliant.
f) Provide dimming capability as indicated in the luminaire schedule on project plans. Dimmable drivers must dim down to 1 percent. Dimmable drivers must be controlled by a Class 2 low voltage 0-10VDC controller dimming signal protocol unless otherwise specified. LED drivers of the

same family/series must track evenly across multiple luminaires at all light levels.

B. Remote LED Drivers

1. Provide remote LED Drivers that are UL listed for dry locations typical of interior installations. Provide LED driver in junction box or housing with mounting plate. Housing must allow for field connections to occur inside the housing or must contain mechanical connections.

PART 3 - EXECUTION

3.1 LUMINAIRE INSTALLATION

A. Install lamps in each luminaire.

B. Fasten luminaire to indicated structural supports.

1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

C. Adjust luminaires that require field adjustment or aiming.

3.2 GROUNDING

A. Ground metal poles and support structures according to Division 26 Section "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 Division 26 Section "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.

3.3 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

**SECTION 28 05 00**
**GENERAL REQUIREMENTS FOR SAFETY AND SECURITY**

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

A. The work of this Section consists of providing all required labor, supervision, materials and equipment (except equipment furnished by the State's Representative to be installed by the Contractor) to satisfactorily complete the work shown on the drawings and/or specified in all Sections of Division 28 and all other work and miscellaneous items, not specifically mentioned, but reasonably inferred for a complete and fully operating facility. The work shall include but not be limited to the following:
   1. Furnish and install all required in-place equipment, conduits, conductors, cables and any miscellaneous materials for the satisfactory interconnection and operation of all associated electrical systems.

1.2 RELATED WORK:

A. This Section provides the basic Electrical Requirements which supplement the General Requirements of Division 1 and apply to all Sections of Division 28.

1.3 STANDARDS AND CODES:

A. All work and material shall be in compliance with and according to the requirements of the latest revision of the following standards and codes:
   1. California Building Code (CBC)
   2. California Electrical Code (CEC)
   3. California Fire Code (CFC)
   4. American National Standards Institute (ANSI) Publications:
      a. C2-02 National Electrical Safety Code
   5. Code of Federal Regulations (CFR):
      a. 29 CFR 1910.147 Control of Hazardous Energy (Lock Out/Tag Out)
   6. Electronics Industries Association (EIA)
   7. Institute of Electrical and Electronics State's Representatives (IEEE)
   8. National Electrical Testing Association (NETA):
      a. Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems, Standard ATS
   9. National Electrical Manufacturers Association (NEMA)
   10. Occupational Safety and Health Act (OSHA) Standards
   11. State of California Public Utilities Commission:
      a. General Order 128 Rules for Construction of Underground Electric Supply and Communication Systems

B. Variances: In instances where two or more codes are at variance, the most restrictive requirement shall apply.

C. Underwriter Laboratories (UL) listing is required for all equipment and materials where such listing is offered by the Underwriters Laboratories. Safety labeling and listing by other organizations, such as ETL Testing Laboratories, may be substituted for UL labeling and listing if acceptable to the State's

Representative. Provide service entrance labels for all equipment required by the NEC to have such labels.

1.4 SUBMITTALS:

A. As specified in Division 1. Submit to the State's Representative shop drawings, manufacturer's data and certificates for equipment, materials and finish, and pertinent details for each system specified. Obtain approval before procurement, fabrication, or delivery of the items to the job site. Partial submittals are not acceptable and will be returned without review.

B. Submittals are required for all items, regardless of whether they are furnished as specified or are substituted.

C. Information to be submitted includes manufacturer's name, trade name, equipment model number, nameplate data, equipment drawings including: size, layout dimensions and capacity, manufacturer's descriptive literature of cataloged products, diagrams, test data, and performance and characteristic curves as applicable. Furnish project specification and paragraph reference, applicable Federal, Industry and Technical Society Publication References, and years of satisfactory service of each item required to establish contract compliance. Photographs of existing installations and data submitted in lieu of catalog data are not acceptable and will be returned without approval.

D. If submittal information includes multiple products, items being submitted for approval shall be clearly identified and Items not to be used on the project shall be clearly marked out.

E. Organize submittals for equipment and items related to each specification section together as a package.

F. Submit submittal packages in digital PDF format.

1. Certificates of Conformance: Submit manufacturer's certifications as required on products, materials, finish, and equipment indicated in the technical sections. Certifications shall be documents prepared specifically for this contract. Preprinted certifications and copies of previously submitted documents will not be acceptable. The manufacturer's certifications shall name the appropriate products, equipment, or materials and the publication specified as controlling the quality of that item. Certification shall not contain statements that imply the item does not meet requirements specified, such as "as good as", "achieve the same end use and results as materials formulated in accordance with the referenced publications;" or "equal or exceed the service and performance of the specified material." Certifications shall state that the item conforms to the requirements specified. Certificates shall be printed on the manufacturer's letterhead and shall be signed by the manufacturer's official, authorized to sign certificates of conformance.

G. Substitutions:

1. The equipment included in the Contract Documents is used to establish standards of quality, utility, and appearance. Equipment which in the

opinion of the State's Representative is equal in quality, utility, and appearance will be approved as substitutions to that specified.

a. Products that are specified by manufacturer, trade name or catalog number establish a standard of quality and do not prohibit the use of equal products of other manufacturers provided they are approved by the State's Representative prior to bidding.

2. Substitutions will be accepted for review where there is a reasonable reason for the substitution. Reasonable reasons include:
   a. Cost savings to the State's Representative. Include deductive change order with submittal.
   b. A product with features providing additional benefits to the end user.
   c. Improved finished environment / Lay out of the final installation.
   d. Delivery considerations.
   e. State's Representative's specific requests.
3. Where items are noted as "or equal", a product of equal design, construction and performance will be considered.
4. Any item proposed as a substitute shall be accompanied by the following:
   a. Drawings and/or data giving sizes, capacities, all pertinent test data, catalog cut sheets, product information, and all other necessary information required to substantiate that the product is equal or exceeds that specified.
   b. A summary sheet noting each performance characteristic noted in the specification section or elsewhere in the contract documents of the specified product and the corresponding performance characteristics of the proposed substitution. The summary sheet shall contain the following information:
      1) Reason for Substitution Request
      2) Pertinent Performance Characteristics
      3) Specified Product Values
      4) Substituted Product Values
      5) Any substitution request that does not include the above information shall be rejected.
      6) Refer to the end of this specification section for an example form to be used for substituted products. A Microsoft Word version of the form can be provided to the Contractor for their use upon request.
5. Substitutions shall be equal, in the opinion of the State's Representative, to the specified equipment. The burden of proof of such shall rest with the Contractor. When the State's Representative in writing accepts a substitution, it is with the understanding that the Contractor guaranteed the substituted equipment to be equal to the one specified and dimensioned to fit within the construction. Approved substitutions shall not relieve the Contractor of responsibilities for the proper execution of the work, or from any provisions of the Plans or Specifications.
6. Contractor shall be responsible for coordination of the substituted products with other trades. Provide all additional connectivity, equipment, increased

wire/conduit size, installation hardware, testing, and other miscellaneous appurtenances as required for a complete and fully functional installation.

7. Only one substitution will be considered for each product specified.
8. Alternate manufacturers must be submitted for approval 10 days prior to bid date unless noted otherwise in Division 1.
9. The Contractor shall be responsible for all expenses in connection with the substitution materials, process, and equipment, including the effect of his/her substitution on him/her, his/her sub-Contractor's or other Contractor's work. No substitution shall be permitted without written authorization of the State's Representative. Any assumptions on the acceptability of a proposed substitution prior to acceptance by the State's Representative are at the sole risk of the Contractor.

H. Change Orders:
   1. Where a change to the contract documents would result in a credit due to the State's Representative or a value add change to the project, provide a detailed change order request for the State's Representative and Engineer to review.
   2. It shall be understood that the Engineer's review of costs associated with the change order shall not constitute approval of the change order or their associated costs. The Engineer's review shall be intended to assist the State's Representative in evaluating the costs associated with the change only. Final approval or rejection of the change order shall be at the discretion of the State's Representative.
   3. Change order requests shall include the following information:
      1) Description of the change
      2) Reference to the document or written direction to make the change:
         (a) In the case of design-team directed changes, reference the drawing/sketch number or RFI number.
         (b) In the case of State's Representative-directed changes, reference the email, memo, or other written direction from the State's Representative and provide a copy of the direction.
      3) Detailed cost breakdown for the change:
         (a) Line item for each material noting:
            (1) Material used (e.g. ¾" EMT)
            (2) Total quantity (e.g. 200lf)
            (3) Unit cost (e.g. $2/lf)
            (4) Total materials cost (e.g. $400)
            (5) Unit labor hours (e.g 6hrs/100lf)
            (6) Total labor hours (e.g. 12hrs)
            (7) Hourly rate (e.g. $90/hr)
            (8) Total labor cost (e.g. $1,080
         (b) Total labor hours for each position (e.g. Journeyman vs. Superintendent)
         (c) Total materials cost

(d) Overhead
(e) Profit
(f) Total change order value (positive for value added changes, negative for credits)

I. Closeout Submittals:
1. As-built drawings: Submit As-Built Record documents as in accordance with section 3.05 below.
2. Cost analysis: Submit final cost information including original bid and any change orders broken down by system, material and labor costs (as applicable):
   a. Fire Alarm System
3. Operation and Maintenance Manuals: Furnish O & M Manuals for equipment where manuals are specified in the equipment specifications or are specified in Division 1. Electrical O & M Manuals shall include as a minimum:
   a. Copies of equipment supplied on the project.
   b. Instruction manuals including operation instructions and maintenance requirements/recommendations.
   c. List of suppliers for all equipment with addresses and telephone numbers.
   d. List of service support for all equipment with addresses and telephone numbers.
   e. Copies of all test reports required in Division 28 specification sections.
   f. Spare Parts: For each piece of equipment, submit a list of recommended spare parts. Include part numbers and the name, address, and telephone number of the supplier.
   g. Other closeout documentation and test results as required under other sections of the specifications.
   h. Provide in a single transmittal.
   i. Warranty for all work, including contractor's general warranty.
   j. All warranties begin as per the Contract, Division 1 or final acceptance of the Work by the State's Representative and Authority Having Jurisdiction, which ever is later:
      1) Manufacturer's Warrantees and Guarantees that are longer than the base contract/specified amount are to be provided with the manuals.
      2) The Contractor is responsible for all Warranty and Guarantee work whether or not the Manufacturer also Warrantees and Guarantees the product.

1.5 CONTRACT DOCUMENTS:

A. Review the Drawings and Specification Divisions of other trades and perform the electrical work that will be required for the installations:

1. Should there be a need to deviate from the Electrical Drawings and Specifications, submit written details and reasons for all changes to the State's Representative for favorable review.
2. All drawings and divisions of these specifications shall be considered as whole. This contractor shall report any apparent discrepancies prior to submitting bids.
3. Should there be a conflict or discrepancy between the drawings and specifications, or between different drawings sheets, or between different specification sections, the most expensive option shall be required, at the discretion of the Engineer.

B. Drawings:
   1. The Drawings shall govern the general layout of the completed construction.
      a. Locations of equipment, inserts, anchors, panels, pullboxes, manholes, conduits, stub-ups, fittings, devices, and ground connections are approximate unless dimensioned; verify locations with the Engineer prior to installation. Field verify scaled dimensions on Drawings.
      b. The general arrangement and location of existing conduits, piping, apparatus, etc., is shown as existing on drawings or specified. The drawings and specifications are for the assistance and guidance of the contractor, exact locations, distances and elevations are governed by actual field conditions. Extreme accuracy of data given herein and on the drawings is not guaranteed. Minor changes may be necessary to accommodate work. The contractor is responsible for verifying existing conditions. Should it be necessary to deviate from the design due to interference with existing conditions or work in progress, claims for additional compensation shall be limited to those for work required by unforeseen conditions as determined by the Engineer.

1.6 COORDINATION:

A. Coordinate the electrical work with the other trades, code authorities, utilities, the Engineer, and the State's Representative:
   1. Failure to accomplish this coordination is not a basis for additional cost reimbursement to the Contractor.
   2. Coordinate does not mean to only send a Request For Information. Coordinate implies that the contractor is to take the lead in bringing all of the necessary organizations together to coordinate the work and to provide for the associated costs.

B. Where connections must be made to existing installations, properly schedule all the required work, including the power and system shutdown periods. Schedule and carry out shutdowns so as to cause the least disruption to operation of the State's Representative's facilities:
   1. Include costs for work during non-normal working hours and temporary facilities as may be required.
   2. Include costs as necessary for sub-contractors to accomplish the specified work.

C. When two trades join together in an area, make certain that no electrical work is omitted. Failure to accomplish this coordination is not a basis for additional cost reimbursement to the Contractor.

D. Operations:
   1. Perform all work in compliance with Division 1:
      a. Keep the number and duration of power and system shutdown periods to a minimum.
      b. All shutdowns which would interfere with the operations of State's Representative's equipment or facilities shall be coordinated with the State's Representative a minimum of 15 days in advance.
         1) Where State's Representative's equipment or facilities must remain operational during the shutdown, provide sufficient means to temporarily backup the interrupted services for the duration of the interruption.
      c. Show all proposed shutdowns and their expected duration on the construction schedule.
         1) If the construction schedule is created and maintained by others, make sure that the associated information is incorporated.
         2) Failure by the Contractor to properly schedule and plan for such activities is not a basis for additional compensation.
      d. Carry out shutdown only after the State's Representative has favorably reviewed the schedule. Submit power/communications interruption schedule 15 days prior to date of interruption. Failure to provide schedule with adequate review time may result in rescheduling of the work at the Contractor's expense.

E. Construction Power:
   1. See Division 1 Temporary Utilities.

F. Storage:
   1. Provide adequate storage for all equipment and materials which will become part of the completed facility so that it is protected from sun, weather, condensation, dust, water, or construction operations.

G. Damaged Products:
   1. Notify the Engineer and the State's Representative in writing in the event that any equipment or material is damaged. Obtain approval from the Engineer and the State's Representative before making repairs to damaged products.

H. Order material in such a timely manner and after approval of the same so as to insure that the approved material is available to be installed on site in a timely manner. Additional costs or substitutions necessitated because the Contractor failed to order material in a timely manner are not reimbursable. Costs associated with processing of paperwork by the State's Representative and design consultants resultant of such failures to coordinate the work by the Contractor shall have such costs reimbursed by the Contractor

1.7 LOCATIONS:

A. General:
1. Use equipment, materials and wiring methods suitable for the types of locations in which they are located:
a. Dry Locations:
1) All those indoor areas which do not fall within the definition below for Wet Locations and which are not otherwise designated on the Drawings.
b. Wet Locations:
1) All locations exposed to the weather, whether under a roof or not, unless otherwise designated on the Drawings.

1.8 SAFETY AND INDEMNITY:

A. The Contractor is solely and completely responsible for conditions of the job site including safety of all persons and properly during performance of the work. This requirement will apply continually and not be limited to normal working hours:
1. No act, service, drawing review or construction review by the State's Representative, the Engineer or their Consultants is intended to include reviews of the adequacy of the Contractors safety measures in or near the construction site.
2. The Contractor performing work under this Division of the Specifications shall hold harmless, indemnify, and defend the State's Representative, the State's Representative, their consultants, and each of their officers, agents and employees from any and all liability claims, losses, or damage arising out of or alleged to arise from bodily injury, sickness, or death of a person or persons and for all damages arising out of injury to or destruction of property arising directly or indirectly out of or in connection with the performance of the work under this Division of the Specifications, and from the Contractor's negligence in the performance of the work described in the construction contract documents, but not including liability that may be due to the sole negligence of the State's Representative, the Engineer, their Consultants or their officers, agents and employees.

PART 2 - PRODUCTS

2.1 STANDARD OF QUALITY:

A. Material and Equipment:
1. Provide materials and equipment that are new and are current products of manufacturers regularly engaged in the production of such products. The standard products shall have been in satisfactory commercial or industrial use for two years prior to bid opening. The two-year period includes use of equipment and materials of similar size under similar circumstances. For uniformity, only one manufacturer will be accepted for each type of product.

B. Service Support:
1. Submit a certified list of qualified permanent service organizations including their addresses and qualification for support of the equipment. These

service organizations shall be convenient to the equipment installation and able to render service to the equipment on a regular and emergency basis during the warranty period of the contract.

C. Manufacturer's Recommendations:
   1. Where installation procedures are required to be in accordance with manufacturer's recommendations, furnish printed copies of the recommendations prior to installation. Installation of the item shall not proceed until recommendations are received. Failure to furnish recommendation shall be cause for rejection of the equipment or material.

2.2 NAMEPLATES:

A. For each piece of electrical equipment, provide a manufacturer's nameplate showing his name, location, the pertinent ratings, the model designation, and shop order number.

B. Additionally, identify each piece of equipment and related controls with a rigid laminated engraved plastic nameplate. Unless otherwise noted, nameplates shall be melamine plastic 0.125 inch thick, white with black center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be 1 by 2.5 inches unless otherwise noted. Where not otherwise specified, lettering shall be a minimum of 0.25 inch high normal block style. Engrave nameplates with the inscriptions indicated on the Drawings and, if not so indicated, with the equipment name. Securely fasten nameplates in place using two stainless steel screws or, where favorably reviewed by the State's Representative, with epoxy cement. Where no inscriptions are indicated on the Drawings, furnish nameplates with appropriate inscriptions furnished by the State's Representative upon prior request by the Contractor.

2.3 FASTENERS:

A. Fasteners for securing equipment to walls, floors and the like shall be either hot-dip galvanized after fabrication or stainless steel.

2.4 FINISH REQUIREMENTS:

A. Equipment:
   1. Refer to each electrical equipment section of these Specifications for painting requirements of equipment enclosures. Repair any final paint finish which as been damaged or is otherwise unsatisfactory, to the satisfaction of the State's Representative.

B. In finished areas, paint all exposed conduits, boxes and fittings to match the color of the surface to which they are affixed.

C. Conduits for fire alarm or life safety raceways shall be factory painted red along their entire length.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Ensure that all equipment and materials fit properly in their installation.

B. Perform any required work to correct improperly fit installation at no additional expense to the State's Representative.

C. Equipment Installation:
   1. Provide the required inserts, bolts and anchors, and securely attach all equipment and materials to their supports.
   2. Mount all metal panels which are mounted on or abutting concrete walls or any outside walls a minimum of ¼ inch from the wall, and paint the back sides of the panels with Bituminous Coating, Rust-oleum C9578 Coal Tar Epoxy Coating or approved equal. Film thickness shall be 10 mils minimum.

D. Cutting, Drilling and Welding:
   1. Provide the required cutting, drilling welding that is required for the electrical construction work. Comply with Division 1 requirements.
   2. Structural members shall not be cut or drilled, except after approval by the State's Representative. Use a core drill wherever it is necessary to drill through concrete or masonry.
   3. Provide the required welding for equipment supports. Conduits and fittings shall not be welded to structural steel. Where welding is required, it shall be accomplished by tradesmen certified to do such work. Provide fire and other protection as appropriate.

3.2 FIELD TESTS:

A. Test shall be in accordance with Acceptance Testing specifications issued by the National Fire Protection Association (NFPA) 72 Chapter 7 for fire alarm and manufacturer's recommendations for security systems.

B. Perform equipment field tests and adjustments. Properly calibrate, adjust and operationally check all devices and components, and demonstrate as ready for service. Make additional calibration and adjustments if it is determined later that the initial adjustments are not satisfactory for proper performance. Perform equipment field test for equipment where equipment field tests are specified in the equipment Specifications. Give sufficient notice to the State's Representative prior to any test so that the tests may witnessed.

C. Provide instruments, supplies, other equipment, temporary facilities as may be necessary and material required for the tests. Instruments shall be of the type designed for the type of tests to be performed and shall be calibrated by a recognized testing laboratory within three months prior to testing.

D. Operational Tests: Operationally test all circuits to demonstrate that the circuits and equipment have been properly installed and adjusted and are ready for full-time service. Demonstrate the proper functioning of circuits in all modes of operation, including alarm conditions.

E. Re-testing will be required for all unsatisfactory tests after the equipment or system has been repaired. Re-test all related equipment and systems if required by the State's Representative. Repair and re-test equipment and

systems which have been satisfactorily tested but later fail, until satisfactory performance is obtained.

F. Perform calibration and adjustment on all equipment.

G. Maintain records of each test and submit five copies to the State's Representative when testing is complete. All tests shall be witnessed by the State's Representative. These records shall include:
   1. Name of equipment tested.
   2. Date of report.
   3. Date of test.
   4. Description of test setup.
   5. Identification and rating of test equipment.
   6. Test results and data.
   7. Name of person performing test.
   8. State's Representative's initials.

H. Items requiring testing as a minimum:
   1. Fire Alarm System.

3.3 PAINTING OF EQUIPMENT:

A. Factory Applied:
   1. Electrical equipment shall have factory applied painting system which shall, as a minimum, meet the requirements of NEMA ICS 6 corrosion-resistance test and the additional requirements specified in the technical section. Fire alarm raceways shall be factory painted red.

B. Field Applied:
   1. Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria.

3.4 SIGNAGE:

A. Nameplate Mounting:
   1. Provide number, location and letter designation of nameplates as indicated. Fasten nameplates to the device with a minimum of two stainless steel sheet-metal screws or two rivets.

3.5 RECORDS:

A. Maintain one copy of the contract Drawing Sheets on the site of the work for recording the record "as built" condition. After completion of the work, the Contractor shall neatly and carefully mark the work as actually constructed, revising, deleting and adding to the Drawing Sheets as required. The following requirements shall be complied with:
   1. Drawings and associated as-built changes shall be completed in AutoCAD or Revit and submitted in CAD/Revit as well as PDF format. Documents with hand-written changes or with RFI responses and field sketches pasted on shall not be acceptable. State's Representative shall make digital backgrounds of original contract documents available for Contractor's use upon request.

2. Cable Size and Type: Provide the size and type of each cable installed on the project.
3. Substructure: Where the location of duct lines, adjacent utilities, cable boxes, and manholes are found to different than shown, carefully mark the correct location on the Drawings. Work shall be dimensioned from existing improvements.
4. Record (As Built) Drawings: At the completion of the Work the Contractor shall provide a set of record “as built” drawings over to the State’s Representative for his use:
   a. Record drawings are required to be transmitted within 30 days of beneficial occupancy.
   b. Transmittal and approval process:
      1) Contractor is to transmit one printed copy for review and comment.
      2) After acceptance of the above, the Contractor is to transmit three printed sets and one digital reproducible set.
      3) Contractor to provide information on their company in the margin of record drawings along with the date of the revisions and the associated revision number.

3.6 POSTED OPERATING INSTRUCTIONS:

A. Provide for each system and principal item of equipment as specified in the technical sections for use by operation and maintenance personnel. The operating instructions shall include the following:
   1. Single line diagrams, wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
   2. Start up, proper adjustments, operating, lubrication and shutdown procedures.
   3. Safety precautions.
   4. The procedure in the event of equipment failure, trouble or alarm.
   5. Other items of instruction as recommended by the manufacturer of each system or item of equipment.

3.7 INSTRUCTION TO STATE’S REPRESENTATIVE'S PERSONNEL:

A. Where specified in the technical sections, furnish the services of competent instructors to give full instruction to designated personnel in the adjustment, operation and maintenance of the specified systems and equipment, including pertinent safety requirements as required. Instructors shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work. Instruction shall be given during the first regular work week after the equipment or systems has been accepted and turned over to the State’s Representative for regular operation. The number of man-days (8 hours per day) of instruction furnished shall be as specified in the individual section. When more than 4 man-days of instruction are specified, use approximately half of the time for classroom instruction. Use other time for field instruction with equipment or system. When significant changes or modifications in the equipment or system are made under the terms

of the contract, provide additional instructions to acquaint the operating personnel with the changes or modifications.

B. Contractor shall video record all training sessions and shall provide the State's Representative with a copy of the recording at the conclusion of the training. Recording shall be in digital video format (MP4, AVI, or similar) and shall be provided on USB stick or DVD labeled with the Contractor's contact information, the training topic, and date of training.

C. Contractor shall maintain an attendance sheet from each session which contains the following information:
   1. Attendees with associated arrival and departure time.
   2. Topics covered.
   3. Information provided.
   4. Signatures of attendees taken at the completion of the session.

3.8 CLEAN UP:

A. Thoroughly clean all soiled surfaces of installed equipment and materials.

B. Upon completion of electrical work, remove all surplus materials, rubbish, and debris that accumulated during the construction work. Leave the entire area neat, clean, and acceptable to the State's Representative.

END OF SECTION 28 05 00

**SECTION 28 05 13**
**WIRE AND CABLES FOR SAFETY AND SECURITY**

PART 1 GENERAL

1.1 DESCRIPTION OF WORK:

A. The work of this Section consists of providing all wire and cable rated 600 volts or less, including splices and terminations, as shown on the Drawings and as described herein.

1.2 RELATED WORK:

A. See the following Specification Section for work related to the work in this Section:
   1. 28 05 00 General Requirements for Safety and Security Systems
   2. 26 05 33 Raceway and Boxes for Electrical Systems

1.3 STANDARDS AND CODES:

A. Work and materials shall be in compliance with and according to the requirements of the latest revision of the following Standards and Codes:
   1. American Society for Testing and Materials (ASTM):
      a. B3-01, Specification for Soft or Annealed Copper Wire
      b. B8-99, Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard or Soft
      c. B173-01a, Specification for Rope-Lay-Stranded Copper Conductors Having Concentric-Stranded Members, for Electrical Conductors
   2. Federal Standards (FED. STD.):
      a. 228, Methods of Testing Insulated Cable and Wire
   3. Federal Specifications (FS):
      a. A-A-59544, Cable and Wire, Electrical
      b. A-A-55809, Pressure Sensitive Electrical Plastic Insulation Tape
   4. National Electrical Manufacturers Association (NEMA):
      a. WC 70-1999/ICEA S-95-658-1999, Cross-Linked Thermosetting Polyethylene, Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
   5. California Electrical Code (CEC)
   6. National Electrical Code (NEC)
   7. Underwriters Laboratories (UL):
      a. 44-83 (R1988), Rubber-Insulated Wires and Cable
      b. 83-1983 (R1989), Thermoplastic-Insulated Wires and Cables
      c. 510-1986, Insulating Tape

1.4 SUBMITTALS:

A. As specified in Section 01 33 00 – Submittal Procedures.
   1. Catalog Data: Provide manufacturer's descriptive literature.
   2. Single Submittal: A single complete submittal is required for all products covered by this Section.

PART 2 PRODUCTS

2.1 CONDUCTORS:

A. General:
   1. Conductors shall be copper, Class B stranded and of the sizes indicated. All conductors 120 volts and above shall be in raceway unless otherwise noted. Minimum power and control wire size shall be No. 12 AWG unless otherwise specified by the State's Representative's Representative. All cable used on this Project shall be of the same type and conductor material.

B. Unless otherwise noted, conductors #6 and larger shall be XHHW insulation suitable for operation in wet or dry locations at temperatures not to exceed 75C in wet locations and 90C in dry locations. Conductors #8 and smaller shall be THHN in dry locations and THWN/THHN in wet locations. Control Cable shall be THHN.

C. Insulation Marking:
   1. All insulated conductors shall be identified with printing colored to contrast with the insulation color.

D. Special Wiring:
   1. Where special wiring is proposed by an equipment manufacturer, submit the special wiring requirements to the State's Representative's Representative and, if approved, provide same. Special wire shall be the type required by the equipment manufacturer.

E. Other Wiring:
   1. Wire or cable not specifically shown on the Drawings or specified, but required, shall be of the type and size required for the application and as approved by the State's Representative's Representative.

F. Terminations:
   1. Cable Termination for Copper: Crimp style two hole NEMA spade terminals designed and rated for copper cable.
   2. Wire Terminations: Crimp on ring-tongue terminals, insulated sleeve, of proper size for the wire used.
   3. End Seals: Heat shrink plastic caps of proper size for the wire on which used.
   4. Manufacturer: T&B, Burndy or approved equal.

G. Manufacturer: General Cable Inc., Southwire, or approved equal.

2.2 FIRE ALARM CABLES:

A. Addressable Loop Cables:
   1. Verify recommended cable type with system manufacturer. Cable shall be minimum #14 shielded twisted pair, unless otherwise noted. Refer to drawings and 28 31 00 Fire Alarm system for additional requirements:
      a. Cable for all exterior, underground or wet locations shall be outdoor rated with water-blocked construction, sunlight and moisture resistance jacket.

1) Manufacturer: #14ga - WestPenn AQ295 or approved equal

b. Cable for all interior areas shall be plenum rated cable.

1) Manufacturer: #14ga - WestPenn 60992BS or approved equal

B. Notification Circuit Cables:

1. Refer to section 2.01 Conductors for Notification Circuit Cables. Refer to drawings for size and quantity. Refer to Specification Section 28 46 00 - Fire Detection and Alarm for additional requirements.

2.3 TAPE:

A. Tape used for cable marking shall be compatible with the insulation and jacket of the cable and shall be of plastic material. Tape shall conform to FS HH-I-595 and UL 510.

PART 3 EXECUTION

3.1 CABLE INSTALLATION:

A. Clean Raceways:

1. Clean all raceways prior to installation of cables as specified in Specification Section 28 05 00 – General Requirements for Safety and Security.

B. Cable Pulling:

1. Exercise care in pulling wires and cables into conduit or wireways so as to avoid kinking, putting undue stress on the cables or otherwise abrading them. No grease will be permitted in pulling cables. Only soapstone, talc, or UL listed pulling compound will be permitted. The raceway construction shall be complete and protected from the weather before cable is pulled into it. Swab conduits before installing cables and exercise care in pulling, to avoid damage to conductors.

C. Bending Radius:

1. Cable bending radius shall be per applicable code. Install feeder cables in one continuous length.

D. Equipment Grounding Conductors:

1. Provide an equipment grounding conductor, whether or not it is shown on the Drawings, in any conduit or any raceway.

E. Wiring at Hinges:

1. For cables crossing hinges, utilize extra flexible stranded wire, make up into groups not exceeding 12, and arrange so that they will be protected from chafing when the hinged member is moved.

F. All wiring and cable shall be supported from the structure above. All wiring below 100 volts shall be installed in conduit unless otherwise noted.

G. Low Voltage Cables:

1. All cables provided inside buildings shall be plenum rated.
2. All cables provide outside buildings shall be outdoor rated, gel filled cables.
3. All low voltage wires and cables concealed in walls shall be run in EMT conduit from flush outlet boxes to above accessible ceilings. Provide

conduit where cables penetrate floors and fire walls above ceilings. Where low voltage cables run parallel to line voltage (over 120 volts), they shall be installed a minimum of 12 inches apart.

3.2 CABLE TERMINATIONS AND SPLICES:

A. Splices:
   1. All fire alarm and security cables shall be continuous below grade (i.e. no splices or terminations below grade).
   2. Use UL listed wirenuts for line voltage branch circuits in dry locations.

B. Terminations: Shall comply with the following:
   1. Make up and form cable and orient terminals to minimize cable strain and stress on device being terminated on.
   2. Burnish oxide from conductor prior to inserting in oxide breaking compound filled terminal.

3.3 FIELD TESTS:

A. The Contractor shall perform the following tests at his expense:
   1. Continuity Test of Wire:
      a. Test each wire for continuity and accuracy of the identifying tags at both ends and at all locations marked. Submit a report to the State’s Representative's Representative certifying the fact of the test and the accuracy of the marking.
   2. Insulation Resistance Tests:
      a. Perform insulation resistance tests on all wire and cable installed. Make these tests after all equipment has been connected, except that equipment which may be damaged by the test voltage shall be disconnected. Test the insulation with a 500 Vdc insulation resistance tester with a scale reading not less than 100 megohms. The insulation resistance shall be 2 megohms or more. Submit results for review.

END OF SECTION 28 05 13

**SECTION 28 46 00**
**FIRE DETECTION AND ALARM**

PART 1 GENERAL

1.1 DESCRIPTION OF WORK:

A. Furnish and install all materials and equipment including all required equipment, panels, raceways, conductors and connections, and provide all labor required and necessary to complete the work shown on the drawings and/or specified and all other work and miscellaneous items, not specifically mentioned, but reasonably inferred for a complete addressable fire alarm installation including all accessories and appurtenances required for testing the systems. It is the intent of the drawings and specifications that all systems be complete, and ready for operation. No extra charge will be paid for furnishing items required by regulations, but not specified herein, or on drawings.

B. The fire alarm system shall comply with requirements of NFPA Standard 72 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.

C. The facility shall have an emergency voice alarm communication system. Digitally stored message sequences shall notify the building occupants that a fire or life safety condition has been reported. Message generator(s) shall be capable of automatically distributing up to eight (8) simultaneous, unique messages to appropriate audio zones within the facility based on the type and location of the initiating event. The Fire Alarm Control Panel (FACP) shall also support Emergency manual voice announcement capability for both system wide or selected audio zones, and shall include provisions for the system operator to override automatic messages system wide or in selected zones.

D. Each designated zone shall transmit separate and different alarm, supervisory and trouble signals to the FACP and designated personnel in other buildings at the site via a multiplex communication network.

E. See site drawings for specific requirements for the site.

1.2 RELATED WORK:

A. Refer to the General Conditions, Supplementary General Conditions, and Division 1 General Requirements.

B. See the following specification sections for work related to the work in this section:
   1. 28 05 00 - General Requirements for Electronic Safety and Security
   2. 26 05 33 - Raceway and Boxes for Electrical Systems
   3. 28 05 13 - Wire and Cable for Electronic Safety and Security

1.3 STANDARDS AND CODES:

A. Devices and equipment for fire alarm system shall be U.L. listed. Underwriters Laboratories (UL) Standards:
   1. UOJZ Control Units

2. 38 Manual Operation Signal Boxes
3. 268 Smoke Detectors for Fire Alarm Signaling Systems
4. 268A Smoke Detectors for Duct Application
5. 464 Audible Signal Appliances
6. 521 Heat Detectors for Fire Protective Signaling Systems
7. 864 Control Units and Accessories for Fire Alarm Systems
8. 1635 Digital Alarm Communicator System Units
9. 1971 Signaling Devices for Hearing Impaired

B. Devices and equipment for fire alarm system shall be listed by the California State Fire Marshal for the specific purpose the device or equipment is used.

C. Work and material shall be in compliance with and according to the requirements of the latest revision of the following standards and codes:
1. California Building Code (CBC), Volumes #1 and #2 (Part 2, Title 24, CCR).
2. California Electrical Code (Part 3, Title CCR).
3. California Mechanical Code (CMC) (Part 4, Title 24, CCR).
4. California Plumbing Code (CPC) (Part 5, Title 24, CCR).
5. California Energy Code (Part 6, Title 24, CCR).
6. California Fire Code (CFC) (Part 9, Title 24).
7. California Green Code (Part 11, Title 24, CCR).
8. California Referenced Standards Code (Part 12, title 24, CCR).
9. NFPA 72 National Fire Alarm Code.
10. NFPA 13 Standards for Fire Sprinkler Systems.
11. ADA Standards for Accessible Design: ADA Accessibility Guidelines (ADAAG) 28, Part 36 Appendix A.
12. ADA Standards for Accessible Design: Code of Regulations (Including Amendments)

1.4 SUBMITTALS:

A. In accordance with Section 28 05 00.

B. Submit the following items:
1. Manufacturer's Catalog Data: Manufacturer's original catalog cuts and original description of data of all material and equipment with sufficient information provided so that the exact function of each device is known. Each item supplied shall be clearly identified including both U.L. number and a copy of the State Fire Marshal's listing.
2. Description of conductors to be used with a statement that all wire shall be in conduit.
3. Voltage drop calculations: Verify that voltage drop on signal device circuits does not exceed 10%.
4. Battery Calculations: Verify that battery capacity exceeds supervisory and alarm power requirements, minimum twenty-four (24) hours supervisory plus 15 minutes at full alarm.
5. Floor plan of the point to point connections.

6. Diagram of the power circuitry.
7. Riser diagram.
8. Copy of California State DIR Fire/Life Safety Certificate of installer.
9. Letter on contractor's letterhead certifying that contractor has at least 3 years experience successfully installing fire alarm systems of similar type and design, or that there is a contractual agreement with a subcontractor having at least 3 years experience successfully installing fire alarm systems of similar type and design.

1.5 SUBSTITUTIONS:

A. Fire Alarm System Manufacturer is an State's Representative Standard no substitutions allowed.

1.6 QUALIFICATIONS OF INSTALLER:

A. NICET level 2 or greater.

B. Prior to installation, submit data for review showing that the contractor has at least 3 years experience successfully installing fire alarm systems of similar type and design, or that there is a contractual agreement with a subcontractor having at least 3 years experience successfully installing fire alarm systems of similar type and design.

C. One contractor shall furnish and install a complete Fire Alarm and Smoke Detection System as described herein and drawn. Installation shall be by a factory authorized installer of the fire alarm system.

1.7 WARRANTIES:

A. The contractor shall warrant all equipment and wiring free from inherent mechanical and electrical defects for one year (365 days) from the date of final acceptance. The contractor shall without additional expense to the State's Representative, replace any defective materials or equipment provided by him under this contract within the warranty period.

B. FACP shall have a five year manufacturer's warranty from the date of final acceptance.

C. Signaling devices shall have a two year manufacturer's warranty from the date of final acceptance.

PART 2 PRODUCTS

2.1 MANUFACTURER:

A. Equipment selections noted below are the basis of design. All products shall be confirmed with District's alarm provider, ATP Alarm:
   1. Phone: 888.646.1559
   2. Website: https://atpalarm.com

B. Fire Alarm Control Panel (FACP):
   1. Notifier NFS-320

C. Manual Pull Station:
   1. Notifier NBG-12LX

D. Smoke Detector (Photoelectric):
   1. Notifier FSP-951(A)
E. Heat Detector (Fixed Temp, 190°):
   1. Notifier FST-951H(A)
F. Amplifier:
   1. Notifier NFC-50/100
G. Speaker/Strobe:
   1. Eaton Eluxa ELSPSTW
H. Weatherproof Speaker:
   1. Eaton Eluxa EL3RSPK-NW

2.2 COMPONENTS:

A. Colors: Provide finish colors under this section in accordance with FED-STD-595.

2.3 FIRE ALARM CONTROL PANEL:

A. Main FACP or network node shall contain a microprocessor based Central Processing Unit (CPU) and power supply. 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.
B. In conjunction with intelligent Loop Control Modules and Loop Expander Modules, the main FACP shall perform the following functions:
   1. Supervise and monitor all intelligent addressable detectors and monitor modules connected to the system for normal, trouble and alarm conditions.
   2. Supervise all initiating signaling and notification circuits throughout the facility by way of connection to addressable monitor and control modules.
   3. Detect the activation of any initiating device and the location of the alarm condition. Operate all notification appliances and auxiliary devices as programmed. In the event of CPU failure, all SLC loop modules shall fallback to degrade mode. Such degrade mode shall treat the corresponding SLC loop control modules and associated detection devices as conventional two-wire operation. Any activation of a detector in this mode shall automatically activate associated Notification Appliance Circuits.
C. The FACP shall be capable of communicating 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.
D. The control panel shall be capable of expansion via up to 10 SLC loops. Each module shall support up to 318 analog/addressable devices for a maximum system capacity of 3180 points. The Fire Alarm Control Panel shall include a full featured operator interface control and annunciation panel that shall include a backlit 640-character liquid crystal display, individual, color coded system

status LEDs, and a keypad for the control of the fire alarm system. Said LCD shall also support graphic bit maps.

E. All programming or editing of the existing program in the system shall be achieved without interrupting the alarm monitoring functions of the fire alarm control panel.

F. The FACP shall be able to provide the following software and hardware features:
   1. Pre-signal and Positive Alarm Sequence: The system shall provide means to cause alarm signals to only sound in specific areas with a delay of the alarm from 60 to up to 180 seconds after start of alarm processing. In addition, a Positive Alarm Sequence selection shall be available that allows a 15-second time period for acknowledging an alarm signal from a fire detection/initiating device. If the alarm is not acknowledged within 15 seconds, all local and remote outputs shall automatically activate immediately.
   2. Smoke Detector Pre-alarm Indication at Control Panel: To obtain early warning of incipient or potential fire conditions, the system shall support a programmable option to determine system response to real-time detector sensing values above the programmed setting. Two levels of Pre-alarm indication shall be available at the control panel: alert and action.
   3. Alert: It shall be possible to set individual smoke detectors for pre-programmed pre-alarm thresholds. If the individual threshold is reached, the pre-alarm condition shall be activated.
   4. Action: If programmed for Action and the detector reaches a level exceeding the pre-programmed level, the control panel shall indicate an action condition. Sounder bases installed with either heat or smoke detectors shall automatically activate on action Pre-Alarm level, with general evacuation on Alarm level.
   5. The system shall support a detector response time to meet world annunciation requirements of less than 3 seconds.
   6. Device Blink Control: Means shall be provided to turn off detector/module LED strobes for special areas.
   7. NFPA 72 Smoke Detector Sensitivity Test: The system shall provide an automatic smoke detector test function that meets the sensitivity testing requirements of NFPA 72.
   8. Programmable Trouble Reminder: The system shall provide means to automatically initiate a reminder that troubles exist in the system. The reminder will appear on the system display and (if enabled) will sound a piezo alarm.
   9. On-line or Off-line programming: The system shall provide means to allow panel programming either through an off-line software utility program away from the panel or while connected and on-line. The system shall also support upload and download of programmed database and panel executive system program to a Personal Computer/laptop. A single change

to one CPU database shall not require a database download to other CPUs.

10. History Events: The panel shall maintain a history file of the last 4000 events, each with a time and date stamp. History events shall include all alarms, troubles, operator actions, and programming entries. The control panels shall also maintain a 1000 event Alarm History buffer, which consists of the 1000 most recent alarm events from the 4000-event history file.
11. Smoke Control Modes: The system shall provide means to perform FSCS mode Smoke Control to meet NFPA-92A and 90B and HVAC mode to meet NFPA 90A.
12. The system shall provide means for all SLC devices on any SLC loop to be auto programmed into the system by specific address. The system shall recognize specific device type ID's and associate that ID with the corresponding address of the device.
13. Passwords and Users: The system shall support two password levels, master and user. Up to 9 user passwords shall be available, each of which may be assigned access to the programming change menus, the alter status menus, or both. Only the master password shall allow access to password change screens.
14. Block Acknowledge: The system shall support a block Acknowledge for Trouble Conditions
15. Sensitivity Adjust: The system shall provide Automatic Detector Sensitivity Adjust based on Occupancy schedules including a Holiday list of up to 15 days.
16. Environmental Drift Control: The system shall provide means for setting Environmental Drift Compensation by device. When a detector accumulates dust in the chamber and reaches an unacceptable level but yet still below the allowed limit, the control panel shall indicate a maintenance alert warning. When the detector accumulates dust in the chamber above the allowed limit, the control panel shall indicate a maintenance urgent warning.
17. Custom Action Messages: The system shall provide means to enter up to 100 custom action messages of up to 160 characters each. It shall be possible to assign any of the 100 messages to any point.
18. Local Mode: If communication is lost to the central processor the system shall provide added survivability through the intelligent loop control modules. Inputs from devices connected to the SLC and loop control modules shall activate outputs on the same loop when the inputs and outputs have been set with point programming to participate in local mode or when the type codes are of the same type: that is, an input with a fire alarm type code shall activate an output with a fire alarm type code.
19. Read status preview - enabled and disabled points: Prior to re-enabling points, the system shall inform the user that a disabled device is in the alarm state. This shall provide notice that the device must be reset before the device is enabled thereby avoiding activation of the notification circuits.

20. Custom Graphics: When fitted with an LCD display, the panel shall permit uploading of a custom bit-mapped graphic to the display screen.
21. Multi-Detector and Cooperating Detectors: The system shall provide means to link one detector with up to two detectors at other addresses on the same loop in cooperative multi-detector sensing. There shall be no requirement for sequential addresses on the detectors and the alarm event shall be a result of all cooperating detectors chamber readings.
22. ACTIVE EVENT: The system shall provide a Type ID called FIRE CONTROL for purposes of air-handling shutdown, which shall be intended to override normal operating automatic functions. Activation of a FIRE CONTROL point shall cause the control panel to (1) initiate the monitor module Control-by-Event, (2) send a message to the panel display, history buffer, installed printer and annunciators, (3) shall not light an indicator at the control panel, (4) Shall display ACTIVE on the LCD as well a display a FIRE CONTROL Type Code and other information specific to the device.
23. NON-FIRE Alarm Module Reporting: A point with a type ID of NON-FIRE shall be available for use for energy management or other non-fire situations. NON-FIRE point operation shall not affect control panel operation nor shall it display a message at the panel LCD. Activation of a NON-FIRE point shall activate control by event logic but shall not cause any indication on the control panel.
24. Mass Notification Override: The system shall be UL 2572 listed for Mass Notification and shall be capable, based on the Risk Analysis, of being programmed so that Mass Notification/Emergency Communications events take precedence over fire alarm events.
25. Security Monitor Points: The system shall provide means to monitor any point as a type security.
26. One-Man Walk Test: The system shall provide both a basic and advanced walk test for testing the entire fire alarm system. The basic walk test shall allow a single operator to run audible tests on the panel. All logic equation automation shall be suspended during the test and while annunciators can be enabled for the test, all shall default to the disabled state. During an advanced walk test, field-supplied output point programming will react to input stimuli such as CBE and logic equations. When points are activated in advanced test mode, each initiating event shall latch the input. The advanced test shall be audible and shall be used for pull station verification, magnet activated tests on input devices, input and output device and wiring operation/verification.
27. Control By Event Functions: CBE software functions shall provide means to program a variety of output responses based on various initiating events. The control panel shall operate CBE through lists of zones. A zone shall become listed when it is added to a point's zone map through point programming. Each input point such as detector, monitor module or panel circuit module shall support listing of up to 10 zones into its programmed zone map.

28. Permitted zone types shall be general zone, releasing zone and special zone. Each output point (control module, panel circuit module) can support a list of up to 10 zones including general zone, logic zone, releasing zone and trouble zone. It shall be possible for output points to be assigned to list general alarm. Non-Alarm or Supervisory points shall not activate the general alarm zone.
29. 1000 General Zones: The system shall support up to 1000 general purpose software zones for linking inputs to outputs. When an input device activates, any general zone programmed into that device's zone map will be active and any output device that has an active general zone in its map will be active. It shall also be possible to use general zone as arguments in logic equations.
30. 1000 Logic Equations: The system shall support up to 1000 logic equations for AND, OR, NOT, ONLY1, ANYX, XZONE or RANGE operators that allow conditional I/O linking. When any logic equation becomes true, all output points mapped to the logic zone shall activate.
31. 100 trouble equations per device: The system shall provide support for up to 100 trouble equations for each device, which shall permit programming parameters to be altered, based on specific fault conditions. If the trouble equation becomes true, all output points mapped to the trouble zone shall activate.
32. Control-By-Time: A time based logic function shall be available to delay an action for a specific period of time based upon a logic input with tracking feature. A latched version shall also be available. Another version of this shall permit activation on specific days of the week or year with ability to set and restore based on a 24 hour time schedule on any day of the week or year.
33. 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.
34. Alarm Verification, by device, with timer and tally: The system shall provide a user-defined global software timer function that can be set for a specific detector. The timer function shall delay an alarm signal for a user-specified time period and the control panel shall ignore the alarm verification timer if another alarm is detected during the verification period. It shall also be possible to set a maximum verification count between 0 and 20 with the "0" setting producing no alarm verification. When the counter exceeds the threshold value entered, a trouble shall be generated to the panel.

G. Central Processing Unit
    1. The Central Processing Unit shall contain and execute all control-by-event (including Boolean functions including but not limited to AND, OR, NOT, ANYx, and CROSSZONE) programs for specific action to be taken if an alarm condition is detected by the system. Such control-by-event programs

shall be held in non-volatile programmable memory, and shall not be lost with system primary and secondary power failure.

2. The Central Processing Unit shall also provide a real-time clock for time annotation, to the second, of all system events. The time-of-day and date shall not be lost if system primary and secondary power supplies fail.
3. The CPU shall be capable of being programmed on site without requiring the use of any external programming equipment. Systems that require the use of external programmers or change of EPROMs are not acceptable.
4. The CPU shall provide an EIA-232 interface between the fire alarm control panel and the UL Listed Electronic Data Processing (EDP) peripherals.
5. The CPU shall provide two EIA-485 ports for the serial connection to annunciation and control subsystem components.
6. The EIA-232 serial output circuit shall be optically isolated to assure protection from earth ground.

H. Display
1. The system display shall provide a 640-character backlit alphanumeric Liquid Crystal Display (LCD). It shall also provide eleven Light-Emitting-Diodes (LEDs) that indicate the status of the following system parameters: AC POWER, FIRE ALARM, PREALARM, SECURITY, SUPERVISORY, SYSTEM TROUBLE, OTHER EVENT, SIGNALS SILENCED, POINT DISABLED, CONTROLS ACTIVE, and CPU FAILURE.
2. The system display shall provide a keypad with control capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels with up to ten (one Master and nine User) passwords shall be accessible through the display interface assembly to prevent unauthorized system control or programming.

I. Loop (Signaling Line Circuit) Control Module
1. The Loop Control Module shall monitor and control a minimum of 318 intelligent addressable devices. This includes 159 intelligent detectors (Ionization, Photoelectric, or Thermal) and 159monitor or control modules.
2. The Loop Control Module shall contain its own microprocessor and shall be capable of operating in a local/degrade mode (any addressable device input shall be capable of activating any or all addressable device outputs) in the unlikely event of a failure in the main CPU.
3. Each Loop shall be capable of operating as a NFPA Style 4 (Class B) circuit.
4. The SLC interface board shall receive analog or digital information from all intelligent detectors and shall process this information to determine whether normal, alarm, or trouble conditions exist for that particular device. Each SLC Loop shall be isolated and equipped to annunciate an Earth Fault condition. The SLC interface board software shall include software to 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 may also be used for automatic

detector testing and the automatic determination of detector maintenance requirements.

J. Digital Voice Command Center
   1. The Digital Voice Command Center located with the FACP, shall contain all equipment required for all audio control, emergency telephone system control, signaling and supervisory functions. This shall include speaker zone indication and control, telephone circuit indication and control, digital voice units, microphone and main telephone handset.
   2. Function: The Voice Command Center equipment shall perform the following functions:
      a. Operate as a supervised multi-channel emergency voice communication system.
      b. Operate as a two-way emergency telephone system control center.
      c. Audibly and visually annunciate the active or trouble condition of every speaker circuit and emergency telephone circuit.
      d. Audibly and visually annunciate any trouble condition for digital tone and voice units required for normal operation of the system.
      e. Provide all-call Emergency Paging activities through activation of a single control switch.
      f. As required, provide vectored paging control to specific audio zones via dedicated control switches.
      g. Provide a factory recorded "library" of voice messages and tones in standard WAV. File format, which may be edited and saved on a PC running a current Windows® operating system.
      h. Provide a software utility capable of off-line programming for the DVC operation and the audio message files. This utility shall support the creation of new programs as well as editing and saving existing program files. Uploading or downloading the DVC shall not inhibit the emergency operation of other nodes on the fire alarm network.
      i. Support an optional mode of operation with four analog audio outputs capable of being used with UL 864 fire-listed analog audio amplifiers and SLC controlled switching.
      j. The Digital Voice Command shall be modular in construction, and shall be capable of being field programmable without requiring the return of any components to the manufacturer and without requiring use of any external computers or other programming equipment.
      k. The Digital Voice Command and associated equipment shall be protected against unusually high voltage surges or line transients.

K. Power Supply
   1. The Main Power Supply shall operate on 120/240 VAC, 50/60 Hz, and shall provide all necessary power for the FACP.
   2. The Main Power Supply shall provide the required power to the CPU using a switching 24 VDC regulator and shall incorporate a battery charger for 24 hours of standby power using dual-rate charging techniques for fast battery recharge.

3. The Main Power Supply shall provide a battery charger for 24 hours of standby using dual-rate charging techniques for fast battery recharge. The supply shall be capable of charging batteries ranging in capacity from 7-200 amp-hours within a 48-hour period.
4. The Main Power Supply shall provide a very low frequency sweep earth detect circuit, capable of detecting earth faults.
5. The Main Power Supply shall be power-limited per UL864 requirements.
6. The Main Power Supply shall communicate power supply, line voltage, battery status and charger status to the local LCD display. Any abnormal condition shall be annunicated and logged to the system alarm history log.
7. Addressable Charger Power SupplyThe auxiliary addressable power supply is a remote 24 VDC power supply used to power Notification Devices and field devices that require regulated 24 VDC power. . NOTIFIER model # ACPS-610
8. The addressable power supply for the fire detection system shall provide up to a minimum of 6.0 amps of 24 volt DC regulated power for Notification Appliance Circuit (NAC) power or 10.0 amps of 24 volt DC general power. The power supply shall have an additional 0.5 amp of 24 VDC auxiliary power for use within the same cabinet as the power supply. It shall include an integral charger designed to charge 12 - 200 amp hour batteries.
9. The addressable power supply shall provide four individually addressable Notification Appliance Circuits that may be configured as Class "A" or Class "B" circuits. All circuits shall be power-limited per UL 864 requirements.
10. The addressable power supply shall provide built-in synchronization for certain Notification Appliances on each circuit without the need for additional synchronization modules. The power supply's output circuits shall be individually selected for synchronization. A single addressable power supply shall be capable of supporting both synchronized and non-synchronized Notification Devices at the same time.
11. The addressable power supply shall operate on 120 or 240 VAC, 50/60 Hz.
12. The interface to the power supply from the Fire Alarm Control Panel (FACP) shall be via the Signaling Line Circuit (SLC) or other multiplexed means Power supplies that do not use an intelligent interface are not suitable substitutes. The required wiring from the FACP to the addressable power supply shall be a single unshielded twisted pair wire.
13. The addressable power supply shall supervise for battery charging failure, AC power loss, power brownout, battery failure, NAC loss, and optional ground fault detection. In the event of a trouble condition, the addressable power supply shall report the incident and the applicable address to the FACP via the SLC.
14. The addressable power supply shall have an AC Power Loss Delay option. If this option is utilized and the addressable power supply experiences an AC power loss, reporting of the incident to the FACP will be delayed. A delay time of zero, two, eight or sixteen hours shall be programmable.

15. The addressable power supply shall have an option for Canadian Trouble Reporting and this option shall be programmable.
16. The addressable power supply mounts in either the FACP backbox or it's own dedicated surface mounted backbox with cover.
17. Each of the power supply's four output circuits shall be programmed- for Notification Appliance Circuit or General Purpose 24 VDC power. Any output circuit shall be able to provide up to 2.5 amps of 24 VDC power.
18. The addressable power supply's output circuits shall be individually supervised when they are selected to be either a Notification Appliance Circuit when wired Class "A" or by the use of and end-of-line resistor. When the power supply's output circuit is selected as General 24 VDC power, the circuit shall be individually supervised when an end-of-line relay is used.
19. When selected for Notification Appliance Circuits, the output circuits shall be individually programmable for Steady, March Time, Dual Stage or Temporal.
20. When selected as a Notification Appliance Circuit, the output circuits of the addressable power supply shall have the option to be coded by the use of a universal zone coder.
21. The addressable power supply shall interface and synchronize with other power supplies of the same type. The required wiring to interface multiple addressable power supplies shall be a single unshielded, twisted pair wire.
22. An individual or multiple interfaced addressable power supplies shall have the option to use an external charger for battery charging. Interfaced power supplies shall have the option to share backup battery power.

L. Audio Message Generator (Prerecorded Voice)/Speaker Control
   1. Each initiating zone or intelligent device shall interface with an emergency voice communication system capable of transmitting a prerecorded voice message to all speakers in the building.
   2. Actuation of any alarm initiating device shall cause a prerecorded message to sound over the speakers. The message shall be repeated four (4) times. Pre- and post-message tones shall be supported.
   3. A built-in microphone shall be provided to allow paging through speaker circuits.
   4. System paging from emergency telephone circuits shall be supported.
   5. The audio message generator shall have the following indicators and controls to allow for proper operator understanding and control:
      a. Lamp Test
      b. Trouble
      c. Off-Line Trouble
      d. Microphone Trouble
      e. Phone Trouble
      f. Busy/Wait
      g. Page Inhibited
      h. Pre/Post Announcement Tone

M. Controls with associated LED Indicators
    1. Speaker Switches/Indicators
        a. The speaker circuit control switches/indicators shall include visual indication of active and trouble status for each speaker circuit in the system.
        b. The speaker circuit control panel shall include switches to manually activate or deactivate each speaker circuit in the system.
    2. Emergency Two-Way Telephone Control Switches/Indicators
        a. The emergency telephone circuit control panel shall include visual indication of active and trouble status for each telephone circuit in the system.
        b. The telephone circuit control panel shall include switches to manually activate or deactivate each telephone circuit in the system.

N. Remote Transmissions
    1. Provide local energy or polarity reversal or trip circuits as required.
    2. The system shall be capable of operating a polarity reversal or local energy or fire alarm transmitter for automatically transmitting fire information to the fire department.
    3. Provide capability and equipment for transmission of zone alarm and trouble signals to remote operator's terminals, system printers and annunciators.
    4. Transmitters shall be compatible with the systems and equipment they are connected to such as timing, operation and other required features.

O. Field Programming
    1. The system shall be programmable, configurable and expandable in the field without the need for special tools, laptop computers, or other electronic interface equipment. There shall be no firmware changes required to field modify the system time, point information, equations, or annunciator programming/information.
    2. All field defined programs shall be stored in non-volatile memory.

P. Specific System Operations
    1. 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.
    2. 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.

Q. System Point Operations

1. Any addressable device in the system shall have the capability to be enabled or disabled through the system keypad or video terminal.
2. System output points shall be capable of being turned on or off from the system keypad or the video terminal.
3. Point Read: The system shall be able to display the following point status diagnostic functions without the need for peripheral equipment. Each point shall be annunciated for the parameters listed:
   a. Device Status.
   b. Device Type.
   c. Custom Device Label.
   d. Software Zone Label.
   e. Device Zone Assignments.
   f. Analog Detector Sensitivity.
   g. All Program Parameters.
4. System History Recording and Reporting: The fire alarm control panel shall contain a history buffer that will be capable of storing up to 4000 system events. Each of these events will be stored, with time and date stamp, until an operator requests that the contents be either displayed or printed. The contents of the history buffer may be manually reviewed; one event at a time, and the actual number of activations may also be displayed and or printed. History events shall include all alarms, troubles, operator actions, and programming entries.
5. The history buffer shall use non-volatile memory. Systems which use volatile memory for history storage are not acceptable.
6. Automatic Detector Maintenance Alert: The fire alarm control panel shall automatically interrogate each intelligent system detector and shall analyze the detector responses over a period of time.
7. If any intelligent detector in the system responds with a reading that is below or above normal limits, then the system will enter the trouble mode, and the particular Intelligent Detector will be annunciated on the system display, and printed on the optional system 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.
8. The system shall include the ability (programmable) to indicate a "pre-alarm" condition. This will be used to alert maintenance personal when a detector is at 80% of its alarm threshold in a 60 second period.

R. Universal Digital Alarm Communicator Transmitter (UDACT):
   1. The UDACT is an interface for communicating digital information between a fire alarm control panel and an UL-Listed central station.
   2. 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.

3. 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 two different telephone numbers.
4. The UDACT shall be capable of transmitting events in 4+2, SIA, and Contact ID.
5. Communication shall include vital system status such as:
   a. Independent Zone (Alarm, trouble, non-alarm, supervisory)
   b. Independent Addressable Device Status
   c. AC (Mains) Power Loss
   d. Low Battery and Earth Fault
   e. System Off Normal
   f. 12 and 24 Hour Test Signal
   g. Abnormal Test Signal (per UL requirements)
   h. EIA-485 Communications Failure
   i. Phone Line Failure
6. 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.
7. 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.
8. The UDACT shall be capable of generating Central Station reports providing detailed programming information for each point along with the central station point address.
9. 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.

S. Printer
   1. The printer shall provide hard-copy printout of all changes in status of the system and shall time-stamp such printouts with the current time-of-day and date. The printer shall be standard carriage with 80-characters per line and shall use standard pin-feed paper. The printer shall be enclosed in a separate cabinet suitable for placement on a desktop or table. The printer shall communicate with the control panel using an interface complying with Electrical Industries Association standard EIA-232D. Power to the printer shall be 120 VAC @ 60 Hz.
   2. The system shall have a strip printer capable of being mounted directly in the main FACP enclosure. Alarms shall be printed in easy-to-read RED, other messages, such as a trouble, shall be printed in BLACK. This printer shall receive power from the system power supply and shall operate via

battery back-up if AC mains are lost. The strip printer shall be UL 864 listed.

3. The system shall have a strip printer capable of being mounted directly in the main FACP enclosure. Alarms shall be printed in easy-to-read RED, other messages, such as a trouble, shall be printed in BLACK. This printer shall receive power from the system power supply and shall operate via battery back-up if AC mains are lost. The strip printer shall be UL 864 listed.

T. Smoke Control Annunciator

1. On/Auto/Off switches and status indicators (LEDS) shall be provided for monitoring and manual control of each fan, damper, HVAC control unit, stairwell pressurization fan, and smoke exhaust fan. To ensure compliance the units supplied shall meet the following UL categories: UUKL, PAZX, UDTZ, QVAX as well as the requirements of NFPA 90A, HVAC, and NFPA 92A & 92B, Smoke Control. The control System shall be field programmable for either 90A operation or 92A/B operation to allow for future use and system expansion.
2. The OFF LED shall be Yellow, the ON LED shall be green, the Trouble/Fault LED shall be Amber/Orange for each switch. The Trouble/Fault indicator shall indicate a trouble in the control and/or monitor points associated with that switch. In addition, each group of eight switches shall have two LEDS and one momentary switch which allow the following functions: An Amber LED to indicate an OFF-NORMAL switch position, in the ON or OFF position; A Green LED to indicate ALL AUTO switch position; A Local Acknowledge/Lamp Test momentary switch.
3. Each switch shall have the capability to monitor and control two addressable inputs and two addressable outputs. In all modes, the ON and OFF indicators shall continuously follow the device status not the switch position. Positive feedback shall be employed to verify correct operation of the device being controlled. Systems that indicate on/off/auto by physical switch position only are not acceptable.
4. All HVAC switches (i.e., limit switches, vane switches, etc.) shall be provided and installed by the HVAC contractor.
5. It shall be possible to meet the requirements mentioned above utilizing wall mounted custom graphic.

2.4 ADDRESSABLE DEVICES – GENERAL

A. Addressable devices shall provide an address-setting means using rotary decimal switches. Addressable devices that require the address be programmed using a programming utility are not an allowable substitute.

B. 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.

C. 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.

D. 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.

E. Detectors shall be intelligent (analog) and addressable, and shall connect with two wires to the fire alarm control panel Signaling Line Circuits.

F. 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.

G. 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.

H. 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.

I. The detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature. Base options shall include a sounder base with a built-in (local) sounder rated at 85 DBA minimum, a relay base and an isolator base designed for Style 7 applications. The system shall also support an intelligent programmable sounder base, the programmable sounder base shall be capable of providing multiple tones based on programming and at a minimum be capable of providing a Temp-4 tone for CO (Carbon Monoxide) activation and a Temp-3 tone for fire activations and be capable of being synchronized with other programmable sounder bases and common area notification appliances; 85 DBA minimum.

J. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).

K. 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.

L. Addressable devices shall store an internal identifying code that the control panel shall use to identify the type of device.

M. 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.

N. 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.

2.5 MANUAL PULL STATION:

A. 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. 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.

B. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.

C. 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.

2.6 SMOKE DETECTOR (PHOTOELECTRIC):

A. The intelligent photoelectric smoke detector shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.

2.7 HEAT DETECTOR (FIXED TEMP, 135° OR 190°):

A. The intelligent thermal detectors shall be addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius). 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.

2.8 AMPLIFIER:

A. The Audio Amplifiers will provide Audio Power () for distribution to speaker circuits.

B. Multiple audio amplifiers may be mounted in a single enclosure, either to supply incremental audio power, or to function as an automatically switched backup amplifier(s).

C. The audio amplifier shall include an integral power supply, and shall provide built-in LED indicators for the following conditions:
   1. Earth Fault on DAP A (Digital Audio Port A)
   2. Earth Fault on DAP B (Digital Audio Port B)
   3. Audio Amplifier Failure Detected Trouble
   4. Active Alarm Bus input
   5. Audio Detected on Aux Input A
   6. Audio Detected on Aux Input B
   7. Audio Detected on Firefighter's Telephone Riser

8. Receiving Audio from digital audio riser
9. Short circuit on speaker circuit 1
10. Short circuit on speaker circuit 2
11. Short circuit on speaker circuit 3
12. Short circuit on speaker circuit 4
13. Data Transmitted on DAP A
14. Data Received on DAP A
15. Data Transmitted on DAP B
16. Data Received on DAP B
17. Board failure
18. Active fiber optic media connection on port A (fiber optic media applications)
19. Active fiber optic media connection on port B (fiber optic media applications)
20. Power supply Earth Fault
21. Power supply 5V present
22. Power supply conditions - Brownout, High Battery, Low Battery, Charger Trouble

D. The audio amplifier shall provide the following built-in controls
   1. Amplifier Address Selection Switches
   2. Signal Silence of communication loss annunciation Reset
   3. Level adjustment for background music
   4. Enable/Disable for Earth Fault detection on DAP A
   5. Enable/Disable for Earth Fault detection on DAP A
   6. Switch for 2-wire/4-wire FFT riser

E. Adjustment of the correct audio level for the amplifier shall not require any special tools or test equipment.

F. Includes audio input and amplified output supervision, back up input, and automatic switch over function, (if primary amplifier should fail).

G. System shall be capable of backing up digital amplifiers.

H. One-to-one backup shall be provided by either a plug-in amplifier card or a designated backup amplifier of identical model as the primary amplifier.

I. One designated backup amplifier shall be capable of backing up multiple primary amplifiers mounted in the same or adjacent cabinets.

J. Multi-channel operation from a single amplifier shall be supported by the addition of an optional plug-in amplifier card.

2.9 SPEAKER/STROBE:

A. 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.

B. 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. Speaker strobes and the Sync Circuit Module 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, 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.

C. 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.

D. 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.

E. All notification appliances shall be backward compatible.

F. Speakers located in outdoor areas shall be listed for outdoor use.

2.10 WEATHERPROOF SPEAKER:

A. 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.

B. 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.

C. 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.

D. 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.

E. All notification appliances shall be backward compatible.

F.

2.11 SIGNAL CONTROL ELEMENT (SCE):

A. Signal control element shall be provided to create an additional supervised notification circuit from an addressable loop. All supervision and trouble reporting to the FACP shall be via the addressable loop.

B. Power for the device and any indicating devices shall be provided via the associated RNPS.

2.12 WIRING:

A. See section 28 05 13. Provide wiring in accordance with NFPA 72. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.

B. Conductors shall be solid copper. Wiring shall be in accordance with local, state and national codes and as recommended by the manufacturer of the fire alarm system. Conductors for 120 volt circuits shall be No. 12 AWG minimum; conductors for low-voltage DC circuits shall be No. 14 AWG minimum for annunciation circuits and No. 18 AWG minimum for initiation circuits.

C. Provide color-coded conductors. Identify conductors by plastic-coated, self-sticking, printed markers or by heat-shrink type sleeves. Each conductor used for the same specific function shall be distinctively color coded. Use different color codes for each interior alarm circuit. Each circuit color code wire shall remain uniform throughout the circuit.

D. Wire and cable not installed in conduit shall have a fire resistance rating suitable for the installation as indicated in NFPA 70 (e.g., FPLR).

E. Pigtail or "T" tap connections to evacuation alarm horns, horn/strobes and strobes are not acceptable.

2.13 CONDUITS:

A. See section 28 05 13. All fire alarm wiring from the FACP to final devices shall be run in conduit unless other wise noted.

B. Identification of Conduit: New conduits containing fire alarm system conductors shall be permanently painted with red paint at the factory. Junction boxes, covers, gutters, and terminal cabinets, containing fire alarm system conductors, shall be painted red or provided with engraved plastic identification signs permanently attached to the equipment.

C. Fire alarm circuits shall not be run in the same conduit with non-fire alarm circuits. AC circuits shall not be run in the same conduit with DC circuits.

D. Provide wiring in rigid metal conduit, except electrical metallic tubing conduit may be provided in dry locations not enclosed in concrete or where not subject to mechanical damage or vandalism.

E. Conceal conduit in finished areas of new construction and wherever practical in existing construction. Conduit runs shall be straight, neatly arranged, properly supported, and parallel or perpendicular to walls and partitions. Identify conductors within each enclosure where a tap, splice, or termination is made.

F. Underground circuit or circuits in wet areas shall be Type UF or USE cable in schedule 40 PVC conduit

PART 3 EXECUTION

3.1 DEMOLITION AND PHASING OF WORK

A. Where the project schedule requires work to be phased, including phasing of demolition work, renovation work, and new construction, the contractor shall provide all required labor and materials needed to re-program the fire alarm system between phases of work to ensure proper functioning of the system for the duration of the work in addition to any programming required at the completion of construction.

B. Where removal of fire alarm devices is required to complete new construction work, the devices shall be removed, and the system shall be reprogrammed to restore the system to a fully functional state prior to commencing new work.

C. After demolition of devices, the Fire Alarm Control Panel shall be free from trouble signals, faults, or other deficiencies prior to commencing new work. Contractor shall provide all required labor and materials needed to troubleshoot the panel and correct all deficiencies prior to commencing new work.

D. Where reprogramming can not be accomplished, the contractor shall provide a fire watch in accordance with CFC and DSA requirements for the duration of the outage.

3.2 INSTALLATION:

A. Equipment, materials, installation, workmanship, inspection, and testing shall be in accordance with the NFPA publications and as modified herein.

B. Follow manufacturers' directions in all cases for installation, testing and energizing.

C. Accurately set, level, support and fasten all equipment.

D. Batteries:
   1. All batteries shall have the date of installation hand written on the side in a location clearly visible to service personnel.
   2. Replace any existing batteries over 4 years old or of unknown age with new compatible, rechargeable, gelled electrolyte, totally sealed, fully charged batteries.

E. Smoke and heat detectors:
   1. Locate detectors in accordance with NFPA 72. If the proposed type of detector has an area coverage capability less than required by NFPA 72,

revise detector layout and submit for approval with the detail drawings. Mount detectors at the underside of ceiling or roof decks unless otherwise indicated.

2. No detector shall be located closer than 12 inches to any part of any lighting fixture. Detectors, located in areas subject to moisture or exterior atmospheric conditions, or hazardous locations as defined by NFPA 70, shall be approved for such locations.
3. 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.

F. Conduit where exposed shall be installed parallel with walls or structural elements; vertical runs to be plumb; horizontal runs level or parallel with structure; conduit grouped neatly together with straight runs, all bends parallels and uniformly spaced.

G. Earthquake Resistant installation/fastening of all electrical equipment shall conform to seismic code requirements. Where anchorage details are shown or not shown on the Drawings, the field installation shall be approved by a Structural State's Representative.

H. 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.

I. 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.

3.3 PRELIMINARY TESTS:

A. Before final acceptance of the work, pre-test system to demonstrate compliance with the contract requirements. System shall be subjected to complete functional and operational tests, including tests in place for each detector. Correct deficiencies pertaining to these requirements prior to formal functional and operational tests of the system. When tests have been completed and corrections made, submit test results and a signed and dated request for formal inspection and final test witnessing.

B. Conduct the following tests during installation of wiring and system components. Preliminary test shall be performed in the presence of the Local Fire Authority and Project Inspector of Record to determine conformance with the specified requirements:

1. Visually inspect all strobes and horn/strobes to ensure that strobe settings are as shown on the drawings.
2. Ground Resistance:
   a. Measure the resistance of each connection to ground. Ground resistance shall not exceed 10 ohms.
3. Dielectric Strength and Insulation Resistance:

a. Test the dielectric strength and the insulating resistance of the system interconnecting wiring by means of an instrument capable of generating 500 volts DC and equipped to indicate leakage current in megohms. For the purpose of this test, connect the instrument between each conductor on the line and between each conductor and ground at the control panel end of the line, with the other extremity open circuited and all series-connected devices in place. The system shall withstand the test without breakdown and shall indicate a resistance of not less than 50 megohms, the measurement being taken after an electrification of 1.0 minute with a DC potential of 500 volts.

4. Standby Battery Test:
   a. Prior to formal inspection and tests, place the fire alarm system on standby battery power for twenty-four (24) hours; immediately thereafter, sound the building evacuation alarm signaling devices for 5 minutes. When the test is complete, allow fire alarm system battery charger to recharge the standby batteries for 24 hours and place the fire alarm system on standby battery power for an additional twenty-four (24) hours; immediately thereafter, sound the building evacuation alarm signaling devices for 5 minutes. Certify that the Fire Alarm System has satisfactorily sounded building evacuation alarms for 5 minutes after the second twenty-four (24) hours on battery power.

3.4 FIELD INSPECTION AND FINAL TEST:

A. Perform the formal inspection and final test in the presence of the in the presence of the manufacturer's representative, the State's Representatives representative, Local Fire Authority and Project Inspector of Record (IOR). NFPA 72 "Inspection and Testing Form" shall be filled out completely and signed by those performing and witnessing the final test:
   1. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
   2. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.
   3. Verify activation of all waterflow switches.
   4. Open initiating device circuits and verify that the trouble signal actuates.
   5. Open and short signaling line circuits and verify that the trouble signal actuates.
   6. Open and short notification appliance circuits and verify that trouble signal actuates.
   7. Ground all circuits and verify response of trouble signals.
   8. Check presence and audibility of tone at all alarm notification devices.
   9. Check installation, supervision, and operation of all intelligent smoke detectors using the walk test.
   10. 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.

11. 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.
12. Test 100% of all automatic fire detection devices:
    a. Where application of heat would destroy any heat detector, it may be manually activated.
13. The communication loops and the indicating appliance circuits shall be opened in at least two (2) locations per zone to check for the presence of correct supervisory circuitry.

B. Test Equipment: It shall be the responsibility of the installing Contractor to furnish tools, instruments, and materials required for the thorough test of the system. This includes, but is not limited to, the following:
1. VOM meter
2. Manufacturers recommended smoke detector testing device and sensitivity test equipment.
3. Heat source for testing rate of rise heat detectors.
4. Keys to all control panels
5. Ladders

3.5 TRAINING:

A. Provide minimum four hours on site training by FACP manufacturer factory trained and authorized personnel.

B. Training sessions shall provide:
1. Instruction on operating the fire alarm system.
2. "Hands-on" demonstrations of the operations of all system components.
3. Instruct process for changing program and functions.

C. Permanently attach Sequence of Operation for fire alarm panel on wall next to FACP. Coordinate exact location with State’s Representative.

3.6 PROJECT CLOSEOUT:

A. As Built Drawings:
1. Provide in accordance with section 28 05 00.
2. Provide a complete set of reproducible "as-built" drawings showing installed wiring, color coding, and wire tag notations for exact locations of all installed equipment, specific interconnections between all equipment, and internal wiring of the equipment upon completion of system:
    a. Drawings shall include actual voltage drop calculations as installed for all new or modified notifications circuits.
    b. Drawings shall include actual battery calculations as installed for any new FACP’s or RNPS’s or any FACP’s or RNPS’s whose loads have been modified.

B. Operating and Instruction Manuals:

1. Operating and instruction manuals shall be submitted prior to testing of the system. Four (4) complete sets of operating and instruction manuals shall be delivered to the State's Representative upon completion.
2. Complete, accurate, step-by-step testing instructions giving recommended and required testing frequency of all equipment, methods for testing each individual piece of equipment, and a trouble shooting manual explaining how to test the primary internal parts of each piece of equipment shall be delivered to the State's Representative upon completion of the system.
3. Maintenance instructions shall be complete, easy to read, understandable, and shall provide the following information:
    a. Instruction on replacing any components of the system, including internal parts.
    b. Instructions on periodic cleaning and adjustment of equipment with a schedule of these functions.
    c. A complete list of all equipment and components with information as to the address and telephone number of both the manufacturer and local supplier of each item.
    d. User operating instructions shall be provided prominently displayed on a separate sheet located next to the control unit in accordance with U.L. Standard 864.

END OF SECTION 28 46 00

**SECTION 31 10 00**
**SITE PREPARATION and PLANT PROTECTION**

## PART 1 GENERAL

### 1.1 RELATED DOCUMENTS

A. Plans and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

### 1.2 DESCRIPTION

A. Protecting improvements and vegetation to remain.

B. Clearing and grubbing.

C. Removal of existing site improvements including but not limited to concrete, utilities, curbs, fencing, and irrigation system.

D. Preserve and protect existing trees, shrubs and other improvements and adjoining properties during removal work, site preparation work and construction.

E. Generally, this project includes construction of new building and associated improvements including but not limited to: Protection of existing improvements, demolition, staking, site preparation, storm drainage, excavation and fill, concrete work, site furnishings, irrigation, and all reasonably incidental and related work as shown on Plans and as specified.

### 1.3 DEFINITIONS

A. Owner, Client, Parks, or State, refers to the California State Parks, Clayton, CA. State's Representative or State, refers to the California State Parks representative(s), associates, or agents.

### 1.4 QUALITY ASSURANCE

A. Stipulations – Site Preparation and Demolition:

1. Work is in accordance with the Plans and specifications and includes but is not necessarily limited to the following:

a. Clearing and grubbing.

b. Identification and protection of vegetation indicated to remain.

c. Removal of existing site improvements, such as paving and bases, concrete curbs, fences, footings, foundations, irrigation system, underground pipes and utilities and structures.

2. Locate and identify existing utility services and protect or disconnect, remove and cap as required for the work.

3. Remove, clean, store and protect all items designated and directed to be salvaged to State's Representative.

4. Remove, store, and protect all items designated and directed to be reinstalled.

5. Obtain and pay for permits required for execution of the work.

B. Review:
1. Contractor shall review and identify with the State's Representative the Limits of Work and extent of site preparation and plant materials to be protected.
2. At the State's Representative's discretion, an Arborist may represent the State's Representative to review the work of the Contractor with regards to the plant protection specified in this section.

C. Plant Protection:

1. Protect trees against cutting, breaking, skinning, and bruising of bark; permit no traffic or stockpiling within drip line.
2. Do not change earth surface within drip line of trees.
3. Do not park vehicles or store materials, supplies and construction equipment within drip line of trees.
4. Install a temporary 4-foot-high orange plastic fence typically at the dripline of the trees except as otherwise directed by the Arborist / State's Representative.
5. Obtain specific instruction from Arborist / State's Representative for pruning of trees, shrubs, roots, or disturbance of soil within spread of tree branches.
6. Note that trees vary greatly in their tolerance of damage and cutting of roots. Cutting of roots three inches or greater shall be avoided. Roots one inch and greater in diameter that must be cut shall be cut cleanly and obliquely with the cut surface facing down.

7. Exposed and pruned roots shall be covered with light well-drained soil backfill and mulch over. The area shall be kept moist.
8. Any trenching required within the root zone shall be done by hand and as directed by the Arborist / State's Representative.
9. Provide periodic watering for all planting within Contract limit and any adjacent areas affected by the work as accepted by the State's Representative.

D. Plant Replacement - See notes on Plans

E. Work Included:
   1. Coordinate shut-off of existing irrigation systems with the State's Representative and be responsible for any damage caused to adjacent landscaping by the work.
   2. Site Preparation and Selective Site Demolition
   3. Work is in accordance with the Plans and specifications and includes but is not necessarily limited to the following:
      a. Clearing and grubbing.
      b. Identification and protection of vegetation indicated to remain.
      c. Removal of existing site improvements, such as paving, curbs, gutters, fences, structures, slabs, foundations, and walls.

F. Locate and identify existing utility services and disconnect, remove and cap.

G. Remove, store and protect all items designated and directed to be reinstalled.

H. Obtain and pay for permits required for execution of this work.

1.5 SUBMITTALS

A. Photographs or videotape, sufficiently detailed, of existing conditions of adjacent streets, adjacent parking areas, trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site demolition.

B. Contractor shall submit a letter with the relevant material submittals certifying that the products used by the Contractor are consistent with the State of California Parks policies. Submit to State's Representative.

C. Record Drawings: Indicate points of disconnection and capping, abandonment and removal of existing utility services; include utility names, sizes and locations, relationship to permanent structures located

on site and on adjacent property, and certificates of severance of utility services from respective utility companies or State's Representative. Submittals to be as specified in Sections 01 33 00.

1.6 PROJECT CONDITIONS

A. Coordination: Coordinate this work with the work of other Sections to avoid delay and interference with other work. Refer to the Demolition Plan for site work requirements.

B. Nuisances: Keep dirt, dust, noise and other objectionable nuisance to a minimum. Use temporary enclosures, coverings and sprinkling, and combinations thereof, as necessary to limit dust to lowest practicable level, except do not use water to the extent that it causes or contaminated run-off.

C. Traffic: Conduct work to ensure minimum interference with vehicular and pedestrian traffic, and to permit unencumbered access to the school property located outside of the project areas including the track and field.

1 Do not close or obstruct streets, sidewalks, or other public passageways without permission from authorities having jurisdiction.

2 If required, by governing authorities, provide alternate routes around closed and obstructed traffic ways.

3 Do not drive any type of vehicle or store products on project site surfaces without prior authorization by State's Representative. Vehicles and storage areas shall be limited to areas noted on Plans.

D. Dispose of cleared, grubbed, and removed material that will not be salvaged or recycled on site.

E. Salvable Improvements: Carefully remove items indicated to be salvaged and store where designated by State's Representatives. Damaged salvaged materials shall be replace with new as directed by State's Representative.

F. Protections:

1 Prevent movement and settlement or adjacent structures. Install temporary barriers, fences, guard rails, enclosures, shoring, bracing, planking, warning signs and other protections required to protect structures, utilities, landscaping and other items that are to remain in place.

2 Protect benchmarks, monuments and reference points from displacement and damage; and if displaced or damaged, replace at no cost to the State's Representative.

3 Install and maintain the required bracing, shoring and supports when removing structural elements and be responsible for safety and support of structure. If the safety of any structure appears to be endangered, cease operations and immediately notify the State's Representative. Do not resume operations until authorized by State's Representative.

## PART 2 PRODUCTS

### 2.1 SOILS

A. Satisfactory Soil Materials. See Section 31 23 00, Excavation and Fill for satisfactory soil material for backfilling excavations and depressions resulting from site clearing.

### 2.2 PROTECTIVE FENCING

A. Protective Fencing: As accepted by State's Representative and as specified herein.

## PART 3 EXECUTION

### 3.1 EXAMINATION

A. Examine areas in which work is to be performed. Report in writing to the State's Representative all prevailing conditions that will adversely affect satisfactory execution of work. Do not proceed with work until unsatisfactory conditions have been corrected.

B. Starting work constitutes acceptance of the existing conditions and the Contractor shall then, at his expense, be responsible for correcting unsatisfactory and defective work encountered.

C. For the duration of the project, provide a construction fence at the perimeter of project(s) as required to secure the project from trespassing and provide a safe construction site. Field verify the perimeter and gate locations with the State's Representative. The fence location may be

adjusted as the project progresses based on the approval of the State's Representative.

D. Install and maintain temporary fencing and other required protective devices and exclude construction activities from tree/shrub zones except as supervised by the Arborist / State's Representative.

E. If access to tree/shrub zones cannot be avoided an intact four inch layer of mulch with minimum 1-1/4-inch thick, metal strap linked plywood shielding shall be maintained in the tree/shrub zone where heavy equipment will be operated.

3.2 CLEARING

A. Remove designated trees, stumps, rubbish, undergrowth and deadwood as well as fences and incidental structures that interfere with the construction as shown on the Plans and as specified. Obtain verification from project inspector prior to removal.

B. Field Verification: Before removing non-designated trees, shrubs, stumps, bushes, vines, rubbish, undergrowth, and deadwood as shown on the Plans and as specified, obtain verification from State's Representative.

C. Remove non-designated trees, shrubs, stumps, bushes, vines, rubbish, undergrowth, and deadwood as well as fences and incidental structures that interfere with the construction as shown on the Plans and as specified. Obtain verification from State's Representative. prior to removal.

D. Backfill holes resulting from plant and structure removal with clean fill compacted to minimum 90% relative compaction. Refer to Civil and Architectural Plans and specifications for more stringent requirements in special areas or cases.

3.3 GRUBBING

A. Remove all stumps and roots in their entirety, brush, organic materials and debris to bare earth except where otherwise required. Tree trunks shall be removed a minimum depth of 2-feet below existing or finish grade, whichever is deeper. Roots of trees and shrubs shall be removed to a minimum depth of 12-inches below existing or finish grade, whichever is deeper. When indicated, such materials as topsoil and leaf mold, or other organic materials above the ground surface suitable for use as mulch or topsoil, shall be salvaged and stockpiled.

B. Remove grasses and weeds. If authorized by State's Representative, Contractor shall apply systemic weed killer and confirm weed kill prior to removal.

C. Backfill and compact areas excavated and open pits and holes resulting from removal operations. Comply with Excavation and Fill Specification for backfill materials, compaction, and installation methods. In planting areas backfill holes with clean approved planting soil compacted to 90% relative compaction to 12-inches below finish grade and 85% relative compaction for the top 12-inches. When indicated, such materials as topsoil and leaf mold, or other organic materials above the ground surface suitable for use as mulch or topsoil, shall be salvaged and stockpiled.

D. Remove existing pavement within proposed planting areas in its entirety, including aggregate gravel and stockpile.

E. Remove existing pavement within proposed pavement areas to a depth sufficient to allow for the construction of the proposed improvements to the grades shown on Plans. Existing base material may be left in place and re-compacted as required where not conflicting with the new pavement section if approved by State's Representative.

3.4 TOPSOIL STRIPPING AND STOCKPILING

A. Perform topsoil striping and stockpiling for reuse under the direction of State's Representative.

B. Coordinate with Section 31 23 00, Excavation and Fill, and Plans; Strip topsoil to required depths in a manner to prevent intermingling with underlying subsoil or other waste materials.

3.5 UTILITIES

A. Contract local utility companies 48 hours minimum prior to start of demolition work. Confirm verbal notices and written notices. Verify locations of all utilities entering site and their locations on site.

B. Cooperate with the State's Representative, utility companies, adjacent property owners, and other building trades in maintaining, protecting, re-routing or extending utilities passing though work areas which serve structures located on project site and on adjacent properties.

C. Verify that utilities that are to be removed, capped or abandoned are turned off, or are disconnected, or are re-routed to new locations before starting demolition.

3.6 REMOVAL

A. General:

1 Remove materials in an orderly and careful manner.

2 Repair or replace all removal work performed in excess to that required at no cost to the State's Representative. Repair or replacement shall match and equal construction, condition and finish existing at time of award of Contract.

B. Remove the following from locations to the extent required or directed for new construction. Removal of slabs and other structures shall include their footings and foundations. Removal of pavements shall include base rock and sub-structures.

1 Fencing, including posts, fabric and footings. Backfill voids if required from removed footings with clean fill as defined in Section 31 23 00, Excavation and Fill.

2 Electric underground wires and conduits occurring within removal areas except those shown as reused on Electrical Plans. Refer to Utility Plans and Specifications.

3 Miscellaneous structural elements that interfere with the new construction as directed.

4 Paving: Remove asphalt and concrete paving including aggregate base rock completely to the minimum depth required for subgrade of new improvements. Dispose of demolished concrete, asphalt and base rock at a material recycling facility. Existing aggregate base may be reused on site if it meets requirements of 31 23 00 Excavation and Fill and the approval of the Geotechnical Engineer or State's Representative.

5 Underground pipes and utilities.

6 Other items noted on the Plans and required to be removed to install the new improvements.

7 Slabs, equipment pads and sidewalks.

8 Electric utility poles, wires and down guys, including all underground wires and conduits occurring within removal areas.

9 Designated utility services occurring within removal areas, including disconnection, capping and complete removal or abandonment.

10 Buried tanks, complete with piping, footings, leach fields and foundations.

11 Trees and their roots to a minimum of 30 inches below existing grade..

12 Miscellaneous structural elements which interfere with the new construction and as directed by the State.

C. Cutting asphalt, concrete curbs and concrete pavement:

1 All lines shall be marked and accepted by State's Representative before the cutting operation.

2 Cut edges of pavement at 90-degree angle to the surface in a true and straight line in accordance with dimensions shown on the Plans. Make cuts with a concrete saw, to 1-1/2" minimum depth.

D. Backfill and compact areas excavated and open pits and holes resulting from removal operations. Comply with requirements specified for backfill materials, compaction and installation methods.

E. Rough grade site within removal areas to meet adjacent contours and to provide positive drainage. Leave site in clean condition acceptable for performance of subsequent construction operations.

3.7 CLEANUP AND DISPOSAL, per specifications

A. Transport trash, rubbish and debris daily from site and legally dispose of:

1 Demolish and waste materials encountered.

2 Remove and promptly dispose of contaminated, vermin-infested and dangerous materials encountered.

3 Do not burn or bury materials on site.

B. Clean excess soil may be distributed on site as accepted by the State's Representative if it does not adversely affect specified finish grades. Coordinate with Section 31 23 00 Excavation and Fill, Plans and Subgrade Preparation and Base Material.

C. At the discretion of the State's Representative, excess soil shall be legally disposed of off-site. Coordinate with Section 31 23 00, Excavation and Fill, and Plans.

D. Upon completion of work under this Section, remove all tools, equipment and temporary enclosures and structures.

END OF SECTION 31 10 00

**SECTION 31 11 00**
**CLEARING & GRUBBING**

PART 1 - GENERAL

1.1 SUMMARY

This Section includes all work necessary to successfully complete demolition, clearing & grubbing to prepare site for the phasing and new construction, including the following:

1. Protecting existing trees and vegetation to remain.
2. Trimming tree limbs and roots.
3. Removing trees as designated.
4. Clearing vegetation, debris, trash and other materials within limits indicated.
5. Grubbing of vegetation within limits indicated.
6. Stripping of topsoil within limits indicated.
7. Removing above-grade site improvements within limits indicated.
8. Disconnecting, capping or sealing, and abandoning site utilities in place.
9. Disconnecting, capping or sealing, and removing site utilities.
10. Disposing of objectionable material off site.
11. Clean line saw cutting of existing asphalt pavement, concrete sidewalks, concrete curb/gutter, etc., as specified herein.
12. Clearing and site preparation. Including removal of site vegetation and other root system.
13. Protection from injury or defacement of trees and other vegetation and objects to be preserved.
    a. Removal of surface debris and deleterious materials such as rubbish.
    b. Removal and stockpile of materials for landscaping use at approved location.

c. Disposal of unwanted materials off site.

1.2 RELATED DOCUMENTS

Caltrans 2025 Standard Specifications, Section 17, Clearing and Grubbing.

1.3 REGULATORY REQUIREMENTS

No burning shall be allowed.

Comply with the following 2025 California Code of Regulations:

1. Title 8: CAL/OSHA, Chapter, Subchapter 4 – Construction Safety Orders
2. Title 24: Part 2, California Building Code, Chapter 33, Protection of Pedestrian during Construction or Demolition.
3. Bay Area Air Quality Management State Representative
4. State Representative Water State Representative, Standard Specification and Details.
5. County of State Representative Public Works Department, Design Guidelines.

1.4 DEFINITIONS

ANSI: American National Standards Institute.

CAL-OSHA: California Occupational Safety and Health Administration.

Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2-inches in diameter; and free of weeds, roots, and other deleterious materials.

Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

1.5 MATERIAL STATE REPRESENTATIVESHIP

Except for stripped topsoil or other materials indicated to remain State Representative’s property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.6 SUBMITTALS

Submittal procedure shall be as outlined in Division 1 – General Requirements.

1.7 QUALITY ASSURANCE

Do not remove or prune trees without first securing a permit from the appropriate agency.

Prune to the standards of the International Society of Arborists and to ANSI 300.

1.8 PROJECT CONDITIONS

Except for materials indicated to be stockpiled or to remain the State Representative's property, cleared materials are the Contractor's property. Remove cleared materials from site and dispose of in lawful manner.

Salvable Improvements: Carefully remove items indicated to be salvaged and store where indicated on plans or where designated by the State Representative. Avoid damaging materials designated for salvage.

Unidentified Materials;

1. If unidentified materials are discovered, including hazardous materials that will require additional removal other than is required by the Contract Documents, immediately report the discovery to the State Representative.

2. If necessary, the State Representative will arrange for any testing or analysis of the discovered materials and will provide instructions regarding the removal and disposal of the unidentified materials.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

Backfill excavations resulting from demolition operations with on-site or import materials conforming to structural backfill defined in Section 31 23 33 Utility Trenching and Backfilling.

1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points during construction.

B. Locate and clearly flag trees and vegetation to remain or to be relocated.

C. Protect existing site improvements to remain during construction.

1. Restore damaged improvements to their original condition, as acceptable to the State Representative. Prior to restoration the contractor shall notify the State Representative of the damaged improvements.

3.2 TREE PROTECTION

A. Erect and maintain temporary fence around drip line of individual trees or around perimeter drip line of groups of trees to remain. Remove fence when construction is complete.

B. Do not store construction materials, debris, or excavated material within drip line of remaining trees.

C. Do not permit vehicles or equipment within drip line of remaining trees.

D. Do not excavate within drip line of remaining trees, unless otherwise indicated.

E. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation edge as possible.

1. Cover exposed roots with burlap and water regularly.

2. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

3. Coat cut faces of roots more than 1-1/2-inches in diameter with an emulsified asphalt or other approved coating formulated for use on damaged plant tissues.

4. Cover exposed roots with wet burlap to prevent roots from drying out. Backfill with soil as soon as possible.

3.3 TREE PRUNING

A. Prune trees to balance the crown, and eliminate hazards. Perform main work to reduce sail effect through thinning, reducing end weights, shortening long heavy limbs, removing deadwood, weak limbs and sucker growth. Prune limbs back to an appropriate lateral branch.

B. Make final cuts at the outer edge of the branch collar in accordance with the arborist’s recommendations.

C. Perform pruning work in a safe and proper manner, adhering to CAL-OSHA and ANSI Standards.

3.4 ROOT PRUNING

A. Do not cut tree roots greater than 3-inch in diameter and less than 12-inches below ground level without approval of the State Representative.

B. Cut tree roots cleanly, as far from the trunk as possible, and not underneath any area where walkways are to be constructed. Root pruning shall be to a depth of 18-inches.

C. Tree root prune using a Vermeer root-cutting machine. Obtain the State Representative's approval before using alternate equipment or techniques.

D. Complete tree root pruning prior to any excavation adjacent to the tree.

E. Do not expose tree roots to drying out. Cover root ends with soil or burlap and keep moist until the final backfill is completed.

3.5 TREE REMOVAL

A. Remove trees designated for removal prior to the construction of new improvements.

B. Perform tree removal work in a safe and proper manner, adhering to CAL-OSHA and ANSI Standards.

C. Remove or grind stumps to a minimum of 18-inches below finish subgrade. Remove surface roots to this depth within 24-inches of the tree trunk. Trees, plants and roots that are below proposed building footprint or slabs on grade shall be removed in its entirety.

3.6 RESTORATION

A. Restore damaged improvements to their original condition, as acceptable to the State Representative.

B. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, as directed by the State Representative.

1. Employ a qualified arborist, licensed in jurisdiction where the Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.

2. Replace trees that cannot be repaired and restored to full-growth status, as determined by the State Representative. Clear and grub existing areas only to extent required by new construction and as

indicated. Use methods required to complete the Work within limitations of governing regulations.

3.7 UTILITIES

A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed or abandoned.

B. Arrange to shut off indicated utilities with utility companies or verify that utilities have been shut off.

C. Existing Utilities: Do not interrupt utilities serving facilities occupied by State Representative or others unless authorized in writing by the State Representative, and then only after arranging to provide temporary utility services according to requirements indicated.

D. Coordinate utility interruptions with utility company affected.

E. Do not proceed with utility interruptions without the permission of the State Representative and utility company affected. Notify State Representative and utility company affected 14 working days prior to utility interruptions.

F. Excavate and remove underground utilities that are indicated to be removed.

G. Securely close ends of abandoned piping with tight fitting plug or wall of concrete minimum 6-inches thick. All abandoned piping shall be filled with a cementious material, such as controlled low strength material.

3.8 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots.

B. Remove trash, debris, logs, concrete, masonry and other waste materials.

C. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.

D. Completely remove stumps, roots, obstructions, and debris extending to a depth of 18-inches below subgrade. Trees, plants and roots that are below proposed building footprint or slabs on grade shall be removed in its entirety.

E. Use only hand methods for grubbing within drip line of remaining trees.

3.9 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.

C. Remove trash, debris, weeds, roots, and other waste materials.

D. Stockpile topsoil materials designated to remain on site at a location approved by the State Representative at a location away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust. Refer to the SWPPP as required.

E. Do not stockpile topsoil within drip line of remaining trees.

3.10 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Remove slabs, paving, curbs, and gutters, as indicated. Where concrete slabs, curb, gutter and asphalt pavements are designated to be removed, remove bases and subbase to surface of underlying, undisturbed soil.

C. Unless the existing full-depth joints coincide with line of pavement demolition, neatly saw-cut to full depth the length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.

D. Remove driveways, curbs, gutters and sidewalks by saw cutting to full depth. If saw cut falls within 30-inches of a construction joint, expansions joint, score mark or edge, remove material to joint, mark or edge

3.11 BACKFILL

A. Place and compact material in excavations and depressions remaining after site clearing in conformance with Section 31 23 33.

3.12 DISPOSAL

Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off the State Representative’s property.

3.13 TEMPORARY FACILITIES

Provide the following temporary facilities to facilitate the demolition operations, as necessary.

1. Temp Traffic Controls

2. Protection of Persons and Property

3. Protection of Utilities

4. Noise and Dust Abatement.

5. Clear and restore area to their original condition.

6. Protect survey markers and monuments, existing improvements, and adjacent structures from removal and damage.

3.14 CONSTRUCTION WASTE MANAGEMENT

To the greatest extent possible, separate reusable and recyclable products from contaminated waste and debris in accordance with the General Contractor's Waste Management Plan. Place recyclable and reusable products in designated containers and protect from moisture and contamination.

END OF SECTION 31 11 00

**SECTION 31 23 00**
**EXCAVATION AND FILL**

## PART 1 - GENERAL

### 1.1 SUMMARY

A. This Section describes the requirements for earthwork operation, as shown on the Drawings and specified:

1. Excavation and/or embankment from existing ground to subgrade, including soil sterilant, for parking areas, walks, paths, and any other site improvements called for on the Plans.
    a. Aggregate base.
    b. Lime stabilization.
    c. Dispose off-site waste, excess or unsatisfactory material.

### 1.2 RELATED DOCUMENTS

A. Caltrans Standard Specifications 2025

1. Division 4 Section 19, Earthwork.
2. Division 4 Section 24, Stabilized Soils.
3. Division 4 Section 26, Aggregate Bases.

### 1.3 RELATED SECTIONS

A. Section 31 11 00 – Clearing and Grubbing

### 1.4 REGULATORY REQUIREMENTS

A. State of California, Department of Transportation, Standard Specifications 2025 - Section 19

B. ASTM

1. D 1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.
2. D1557-70 for testing in compaction.z
3. D 1586, Method for Penetration Tests and Split-Barrel Sampling of

Soils.

4. D 2487, Classification of Soils for Engineering Purposes.

5. D 3740, Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

6. D 4318. Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

7. E 329, Specification for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.

8. E 548, Guide for General Criteria Used for Evaluating Laboratory Competence.

C. California Building Code, Title 24, Part 2 – California Code of Regulations, Chapter 18 and 18A, Soils and Foundations.

D. CAL/OSHA, Title 8.

## 1.5 DEFINITIONS

A. Borrow: Approved soil material imported from off-site for use as Structural Fill or Backfill.

B. Excavation: Removal of material encountered above subgrade elevations.

1. Authorized Over-Excavation: Excavation below subgrade elevations or beyond indicated horizontal dimensions as shown on plans or authorized by the State Representative's Representative.

2. Unauthorized Over-Excavation: Excavation below subgrade elevations or beyond indicated horizontal dimensions without authorization by the State Representative's Representative. Unauthorized excavation shall be without additional compensation.

C. Structural Backfill: Soil materials approved by the State Representative's Representative and used to fill excavations resulting from removal of existing below grade facilities, including trees.

D. Structural Fill: Soil materials approved by the State Representative's Representative and used to raise existing grades.

E. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material ¾-cubic yards or more in volume that when tested by an independent geotechnical testing agency, according to ASTM D 1586, exceeds a standard penetration

resistance of 100 blows/2-inches.

F. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man made stationary features constructed above or below grade.

G. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below base or topsoil materials.

H. Unsuitable Material: Any soil material that is not suitable for a specific use on the Project. The State Representative's Representative will determine if a soil material is unsuitable.

I. Utilities: onsite underground pipes, conduits, ducts and cables.

## 1.6 SUBMITTALS

A. Submittal procedure shall be as outlined in Division 1 – General Requirements.

B. Submit material certificates signed by the material producer and the Contractor, certifying that that each material item complies with, or exceeds the specified requirements.

## 1.7 QUALITY ASSURANCE

A. Conform all work and materials to the recommendations or requirements of the State Representative's Representative.

B. Conform all work to the appropriate portion(s) of Caltrans Standard Specifications, Section 17 and 19, and the appropriate sections of the California Building Code.

C. Percentage of compaction specified shall be the minimum acceptable. The percentage represents the ratio of the dry density of the compacted material to the maximum dry density of the material as determined by the procedure set forth in ASTM D 1557.

D. Excavate and backfill existing areas only to extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations. Backfill as necessary to achieve rough grade elevations as indicated per plan.

E. Perform excavation, filling, compaction and related earthwork under the observation of the State Representative. Materials placed without approval of the State Representative's will be presumed to be defective and, at the discretion of the State Representative shall be removed and replaced at no cost to the State Representative. Notify the State Representative at

least 24-hours prior to commencement of earthwork and at least 48 hours prior to testing.

F. The State Representative will perform observations and tests required to enable him to form an opinion of the acceptability of the Project earthwork. Correct earthwork that, in the opinion of the State Representative, does not meet the requirements of these Technical Specifications.

G. Upon completion of the construction work, certify that all compacted fills and foundations are in place at the correct locations, and have been constructed in accordance with sound construction practice. In addition, certify that the materials used are of the types, quality and quantity required by these Technical Specifications. The Contractor shall be responsible for the stability of all fills and backfills constructed by his forces and shall replace portions that in the opinion of the State Representative's Representative have been displaced or are otherwise unsatisfactory due to the Contractor's operations.

H. Do not mix or place cement treated base when the temperature is below is below 36 degrees F or when the ground is frozen.

I. Finish surface of material to be stabilized prior to lime treatment shall be as specified in Section 24-1.04 of Caltrans Standard Specifications and as required by these Technical Specifications.

J. Finish surface of the stabilized material after lime treatment shall be as specified in Section 24-1.08 of Caltrans Standard Specifications and as required by these Technical Specifications.

K. Identify and protect existing utilities.

L. Finish soil grade tolerance at completion of grading:

1. Paved areas: +0.05

2. Other areas: ±0.10 feet.

## 1.8 PROJECT CONDITIONS

A. Promptly notify the State Representative of surface or subsurface conditions differing from those disclosed in conformance with Division 1 General Requirements.

B. Protect open excavations, trenches, and the like with fences, covers and railings to maintain safe pedestrian and vehicular traffic passage.

C. Prevent erosion of freshly graded areas during construction and until such time as permanent drainage and erosion control measures have been

installed.

D. Temporarily stockpile fill material in an orderly and safe manner and in a location approved by the State Representative.

E. Provide dust and noise control in conformance with Division 1 General Requirements.

F. Environmental Requirements: When unfavorable weather conditions necessitate interrupting earthwork operation, areas shall be prepared by compaction of surface and grading to avoid collection of water. Provide adequate temporary drainage to prevent erosion. After interruption, compaction specified in last layer shall be re-established before resuming work.

## PART 2 - PRODUCTS

### 2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from on-site excavations.

B. Obtain approval of on-site soil materials and borrow materials to be used for structural fill or structural backfill from the State Representative's Representative.

C. On-Site Structural Fill and Structural Backfill: Soil or soil-rock mixture from on site excavations, free from organic matter or other deleterious substances. On-site structural fill and backfill shall not contain rocks or rock fragments over 3 inches in greatest dimension.

D. Imported Structural Fill and Structural Backfill Type A: Conform to the requirements of on-site structural fill. Material shall also be a non-expansive and predominantly granular soil or soil-rock mixture with plasticity index of 8 or less, has a liquid limit less than 25, and an R-Value of 25 or greater and shall not contain ground up asphaltic concrete or AC fragments.

E. Imported Structural Fill and Structural Backfill Type B: Conform to the requirements of on-site structural fill. Material shall also be a non-expansive and predominantly granular soil or soil-rock mixture with plasticity index of 12 or less, has a liquid limit less than 25, and an R-Value of 25 or greater.

### 2.2 SOIL STERILANT

A. Commercial chemical for weed control, registered by EPA. Provide

granular, liquid or wet-able powder form.

## 2.3 AGGREGATE BASE

A. Material: Caltrans Standard Specification Section 26.

1. Class 2, 1-1/2-inch Maximum: Section 26-1.02A.
2. Class 2, 3/4-inch Maximum: Section 26-1.02A.
3. Class 3: Section 26-1.02B.

## 2.4 LIME STABILIZATION

A. Lime Treatment Material: Conform to Section 24-1.02 and 24-1.03 of Caltrans Standard Specifications and the Project Geotechnical Report.

# PART 3 - EXECUTION

## 3.1 GENERAL

A. Conform to Section 19, Earthwork, Caltrans Standard Specifications as modified by the Contract Documents.

B. Placement and compaction of material by flooding, ponding, or jetting will not be permitted.

C. The use of explosives will not be permitted.

## 3.2 CONTROL OF WATER AND DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding the site and surrounding area. Provide dewatering equipment necessary to drain and keep excavations and site free from water.

B. Dewater during backfilling operation so that groundwater is maintained a least two feet below level of compaction effort.

C. Obtain the State Representative’s approval for proposed control of water and dewatering methods.

D. Protect subgrades from softening, undermining, washout and damage by rain or water accumulation.

E. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations.

F. Maintain dewatering system in place until dewatering is no longer required.

## 3.3 WET WEATHER CONDITIONS

A. Do not prepare subgrade, place or compact soil materials if above optimum moisture content.

B. If the State Representative's Representative allows work to continue during wet weather conditions, conform to supplemental recommendations provided by the State Representative's Representative.

## 3.4 EXCAVATION

A. Excavate earth and rock to lines and grades shown on drawings as prepared by a licensed professional engineer and to the neat dimensions indicated on the Plans, required herein or as required to satisfactorily compact backfill.

B. Remove and dispose of large rocks, pieces of concrete and other obstructions encountered during excavation.

C. Where forming is required, excavate only as much material as necessary to permit placing and removing forms.

D. Provide supports, shoring and sheet piles required to support the sides of excavations or for protection of adjacent existing improvements.

## 3.5 REMOVAL OF EXISTING FILLS AND UNSUITABLE MATERIAL

A. Over-excavate areas of existing fills and other unsuitable material encountered during mass grading as directed by the State Representative's Representative.

B. Conform with Division 1 General Requirements.

## 3.6 GRADING

A. Uniformly grade the Project to meet existing conditions.

B. Finish ditches, gutters and swales to the sections, lines and grades indicated and to permit proper surface drainage.

C. Round tops and bottoms of slopes as indicated or to blend with existing

contours.

## 3.7 SUBGRADE PREPARATION

A. Prepare subgrades under paved areas, curbs, gutters, walks, structures, other surface facilities and areas to receive structural fill. At least 6 inches of select material shall be placed beneath exterior flatwork and extend at least two feet beyond the slab edges.

B. Prepare subgrades for paved areas, curbs and gutters by plowing or scarifying surface at least 9 inches in one lift below final subgrade elevations and 1-foot beyond edge of pavement unless specified otherwise by the State Representative's Representative. Uniformly moisture condition to obtain optimum moisture contents. Break clods and condition surface by harrowing or dry rolling. Remove boulders, hard ribs and solid rock. Prepare earth uniform for full depth and width of subgrade.

   1. Surface soil that has a moisture content of less than 22 percent (average, approximate plastic limit of the soil) should be excavated, moisture-conditioned to at least three percent above optimum moisture content, and compacted to between 88 and 93 percent relative compaction to reduce its expansion potential; maximum depth of required excavation for moisture conditioning is about two feet.

C. Protect utilities from damage during compaction of subgrades and until placement of final pavements or other surface facilities.

D. Obtain the State Representative's Representative's approval of subgrades prior to placing pavement.

E. Subgrade preparation will not be required in areas where lime treatment is used.

## 3.8 PLACEMENT OF STRUCTURAL FILL

A. Obtain the State Representative's approval of surface to receive structural fill prior to placement of structural fill material.

B. Place structural fill on prepared subgrade.

C. Spread structural fill material in uniform lifts not more than 8-inches in un-compacted thickness and compact.

D. Place structural fill material to suitable elevations above grade to provide for anticipated settlement and shrinkage.

E. Overbuild fill slopes, as required by the State Representative's, to obtain

required compaction. Remove excess material to lines and grades indicated.

F. Do not drop fill on structures. Do not backfill around, against or upon concrete or masonry structures until structure has attained sufficient strength to withstand loads imposed and the horizontal structural system had been installed.

## 3.9 TEMPORARY AND PERMANENT SLOPES

A. Temporary slopes less than 10 feet high should be inclined no steeper than 1.5:1 (horizontal to vertical).

B. Shallow, permanent, cut and fill slopes shall be constructed no steeper than 2:1 (horizontal to vertical).

## 3.10 AGGREGATE BASE

A. Watering, Spreading and Compacting: Section 26-1.035, 26-1.04 and 26-1.05 of Caltrans Standard Specifications.

## 3.11 LIME STABILIZATION

A. Performing the stabilization shall conform to Section 24-1.05, through 24-1.09 of Caltrans Standard Specifications and the following:

1. Add lime in the amount specified by the State Representative's Representative.

2. Lime treat subgrade soils from back of curb to back of curb to a depth specified by the State Representative's Representative.

3. Mix in two mixing periods, both with the tines lowered to the same depth. Both mixing periods shall be monitored and verified by the State Representative's Representative. The second mixing shall occur at about 24 hours after the initial mixing.

4. Compact and grade the lime mixed subgrade immediately after the second mixing.

5. Compact the lime treated subgrade to 93 percent as determined by ASTM D1557.

6. After application of the curing seal, do not allow traffic on the lime treated material for a period of 7 days in lieu of the 3 days specified in Section 24-1.03 of Caltrans Standard Specifications.

7. Proof-roll the stabilized subgrade after compacting to confirm that a

non-yielding surface has been achieved. Yielding areas, if any, shall be mitigated. Mitigation could consist of over-excavation, utilization of stabilization fabric, or chemical treatment. Each case shall be addressed individually in the field by the State Representative's Representative.

## 3.12 COMPACTION AND TESTING

A. Do not compact by ponding, flooding or jetting.

B. Compact soils at optimum water content. Aerate material if it is too wet. Add water to material if it is too dry. Thoroughly mix lifts before compaction to ensure uniform moisture distribution.

C. Perform compaction using rollers, pneumatic or vibratory compactors or other equipment and mechanical methods approved by the State Representative's Representative.

D. Compaction requirements:

1. Compact structural fills less than 5-feet thick to 90 percent compaction.

2. Compact structural fill 5-feet thick or greater to 95 percent compaction.

3. Compact the upper 6 inches of subgrade soils beneath pavements, curbs and gutters to 95 percent compaction. Extend compaction 2-feet beyond pavement edges unless specified otherwise by the State Representative's Representative.

4. Compact the upper 6-inches of subgrade soils under walks, structures and areas to receive structural fill to 90 percent compaction.

## 3.13 SOIL STERILIZATION

A. Apply soil sterilant to areas indicated, such as beneath asphalt concrete pavement, brick pavement, concreter pavement and at grade concrete slabs, including sidewalks, curbs and gutters. Also where indicated apply soil sterilant below expansion and control joints and at areas where pipes, ducts or other features penetrate slabs.

B. Apply soil sterilant uniformly and at the rates recommended by the manufacturer.

C. Apply soil sterilant to prepared subgrade, or after installation of aggregate base as recommended by the manufacturer.

3.14 DISPOSAL

A. Lawfully dispose of all unsuitable and excess or surplus material off-site at no cost to the State Representative.

END OF SECTION 31 23 00

# SECTION 31 23 33
# UTILITY TRENCHING AND BACKFILLING

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Excavation, bedding, and backfill of underground storm drain, sanitary sewer and water piping and associated structures.

B. The CONTRACTOR shall provide all materials, equipment, and labor necessary to perform and complete all utility earthwork as shown on the Drawings and as specified herein.

C. The work of this Section includes all utility earthwork required for construction of the project. Such earthwork shall include, but may not necessarily be limited to, the loosening, removing, loading, transporting, depositing, and compacting in its final location of all materials wet and dry, as required for the purposes of completing the work, which shall include, but not necessarily be limited to, the furnishing, placing, and removing of sheeting, shoring and bracing necessary to safely support the sides of all excavations; all pumping, ditching, draining and other required measures for the removal or exclusion of water from the excavation; the supporting of structures above and below the ground; all backfilling around structures and all backfilling of trenches and pits; the disposal of excess excavated materials; borrow of materials to make up deficiencies for fills; and all other incidental earthwork.

D. Hazardous materials shall be handled in accordance with all regulatory agency requirements. Asbestos cement pipe (ACP) exists within the project area and replacement of existing ACP is anticipated but shall be abandoned in place unless otherwise noted in the plans. The contractor shall make every attempt to protect all asbestos containing items during the execution of this contract. However, there will be instances where ACP or asbestos containing material will need to be removed, handled, cut, disturbed, or disposed of and the contractor shall comply with all local, state and federal regulations regarding construction activities near asbestos containing materials.

### 1.2 SECTION EXCLUDES

A. Drainage fill material and placement around subdrains.
B. Power, telecommunications, and low voltage scope of work.

## 1.3 RELATED DOCUMENTS

ASTM:

1. C 33, Specification for Concrete Aggregates.
2. C 150, Specification for Portland Cement.
3. C 260, Specification for Air-Entraining Admixtures for Concrete.
4. C 618, Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
5. D 1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.
6. D 2321, Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.
7. D 2487, Classification of Soils for Engineering Purposes.
8. D 3740, Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
9. E 329, Specification for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.
10. E 548, Guide for General Criteria Used for Evaluating Laboratory Competence.

C. 2025 California Building Code, California Code of Regulations, Title 24, Part 2 - Chapter 18, Foundations, and Retaining Walls, and Chapter 33, Site Work, Demolition and Construction.

D. Caltrans 2025 Standard Specifications:
   1. Section 19, Earthwork.
   2. Section 26, Aggregate Bases.

E. CAL/OSHA, Title 8.

F. State Representative Standard Specifications and Drawings.

## 1.4 RELATED SECTIONS

A. Section 31 11 00, Clearing and Grubbing.

B. Section 33 41 00, Storm Drain System.

C. Section 33 11 66, Water Distribution System.

## 1.5 DEFINITIONS

A. AC: Asphalt Concrete.

B. ASTM: American Society for Testing and Materials.

C. Bedding: Material from bottom of trench to bottom of pipe.

D. CDF: Controlled Density Fill.

E. DIP: Ductile Iron Pipe.

F. Initial Backfill: Material from bottom of pipe to 12-inches above top of pipe.

G. PCC: Portland Cement Concrete.

H. RCP: Reinforced Concrete Pipe.

I. Springline of Pipe: Imaginary line on surface of pipe at a vertical distance of ½ the outside diameter measured from the top or bottom of the pipe.

J. Subsequent Backfill: Material from 12-inches above top of pipe to subgrade of surface material or subgrade of surface facility or to finish grade.

K. Trench Excavation: Removal of material encountered above subgrade elevations and within horizontal trench dimensions.

1. Authorized Trench Over-Excavation: Excavation below trench subgrade elevations or beyond indicated horizontal trench dimensions as shown on plans or authorized by the State Representative.

2. Unauthorized Trench Over-Excavation: Excavation below trench subgrade elevations or beyond indicated horizontal trench dimensions without authorization by the State Representative. Unauthorized excavation shall be without additional compensation.

L. Utility Structures:
1. Storm Drain Manholes, vaults, etc.
2. Sanitary sewer manholes, vaults, etc.
3. Water vaults, etc.

## 1.6 SUBMITTALS

A. Submittal procedure shall be as outlined in Division 1 – General Requirements

B. Product Data:

1. Grading and quality characteristics showing compliance with requirements for the Work.
2. Certify that material meets requirements of the Project.

C. Samples:

1. If required by the State Representative, provide 40-pound samples of all imported trench bedding and backfill material sealed in airtight containers, tagged with source locations and suppliers of each proposed material. Do not import materials to Project without written approval of the State Representative.

2. Provide materials from same source throughout work. Change of source requires approval of the State Representative's.

D. Material Test Reports: Provide, from a qualified testing agency, the following test results showing compliance with the project requirements:

1. Classification according to ASTM D 2487 of each imported trench bedding and backfill material.

2. Laboratory compaction curve in conformance with ASTM D 1557 for each imported trench bedding and backfill material

## 1.7 QUALITY ASSURANCE

A. Provide an independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock definition testing, as documented according to ASTM D 3740 and ASTM E 548.

B. Conform all work and materials to the recommendations or requirements and meet the approval of the State Representative.

C. Conform all work to the appropriate portion(s) of the Caltrans Standard Specifications, Section 19.

D. Percentage of compaction specified shall be the minimum acceptable. The percentage represents the ratio of the dry density of the compacted material to the maximum dry density of the material as determined by the procedure set forth in ASTM D 1557.

E. The State Representative will perform observations and tests required to enable him to form an opinion of the acceptability of the trench backfill. Correct the trench backfill that, in the opinion of the State Representative, does not meet the requirements of these Technical Specifications.

1.8 PROJECT CONDITIONS

A. Promptly notify the State Representative of surface or subsurface conditions differing from those disclosed in the Plans. First notify the State Representative verbally to permit verification and extent of condition and then in writing. No claim for conditions differing from those anticipated in the Contract Documents and disclosed in the Plans will be allowed unless Contractor has notified the State Representative in writing of differing conditions prior to contractor starting work on affected items.

B. Protect open, trenches, and utility structure excavations with fences, covers and railings to maintain safe pedestrian and vehicular traffic passage.

C. Stockpile on-site and imported backfill material temporarily in an orderly and safe manner.

D. Provide dust and noise control in conformance with Section 01 00 00, General Requirements.

E. Areas to receive structural soil mix shall be inspected by the State Representative before starting work.

PART 2 - PRODUCTS

2.1 PIPE BEDDING AND INITIAL BACKFILL

A. Class 2 Aggregate Base: Conform to Section 26 of Caltrans Standard Specifications, ¾-inch maximum.

B. Sand: Conform to Section 19-3.025B of Caltrans Standard Specifications.

2.2 WARNING TAPE

A. See Section 33 11 66, Water Distribution System.

2.3 SUBSEQUENT BACKFILL

A. Conform to on-site or imported structural backfill in Section 31 23 00, Excavation and Fill.

2.4 CONTROLLED DENSITY FILL (CDF) (IN TRENCHES)

A. Provide non-structural CDF, from bottom of trench to finish subgrade of subbase or base material, that can be excavated by hand and produce unconfined compressive 28-day strengths from 50-psi to a maximum of 150-psi. Provide aggregate no larger than 3/8-inch top size. The 3/8-inch aggregate shall not comprise more than 30% of the total aggregate content.

B. Cement: Conform to the standards as set forth in ASTM C-150, Type II Cement.

C. Fly Ash: Conform to the standards as set forth in ASTM C-618, for Class F pozzolan. Do not inhibit the entrainment of air with the fly ash.

D. Air Entraining Agent: Conform to the standards as set forth in ASTM C-260.

E. Aggregates need not meet the standards as set forth in ASTM C-33. Any aggregate, producing performances characteristics described herein will be accepted for consideration. The amount of material passing a #200 sieve shall not exceed 12% and no plastic fines shall be present.

F. Provide CDF that is a mixture of cement, Class F pozzolan, aggregate, air entraining agent and water. CDF shall be batched by a ready mixed concrete plant and delivered to the job site by means of transit mixing trucks.

G. The Contractor shall determine the actual mix proportions of the controlled density fill to meet job site conditions, minimum and maximum strengths, and unit weight. Entrained air content shall be a minimum of 4.0%. The actual entrained air content shall be established for each job with the materials and aggregates to be used to meet the placing and unit weight requirements. Entrained air content may be as high as 20% for fluidity requirements. Mix design shall meet the State Representative's approval.

## 2.5 FILTER FABRIC

. Filter Fabric:

1. Filter Fabric: Section 88-1.03 of Caltrans Standard Specifications.

2. Mirifi 140N (Mirifi Inc., Charlotte, NC) (Tel. 800-438-1855) or equal.

# PART 3 - EXECUTION

## 3.1 TRENCHING AND EXCAVATION

A. Existing PCC or AC Areas: Cut PCC or AC to full depth at a minimum distance of 12-inches beyond the edge of the trench.

B. Excavate by hand or machine. For gravity systems begin excavation at the outlet end and proceed upstream. Excavate sides of the trench parallel and equal distant from the centerline of the pipe. Hand trim excavation. Remove loose matter.

C. Excavation Depth for Bedding: Minimum of 4-inches below bottom of pipe or as otherwise allowed or required by the State Representative, except that bedding is not required for nominal pipe diameters of 2-inches or less.

D. Excavation Width at Springline of Pipe:

1. Up to a nominal pipe diameter of 24-inches: Minimum of twice the outside pipe diameter, or as otherwise allowed or required by the State Representative.

2. Nominal pipe diameter of 30-inches through 36-inches: Minimum of the outside pipe diameter plus 2-feet, or as otherwise allowed or required by the State Representative.

3. Nominal pipe diameter of 42-inches through 60-inches: Minimum of the outside pipe diameter plus 3-feet, or as otherwise allowed or required by the State Representative.

E. Over-Excavations: Backfill trenches that have been excavated below bedding design subgrade, with approved bedding material.

1. Comply with the State Representative's limitations on the amount of trench that is opened or partially opened at one time. Do not leave trenches open overnight without the approval of the State Representative.

2. Where forming is required, excavate only as much material as necessary to permit placing and removal of forms

3. Bottoms of trenches will be subject to testing by State Representative. Correct deficiencies as directed by the State Representative.

4. Grade bottom of trench to provide uniform thickness of bedding material and to provide uniform bearing and support for pipe along entire length. Remove stones to avoid point bearing

F. Control of Water and Dewatering

1. Be solely responsible for dewatering trenches and excavations and subsequent control of ground and surface water. Provide and maintain such pumps or other equipment as may be necessary to control ground water and seepage to the satisfaction of the State Representative and the State Representative until backfilling is completed.

2. Dewater during backfilling operation so that groundwater is maintained a least one foot below level of compaction effort.

3. Obtain the State Representative's approval for proposed control of water and dewatering methods.

4. Reroute surface water runoff away from open trenches and excavations. Do not allow water to accumulate in trenches and excavations.

5. Maintain dewatering system in place until dewatering is no longer required.

G. Bracing and Shoring

1. Conform to California and Federal OSHA requirements.

2. Place and maintain such bracing and shoring as may be required to support the sides of the excavations for the proper protection of workmen; to facilitate the work; to prevent damage to the pipes and appurtenances being constructed; and to prevent damage to adjacent structures or facilities. Remove all bracing and shoring upon completion of the work.

3. Be solely responsible for all bracing and shoring and, if requested by the State Representative, submit details and calculations to the State Representative. The State Representative may forward the submittal to the State Representative, the Consulting Engineer and/or the California Division of Industrial Safety for their review. The Contractor's submittal shall include the basic design, assumed soils conditions and estimation of forces to be resisted, together with plans and specifications of the materials and methods to be used, and shall be prepared by a civil engineer or structural engineer registered in California. No excavations in trench section or around structures shall precede a response to the submittal by the State Representative.

4. Be solely responsible for installing and extracting the sheathing in a manner which will not disturb the line, grade, or backfill compaction or operation of the utility being installed or adjacent utilities and facilities.

H. Pipe Bedding

1. Obtain approval of bedding material from the State Representative.

2. Accurately shape bedding material to the line and grade called for on the Plans. Carefully place and compact bedding material to the elevation of the bottom of the pipe in layers not exceeding 8-inches in loose thickness. Compact bedding material at optimum water content to 90% relative compaction for sand and 95% relative compaction for fine gravel, gravel

shall not be pea gravel, unless specified otherwise on the Plans or by the State Representative. Compact by pneumatic tampers or other mechanical means approved by the State Representative. Jetting or ponding of bedding material will not be permitted.

3. Upon completion of bedding operations, and prior to the installation of pipe, notify the State Representative, who will inspect the bedding layer. Do not commence pipe laying until the State Representative has approved the bedding.

I. Warning Tape
   1. Install in accordance with Section 33 11 66.

J. Backfilling
   1. Obtain approval of backfill material from State Representative.
   2. Bring initial backfill up simultaneously on both sides of the pipe, so as to prevent any displacement of the pipe from its true alignment. Carefully place and compact initial backfill material to an elevation of 12-inches above the top of the pipe in layers not exceeding 8-inches in loose thickness. Compact initial backfill material at optimum water content to 90% relative compaction for sand and 95% relative compaction for fine gravel, gravel shall not be pea gravel, unless specified otherwise on the Plans or by the State Representative. Compact by pneumatic tampers or other mechanical means approved by the State Representative. Jetting or ponding of initial backfill material will not be permitted.

   3. Bring subsequent backfill to subgrade or finish grade as indicated. Carefully place and compact subsequent backfill material to the proper elevation in layers not exceeding 8-inches in loose thickness. Compact subsequent backfill material per geotechnical recommendations, unless specified otherwise on the Plans or by the State Representative. Compact by pneumatic tampers or other mechanical means approved by the State Representative. Jetting or ponding of subsequent backfill material will not be permitted.

   4. Do not use compaction equipment or methods that produce horizontal or vertical earth pressures which may cause excessive pipe displacement or damage the pipe.

   5. Utility backfill shall be inspected and tested by the State Representative during placement. Cooperate with the State Representative and provide working space for such tests in operations. Backfill not compacted in accordance with these specifications shall be re-compacted or removed as necessary and replaced to meet the specified requirements, to the satisfaction of the State Representative prior to proceeding with the Project.

K. Cleanup
   1. Upon completion of utility earthwork all lines, manholes catch basins, inlets, water meter boxes and other structures shall be thoroughly cleaned of dirt, rubbish, debris and obstructions of any kind to the satisfaction of the State Representative.

END OF SECTION 31 23 33

**SECTION 31 25 00**
**EROSION AND SEDIMENTATION CONTROL**

PART 1 - GENERAL

1.1 SUMMARY

A. This Section describes the requirements for providing and installing temporary erosion and sedimentation control structures as specified.

1.2 SUBMITTALS

A. Follow Submittal procedure outlined in Section 1 General Provisions.

1.3 REGULATORY REQUIREMENTS:

A. California Stormwater Quality Association (CASQA) “Stormwater Best Management Practice Handbook for Construction”.

B. State Water Resources Control Board (SWRCB) standards.

C. California Stormwater Quality Association “Stormwater Best Management Practice Handbook” for Construction and Industrial and Commercial Development, latest edition.

PART 2 - PRODUCTS

2.1 FURNISH AND INSTALL PRODUCTS TO ELIMINATE POTENTIAL EROSION AND SEDIMENTATION DURING CONSTRUCTION WORKS. PRODUCTS WHICH SHALL BE INSTALLED, BUT ARE NOT LIMITED TO, THE FOLLOWING:

A. Siltation fences

B. Outlet structure, basins, ditches

C. Hydroseeding

D. Wattle and/or Gravel bags

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall review the BMP’s selected for the Project.

B. Erosion and sedimentation control measures are to be installed in areas only to extent required by new construction and as indicated or as directed by governing regulations.

C. The Contractor shall provide inspection and repair BMP's throughout the construction process.

END OF SECTION 31 25 00

# SECTION 31 37 00
# BOULDERS

## PART 1 GENERAL REQUIREMENTS

### 1.1 RELATED DOCUMENTS

A. Plans and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

### 1.2 SUMMARY

A. This Section includes the following: Supply and deliver specified boulders and materials and provide experienced skilled labor to install boulders. Provide installation equipment and labor required to complete the work in this Section as noted:

1. Boulders for rock outcrops and rock outcrop walls.

2. Boulders for pathway edging, corners and planting areas.

B. Related Sections including but not limited to the following. If a conflict exists between Sections, notify the State's Representative for clarification. If not available, use whichever Section is more stringent.

1. Section 02 41 13 – Selective Site Demolition

2. Section 31 10 00 – Site Preparation & Plant Protection

3. Section 31 23 00 – Excavation and Fill

4. Section 32 15 40 – Fine Aggregate Paving

5. Section 32 84 00 – Irrigation

### 1.4 DEFINITIONS

A. Owner, Client, Parks, or State, refers to the California State Parks, Clayton, CA. State's Representative or State, refers to the California State Parks representative(s), associates, or agents.

## 1.3 SUBMITTALS

A. Submit a schedule to the State's Representative for selection, procurement, delivery and placement of Boulders on site. Site Boulder setting work shall be scheduled to take no more than 5 days. Ensure that the State's Representative is available for on-site observation for Boulder selection and placement.

B. Notify the State's Representative of the proposed Boulder types, sizes, color, quantities and gradation prior to delivering rock to the site. The State's Representative reserves the right to accompany Contractor to boulder quarry or source to hand select all specified Boulders.

C. Provide on-site, in situ mock-ups of Boulder placements for State's Representative review and approval prior to final installation. Successfully approved Boulder mock-ups may be incorporated into the final site product.

## 1.4 INSPECTION

A. The Contractor shall obtain approval of the following prior to proceeding with construction:

1. Boulder selections at source quarry or site.

2. Preparation of the sub-grade and prior to placement of Boulders.

3. In situ mock-up(s) of Boulder placements. One mock-up for each different type of Boulder placement noted.

## 1.5 QUALITY ASSURANCE

A. For all installations of Boulders, Contractor shall provide experienced crew (3 years minimum) comprised of skilled Stoneworkers/Boulder Setting specialists. Include at least (1) lead excavator operator and (2) field crew (minimum).

B. Pre-construction Meeting: Conduct meeting at Project Site with State's Representative to define and schedule all Boulder work and to comply with specified requirements.

C. Ensure Boulder placement equipment and personnel/operators meet the requirements of the specifications for type and experience level and ensure protection of trees and other improvements.

D. Contractor shall have the required State of California insurance limits and authorization to be on State of California property. Contractor shall obtain all required permits from the local agencies and the State to select, procure, transport and place Boulders on the Project Site.

## PART 2 - MATERIALS

### 2.1 BOULDERS

A. Boulders shall be select quality native stone from a State's Representative approved location. The intended, approved location is Cemex quarry. Should Cemex not have boulders to meet size and quantity specifications alternative quarries shall be pursued by Contractor. Boulders shall tend towards blocky, angular, forms with no sharp edges. Rounded or river boulders are not approved.

B. Boulders shall be selected for suitability for the installations specified and noted herein. Cut, scarred, spalled, chipped, or broken Boulders shall not be accepted.

C. Boulders shall be hand selected by the State's Representative and Contractor at the source location.

D. Boulders Sizes and Quantities are as noted here an Plans and scaled in drawings. Ensure that there is the proper quantity and boulder sizes to complete the project intent, as illustrated on the Plans. This size chart is offered to assist Contractor in bidding sizes, weights, and placement effort. Tons (weight) can be calculated by source quarry for pricing, shipping costs, and placement effort.

| **Location** | **Length Feet** | **Width Feet** | **Height Feet** |
|---|---|---|---|
| **Plaza Seating Area-BASE BID** | | | |
| P1 | 5 | 4 | 3 |
| P2 | 5 | 4 | 4 |
| P3 | 2 | 2 | 2 |
| **Sloped Path East (bottom)- BASE BID** | | | |
| E1 | 7 | 4 | 5 |

| | | | |
|---|---|---|---|
| E2 | 6 | 5 | 5 |
| E3 | 5 | 3 | 4 |
| E4 | 4 | 3 | 3 |
| E5 | 3 | 3 | 4 |
| E6 | 3 | 3 | 3 |
| E7 | 2 | 2 | 2 |
| Sloped Path West (bottom)-**ADD ALT** | | | |
| W1 | 7 | 5 | 4 |
| W2 | 5 | 4 | 4 |
| W3 | 5 | 3 | 3 |
| W4 | 4 | 3 | 3 |
| W5 | 3 | 2 | 3 |
| Classroom East (left)-**NIC** | | | |
| CE1 | 5 | 4 | 4 |
| CE2 | 5 | 3 | 3 |
| CE3 | 4 | 3 | 3 |
| Classroom West (right) )-**NIC** | | | |
| CW1 | 5 | 4 | 4 |
| CW2 | 4 | 3 | 4 |
| CW3 | 4 | 3 | 3 |
| CW4 | 3 | 3 | 3 |
| CW5 | 3 | 3 | 3 |
| Trailhead North (left) )-**ADD ALT** | | | |

| | | | |
|---|---|---|---|
| TN1 | 5 | 3 | 3 |
| TN2 | 4 | 4 | 4 |
| TN3 | 4 | 4 | 4 |
| TN4 | 4 | 4 | 3 |
| TN5 | 3 | 3 | 4 |
| TN6 | 3 | 3 | 3 |
| TN7 | 3 | 3 | 3 |
| TN8 | 2 | 2 | 2 |
| Trailhead South (right) )-**ADD ALT** | | | |
| TS1 | 6 | 4 | 4 |
| TS2 | 5 | 3 | 4 |
| TS3 | 4 | 3 | 3 |
| TS4 | 3 | 3 | 3 |

PART 3 - EXECUTION

3.1 SUBGRADE PREPARATION

A. Areas where Boulders are to be placed shall be graded to elevations shown on the Plans. The soil surface shall be smooth and free from any obstructions to provide adequate contact area between the soil and Boulders. Compact the subgrade to 90% relative compaction, as required to ensure that Boulder do not settle or shift.

3.2 BOULDER PLACEMENT

A. Prepare site to accept Boulders as described on the Plans and as directed by State's Representative. Verify placement and Boulder type and size with State's Representative prior to installation. Boulders shall be placed after rough site grading has been completed, and prior to site paving operations. See Plans for additional information.

B. Contractor shall be required to use a track excavator with articulating thumb and zero clearance arm capable of picking up, rotating 360 degrees, handling, and setting specified boulder sizes (and their quarry calculated weights assume maximum weight of 14 tons) while excavator arm is in full extended position.

C. Boulders shall be expertly set to ensure a high quality, professional, garden-design level of workmanship. When instructed, ensure tight, permanent fit between adjacent Boulders, and between these rocks and adjacent surfacing or planting.

D. Contractor shall provide experienced and skilled stoneworkers/Boulder setting crew as note in these Specifications. Crew shall work under direct observation of State's Representative. State's Representative shall direct the scheduling and placement of all Boulders.

E. Protect all site improvements during the transportation, storage, and placement of Boulders.

F. Place or remove excess Boulders at the direction of the State's Representative.

G. Leave the site clean and free of debris.

END OF SECTION 31 37 00

# SECTION 32 05 23
# EXTERIOR CONCRETE PAVING

## PART 1 - GENERAL

### 1.0 SECTION INCLUDES

A. Materials for Exterior Concrete Paving.

B. Aggregate and aggregate grading for Exterior Concrete Paving.

C. Water for Exterior Concrete Paving.

D. Admixtures for Exterior Concrete Paving.

E. Proportioning for Exterior Concrete Paving.

F. Mixing and transporting Exterior Concrete Paving.

G. Formwork for cast in place Exterior Concrete Paving.

H. Embedded materials for Exterior Concrete Paving.

I. Steel reinforcement for Exterior Concrete Paving.

J. Placing and finishing Exterior Concrete Paving.

K. Curing Exterior Concrete Paving.

L. Protecting Exterior Concrete Paving.

### 1.1 RELATED SECTIONS

A. Section 31 11 00, Clearing and Grubbing

### 1.2 RELATED DOCUMENTS

A. ASTM:

1. A 82, Cold Drawn Steel Wire for Concrete Reinforcement.

2. A 185, Steel Welded Wire Fabric, Plain for Concrete Reinforcement.

3. A 615, Deformed and Plain Billet Steel Bars, for Concrete Reinforcement.

4. C 94, Specification for Ready-mixed Concrete.

5. C 114, Method for Chemical Analysis of Hydraulic Cement.

6. C 150. Portland Cement.

7. C 618, Fly Ash and Raw or Calcined Natural Pozzolan for use as Natural Admixture in Portland Cement.

8. C 1751, Preformed Expansion Joint Fillers for Concrete. Paving and Structural Construction (Non-extruded and Resilient Bituminous Types).

B. Caltrans 2018 Standard Specifications:

1. Section 51: Concrete Structures.

2. Section 73: Concrete Curbs and Sidewalks.

3. Section 90: Concrete.

## 1.3 DEFINITIONS

A. ASTM: American Society for Testing Materials

## 1.4 SUBMITTALS

A. Submittal procedure shall be as directed by the District's General Requirements.

B. Concrete Mix Design: Have all concrete mixes designed by a testing laboratory and approved by the Consulting Engineer. Conform all mixes to the applicable building code requirement, regardless of other minimum requirements listed herein or on the drawings. Submit mix designs for review before use. Show proportions and specific gravities of cement, fine and coarse aggregate, and water and gradation of combined aggregates.

## 1.5 QUALITY ASSURANCE

A. Concrete shall be subject to quality assurance in accordance with Section

90 of Caltrans Standard Specifications.

1. Slump tests: Have available, at job site, equipment required to perform slump tests. Make one slump test for each cylinder sample, from same concrete batch. Allowable maximum slump shall be 4 inches for walls and 3 inches for slab on grade.

B. Certifications:

1. Provide District's Representative at the time of delivery with certificates of compliance signed by both Contractor and Supplier containing the following statements:

   a. Materials contained comply with the requirements of the Contract Documents in all respects.

   b. Proportions and mixing comply with the design mix approved by the Consulting Engineer. Design mix shall have been field tested in accordance with the herein requirements of the Caltrans Standard Specifications and produces the required compressive strength under like conditions.

   c. Statement of type and amount of any admixtures.

2. Provide District's Representative, at time of delivery, with certified delivery ticket stating volume of concrete delivered and time of mixing, or time of load-out in case of transit mixers.

C. Conform to the applicable provisions of Section 51, 73 and 90 of the Caltrans Standard Specification and these Technical Specifications.

1. Conform construction of Exterior Concrete Paving surface improvements (including curbs, gutters, medians, valley gutters, walks, pads) to the requirements of Section 73 of the Caltrans Standard Specifications unless otherwise required in these Technical Specifications or shown on the Plans.

2. Conform other construction of Exterior Concrete Paving items to the requirements of Section 51 of the Caltrans Standard Specifications unless otherwise required in these Technical Specifications or shown on the Plans.

## 1.6 DESIGNATION

A. General: Whenever the 28-day compressive strength is designated herein or on the Plans is a 3,000psi or greater, the concrete shall considered to be designated by compressive strength. The 28-day compressive strength shown herein or on the plans which are less than a 3,000psi are shown for design information only and are not considered a requirement for acceptance of the concrete. Whenever the concrete is designated by class or as minor concrete herein or on the Plans, the concrete shall contain the cement per cubic yard shown in Section 90-1.01 of the Caltrans Standard Specifications.

B. Unless noted otherwise herein or on the Plans, the minimum compressive strength for Exterior Concrete Paving at 28 days for this Project shall be 3,000 psi.

## PART 2 - PRODUCTS

### 2.1 PORTLAND CEMENT

A. General: Type II (modified) cement conforming to section 90-2.01 of the Caltrans Standard Specifications.

B. Refer to 03 35 00 Cast-in-Place Concrete finishing for integral color.

### 2.2 AGGREGATE AND AGGREGATE GRADING

A. General: Conform to the requirements of Section 90-2.02, 2.02A and 2.02B of the Caltrans Standard Specifications.

B. Aggregate Size and Gradation: Conform to the requirements of Section 90-3 of the Caltrans Standard Specifications for 1-inch maximum combined aggregate.

### 2.3 WATER

A. General: Conform to the requirements of section 90-2.03 of the Caltrans Standard Specifications. For mixing and curing Exterior Concrete Paving and for washing aggregates.

### 2.4 EXPANSION JOINT MATERIAL

A. Material for expansion joints in Exterior Concrete Paving improvements shall be pre-molded expansion joint fillers conforming to the requirements of ASTM Designation D 1751. Expansion joint material shall be shaped to fit the cross section of the concrete prior to being placed. Suppliers certificates showing conformance with this specification shall be delivered with each shipment of materials delivered to the job site. Unless noted otherwise herein or on the Plans expansion joint thickness shall be as follows:

1. Curbs, Curb Ramps, Sidewalks, Driveways and Gutter Depressions: ¼-inch.

2. Gutter Lining, Ditch Lining and Channel Lining: ½-inch.

3. Structures: As indicated.

## 2.5 REINFORCEMENT AND DOWELS

A. Bar reinforcement for concrete improvements shall be deformed steel bars of the size or sizes called for on the plans conforming to the requirements of ASTM Designation A 615 for Grade 60 bars. Size and shape for bar reinforcement shall conform to the details shown or called for on the Plans. Substitution of wire mesh reinforcement for reinforcing bars will not be allowed.

B. Slip dowels, where noted or called for on the plans or detail drawings shall be smooth billet-steel bars as designated and conforming to the requirements of ASTM Designation A 615 for Grade 60 bars. Ends of bars inserted in new work shall be covered with a cardboard tube sealed with cork; no grease or oil shall be used.

C. Mesh for reinforcement for concrete improvements shall be cold drawn steel wire mesh of the size and spacing called for on the plans conforming to the requirements of ASTM Designation A 82 for the material and ASTM Designation A 185 for the mesh. Size and extent of mesh reinforcement shall conform to the details shown or called for on the plans.

D. Tie wire for reinforcement shall be eighteen (18) gauge or heavier, black, annealed conforming to the requirements of ASTM Designation A 82.

E. Suppliers certificates showing conformance with this specification shall be delivered with each shipment of materials delivered to the job site.

## 2.6 ACCESSORY MATERIALS

A. Conform water stops and other items required to be embedded in of Exterior Concrete Paving structures to the applicable requirements of Section 51 of the Caltrans Standard Specifications unless otherwise specifically noted or called for on the Plans or detail drawings.

B. Curing Compounds:

1. Regular Exterior Concrete Paving: "Non-Pigmented Curing Compound - Chlorinated Rubber Base-Clear" conforming to the requirements contained in Section 90-7.01B, of the Caltrans Standard Specifications.

2. Color Conditioned Decorative Exterior Concrete Paving: LITHOCHROME colorwax as manufactured by the L. M. Scofield Company or approved equal.

## 2.7 FORMS

A. Conform to the requirements of Section 51-1.05 of the Caltrans Standard Specifications.

## 2.8 PRECAST CONCRETE STRUCTURES

A. Conform to the following Sections of Caltrans Standard Specifications:

1. 51-1.02, Minor Structures.

2. 70-1.02C, Flared End Sections.

3. 70-1.02H, Precast Concrete Structures.

# PART 3 - EXECUTION

## 3.1 STRUCTURAL EXCAVATION

A. Structural excavation may be either by hand, or by machine and shall be neat to the line and dimension shown or called for on the plans. Excavation shall be sufficient width to provide adequate space for working therein, and comply with CAL-OSHA requirements.

B. Where an excavation has been constructed below the design grade, refill the excavation to the bottom of the excavation grade with approved material

and compact in place to 95% of the maximum dry density.

C. Remove surplus excavation material remaining upon completion of the work from the job site, or condition it to optimum moisture content and compact it as fill or backfill on the site, if the material is approved by the Geotechnical Consultant.

3.2 SOIL STERILANT

A. Furnish and apply to areas indicated in accordance with Section 31 23 00, Excavation and Fill.

3.3 BRACING AND SHORING

A. Conform to California and Federal OSHA requirements.

B. Place and maintain such bracing and shoring as may be required to support the sides of the excavations for the proper protection of workmen; to facilitate the work; to prevent damage to the facility being constructed; and to prevent damage to adjacent structures or facilities. Remove all bracing and shoring upon completion of the work.

C. Be solely responsible for all bracing and shoring and, if requested by the District's Representative, submit details and calculations to the District's Representative. The District's Representative may forward the submittal to the Geotechnical Consultant, the Consulting Engineer and/or the California Division of Industrial Safety for their review. The Contractor's submittal shall include the basic design, assumed soils conditions and estimation of forces to be resisted, together with plans and specifications of the materials and methods to be used, and shall be prepared by a civil engineer or structural engineer registered in California. No excavations related to the proposed facility shall precede a response to the submittal by the District's Representative.

D. Be solely responsible for installing and extracting the sheathing in a manner which will not disturb the position or operation of the facility being constructed or adjacent utilities and facilities.

3.4 PLACING CONCRETE FORMS

A. Form concrete improvements with a smooth and true upper edge. Side of the form with a smooth finish shall be placed next to concrete. Construct

forms rigid enough to withstand the pressure of the fresh concrete to be placed without any distortion.

B. Thoroughly clean all forms prior to placement and coat forms with approved form oil in sufficient quantity to prevent adherence of concrete prior to placing concrete.

C. Carefully set forms to the alignment and grade established and conform to the required dimensions. Rigidly hold forms in place by stakes set at satisfactory intervals. Provide sufficient clamps, spreaders and braces to insure the rigidity of the forms.

D. Provide forms for back and face of curbs, lip of gutters and edge of walks, valley gutters or other surface slabs that are equal to the full depth of the concrete as shown, noted or called for on the Plans. On curves and curb returns provide composite forms made from benders or thin planks of sufficient ply to ensure rigidity of the form.

## 3.5 PLACING STEEL REINFORCEMENT

A. Bars shall be free of mortar, oil, dirt, excessive mill scale and scabby rust and other coatings of any character that would destroy or reduce the bond. All bending shall be done cold, to the shapes shown on the plans. The length of lapped splices shall be as follows:

1. Reinforcing bars No. 8, or smaller, shall be lapped at least 45 bar diameters of the smaller bar joined, and reinforced bars Nos. 9, 10, and 11 shall be lapped at least 60 bar diameters of the smaller bars joined, except when otherwise shown on the plans.

2. Splice locations shall be made as indicated on the plans.

B. Accurately place reinforcement as shown on the plans and hold firmly and securely in position by wiring at intersections and splices, and by providing precast mortar blocks or ferrous metal chairs, spacers, metal hangers, supporting wires, and other approved devices of sufficient strength to resist crushing under applied loads. Provide supports and ties of such strength and density to permit walking on reinforcing without undue displacement.

C. Place reinforcing to provide the following minimum concrete cover:

1. Surfaces exposed to water: 4-inches.

2. Surfaces poured against earth: 3-inches.

3. Formed surfaces exposed to earth or weather: 2-inches.

4. Slabs, walls, not exposed to weather or earth: 1-inch.

D. Minimum spacing, center of parallel bars shall be two and one half (2-1/2) times the diameter of the larger sized bar. Accurately tie reinforcing securely in place prior to pouring concrete. Placing of dowels or other reinforcing in the wet concrete is not permitted.

## 3.6 MIXING AND TRANSPORTING EXTERIOR CONCRETE PAVING

A. Transit mix concrete in accordance with the requirements of ASTM Designation C 94. Transit mix for not less than ten (10) minutes total, not less than three (3) minutes of which shall be on the site just prior to pouring. Mix continuous with no interruptions from the time the truck is filled until the time it is emptied. Place concrete within one hour of the time water is first added unless authorized otherwise by the District's Representative.

B. Do not hand mix concrete for use in concrete structures

## 3.7 PLACING EXTERIOR CONCRETE PAVING

A. Thoroughly wet subgrade when concrete is placed directly on soil. Remove all standing water prior to placing concrete.

B. Do not place concrete until the subgrade and the forms have been approved.

C. Convey concrete from mixer to final location as rapidly as possible by methods that prevent separation of the ingredients. Deposit concrete as nearly as possible in final position to avoid re-handling.

D. Place and solidify concrete in forms without segregation by means of mechanical vibration or by other means as approved by the District's Representative. Continue vibration until the material is sufficiently consolidated and absent of all voids without causing segregation of material. The use of vibrators for extensive shifting of fresh concrete will not be permitted.

E. Concrete in certain locations may be pumped into place upon prior approval

by the District's Representative. When this procedure requires redesign of the mix, such redesign shall be submitted for approval in the same manner as herein specified for approval of design mixes.

## 3.8 PLACING ACCESSORY MATERIALS

A. Place water stops and other items required to be embedded in of Exterior Concrete Paving structures at locations shown or required in accordance with Section 51 of the Caltrans Standard Specifications unless otherwise specifically noted or called for on the Plans.

B. Curing Compounds:

1. Regular Exterior Concrete Paving: Apply "Non-Pigmented Curing Compound - chlorinated Rubber Base-Clear" in accordance with Section 90-7.01B, 7.01D and 7.03 of the Caltrans Standard Specifications.

2. Color Conditioned Decorative Exterior Concrete Paving: Apply LITHOCHROME colorwax, or approved equal, in accordance with the manufacturer's instructions.

## 3.9 EXPANSION JOINTS

A. Construct expansion joints incorporating pre-molded joint fillers at twenty (20) foot intervals in all concrete curbs, gutters, sidewalks, median/island paving, valley gutters, driveway approaches and at the ends of all returns. At each expansion joint install one-half inch by twelve inch (1/2" x 12") smooth slip dowels in the positions shown or noted on the detail drawings.

B. Orient slip dowels at right angles to the expansion joint and hold firmly in place during the construction process by means of appropriate chairs.

## 3.10 WEAKENED PLANE JOINTS

A. Construct weakened plane joints in concrete curbs, gutters, sidewalks, median/island paving and valley gutters between expansion joints at ten (10) foot intervals throughout, or as otherwise indicated. Depth of joint score depth to be one-fourth (25%) the thickness of the concrete.

1. Grooved Joints: Form weakened plane joints after initial floating by

grooving and finishing each edge of joint to a radius of 1/8-inch. Repeat grooving of weakened plane joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

2. Sawed Joints: Form weakened plane joints with power saws equipped with shatterproof abrasive or diamond-rimed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade or otherwise damage surface and before concrete develops random contraction cracks.

## 3.11 FORM REMOVAL

A. Remove forms without damage to the concrete. Remove all shores and braces below the ground surface, before backfilling.

B. Do not backfill against concrete until the concrete has developed sufficient strength to prevent damage.

C. Leave forms for cast-in-place walls in place at least 72 hours after pouring.

D. Leave edge forms in place at least 24 hours after pouring.

## 3.12 CONSTRUCTION

A. Form, place and finish concrete curbs, walkways, island paving, valley gutters and driveway approaches in conformance with the applicable requirements of Section 73-1.04, 73-1.05, 72-1.05A and 73-1.06 of the Caltrans Standard Specifications as modified herein.

B. Provide a medium broom finish to all horizontal surfaces unless otherwise shown.

C. Construct new concrete curb, curb and gutter and valley gutters against existing asphalt concrete by removing a minimum of 12-inches of the asphalt concrete to allow placement of curb or gutter forms. Patch pavement with a 6-inch deep lift of asphalt concrete after gutter form is removed.

D. Where monolithic curb, gutter and sidewalk is specified, separate concrete pours will not be allowed.

## 3.13 CONNECTING TO EXISTING CONCRETE IMPROVEMENTS

A. New curb, gutter, or sidewalk is to connect to existing improvements to remain by saw cutting to existing sound concrete at the nearest score line, expansion joint or control joint. Drill and insert ½-inch diameter by 12-inch long dowels at 24-inches on center into existing improvements. Install pre-molded expansion joint filler at the matching joint.

B. A cold joint to the existing curb is not acceptable.

## 3.14 DECORATIVE AND NON-DECORATIVE SURFACING CONSTRUCTION

A. Decorative surfacing concrete walks or other installations shall be formed and placed as a concrete slab conforming to the details shown or noted on the Plans. Exposed aggregate concrete sidewalks shall be repaired in kind or better condition.

B. Add lampblack or equivalent to the non-decorative surface concrete at the mixing plant.

## 3.15 ACCESSIBLE PATH OF TRAVEL CONSTRUCTION FINISH

. Provide equivalent of medium salted finish at slopes less than 6% and slip-resistant finish at slopes 6% and greater along any accessible path of travel.

## 3.16 FIELD QUALITY CONTROL

A. Finish subgrade for concrete improvements shall be subject to approval prior to placement of forms.

B. No concrete shall be placed prior to approval of forms.

C. Concrete improvements constructed shall not contain areas that pond water and shall be smooth and ridge free.

D. Conform the finish grade at top of curb, flow line of gutter, and the finish cross section of concrete improvements to the design grades and cross sections.

E. Variation of concrete improvements from design grade and cross section as shown or called for on the plans shall not exceed the tolerances established in Sections 73-1.05 and/or 73-1.06 of the Caltrans Standard Specifications.

## 3.17 RESTORATION OF EXISTING IMPROVEMENTS

A. Replace in kind all pavement or other improvements removed or damaged due to the installation of concrete improvements.

B. Remove, landscaping or plantings damaged or disturbed due to the installation of concrete improvements. Replace in kind.

END OF SECTION 32 05 23

# SECTION 32 11 32
# AGGREGATE BASE COURSE

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES

A. Aggregate base.

B. Lime stabilization.

### 1.2 RELATED SECTIONS

A. Section 32 16 16, Asphalt Paving

B. Section 32 05 23, Exterior Concrete Paving

### 1.3 RELATED DOCUMENTS

A. Caltrans 2025 Standard Specifications

1. Division 4 Section 24, Stabilized Soils.

2. Division 4 Section 26, Aggregate Bases.

B. ASTM:

1. D 1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.

### 1.4 DEFINITIONS

A. ASTM: American Society for Testing Materials.

### 1.5 SUBMITTALS

A. Submittal procedure shall be as outlined in the State Representative's General Requirements.

B. Submit material certificates signed by the material producer and the Contractor, certifying that that each material item complies with, or exceeds the specified requirements.

## 1.6 QUALITY ASSURANCE

A. Conform to these Specifications and Section 19 of Caltrans 2025 Standard Specifications.

B. Finish surface of the prepared subgrade to receive aggregate base, shall be as specified in Section 31 23 00.

C. Finish surface of material to be stabilized prior to lime treatment shall be as specified in Section 24-1.04 of Caltrans Standard Specifications.

D. Finish surface of the stabilized material after lime treatment shall be as specified in Section 24-1.08 of Caltrans Standard Specifications.

E. Do not project the finish surface of aggregate base above the design subgrade.

F. Finish surface of aggregate base shall be 0 to - 0.05-feet.

G. Finish surface of cement treated base shall be as specified in Section 27 of Caltrans Standard Specifications.

H. Percentage of compaction specified shall be the minimum acceptable. The percentage represents the ratio of the dry density of the compacted material to the maximum dry density of the material as determined by the procedure set forth in ASTM Designation D1557.

# PART 2 - PRODUCTS

## 2.1 FILL MATERIAL

A. If fill material is required to restore the previously constructed subgrade to its proper elevation, provide structural fill material specified in Section 31 23 00.

## 2.2 AGGREGATE BASE

A. Material: Caltrans Standard Specification Section 26.
   1. Class 2, 3/4-inch Maximum: Section 26-1.02A.

## 2.3 LIME STABILIZATION

A. Lime Treatment Material per Geotechnical recommendation and field investigation if required

# PART 3 - EXECUTION

3.1 SOIL STERILANT

A. Furnish and apply to areas indicated in accordance with Section 31 23 00.

3.2 AGGREGATE BASE

A. Watering, Spreading & Compacting: Section 26-1.035, 26-1.04 and 26-1.05 of Caltrans Specs

3.3 LIME STABILIZATION

A. Performing the stabilization shall conform with Geotechnical recommendation

END OF SECTION 32 11 32

# SECTION 32 15 40

# FINE AGGREGATE PAVING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Plans and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

B. Related sections including, but not limited to, the following: If a conflict exists between Sections, notify the State's Representative for clarification.

1. Section 31 10 00 – Site Preparation and Plant Protection

2. Section 31 23 00 – Excavation and Fill

### 1.2 DESCRIPTION

A. Provide fine aggregate paving as indicated on the Plans and as specified herein.

### 1.3 DEFINITIONS

A. Owner, Client, Parks, or State, refers to the California State Parks, Clayton, CA. State's Representative or State, refers to the California State Parks representative(s), associates, or agents.

### 1.4 QUALITY ASSURANCE

A. Proprietary items shown on the Plans and specified herein are shown to establish standards of quality, utility, design, and function. Equivalent units by other manufacturers (substitutions) will be considered provided they are similar in characteristics. They shall be substituted only if approved by the State's Representative.

B. Reference Standards

1. Work shall be completed in accordance with the United State Access Board, Section 1017, (Trails).

2. All local, municipal and state laws and rules and regulations governing or relating to any portion of this work are hereby incorporated into and made a part of these specifications and the Contractor shall carry out their provisions. Any specification herein contained, shall not be construed to conflict with the above rules, regulations or requirements.

3. Conform to California State Parks accessibility regulations, specifications and instructions.

C. Stipulations: At no point shall the fine aggregate paving surface fail to drain.

D. Surface shall be solid with a smooth, even surface.

E. Fine Aggregate Paving - Contractor shall have a minimum of three years of documented experience with successful completion of projects of similar size and complexity. The installer must have a minimum of five (5) years of experience installing fine aggregate paving and must have satisfactorily completed projects of similar size and scope using the specified material.

1.5 SUBMITTALS

A. Submit one cubic foot of each specified fine aggregate paving mix and crushed base course material for approval. Contractor shall submit certified test results from a commercial testing laboratory or other evidence satisfactory to the State's Representative proving that all materials used meet the quality and gradation requirements specified.

B. The approved submittal and instructions become part of this specification.

1.6 PERFORMANCE REQUIREMENTS

A. Carefully check and verify dimensions and quantities and immediately inform the State's Representative if any discrepancy between the Plans and/or Specifications and actual conditions is noted. Do not initiate the work in any area where there is such a discrepancy until approval has been given by the State's Representative.

1.7 JOB CONDITIONS

A. Deliver, store, and protect products under provisions of Section 01 60 00.

B. Materials Delivery and Storage: Deliver manufactured materials in original containers with brand and maker's name marked thereon. Materials in broken containers or showing evidence of damage will be rejected and must be immediately removed from the site. Do not bring odorous materials to the site until they are to be used. Furnish quantities necessary to complete the work shown on the Plans. Quantities given on the Plans are for convenience.

C. Deliver fine aggregate paving, base rock, and other required materials to the job site in such a manner as to deter contamination and saturation by rainwater or other harmful substances or materials.

PART 2 - MATERIALS

2.1 FINE AGGREGATE PAVING (#10 minus, or 3/8$^{th}$ inch minus crushed with fines)

A. Fine Aggregate Paving mix design:

1. (1) Part AASHTO #8

2. (4) Parts unwashed AASHTO #10

3. (1) Part minus #200 fines

B. Fine Aggregate Paving (3/8$^{th}$ inch minus crushed with fines) aggregate shall be crushed rock free from deleterious or foreign matter with a plasticity index not exceeding 6 by ASTM D4318, a pH between 6-12.45 per EPA 9045C, and abrasion of 35% maximum per AASHTO T96, meeting the following gradation:

| SIEVE | PERCENT PASSING |
|---|---|
| 1/2” | 100 |
| 3/8” | 96-100 |
| #4 | 75-90 |
| #8 | 55-75 |
| #16 | 35-50 |
| #200 | 10-15 |

2.1 CRUSHED BASE COURSE (STATE SPECIFICATION):

A. Crushed base course rock shall conform to the following quality standards:

| | |
|---|---|
| Abrasion (AASHTO T 96) Maximum wear | 35% |
| Fractured Face Minimum wear | 75% |
| Liquid Limit (AASHTO T89) not greater than | 30% |
| Plasticity Limit (AASHTO T91) not greater than | 6% |

B. Aggregates shall consist of uniform quality, clean, tough, durable fragments of rock or gravel, free from flat, elongated, soft or disintegrated pieces, and other objectionable matter occurring either free or as a coating on the stone.

C. Based on U.S. standard sieves, the gradation of the aggregates to be furnished shall be as indicated below:

GRADATION

| SIEVE DESIGNATION | PERCENT PASSING BY WEIGHT | |
|---|---|---|
| (Square Opening) | 1-1/2" Minus Base or Surfacing Course | 3/4" Minus Leveling or Surfacing Course |
| 2” | 100 | - |
| 1-1/2” | 95-100 | - |
| 1” | - | -100 |
| 3/4” | 55-75 | 90-100 |
| 3/8” | - | 55-75 |
| 1/4” | 35-50 | 40-60 |
| No. 200 | 0-5 | 0-5 |

2.2 GEOTEXTILE FILTER FABRIC

A. Filter fabric shall be pervious synthetic polymer, non-woven, from continuous filaments. Fabric shall be Mirafi N series nonwoven or approved equal.

PART 3 - EXECUTION

3.1 PREPARATION

A. Preparation: Complete earthwork and related work prior to installation of base course and fine aggregate paving. Complete finish grading and compaction to bring subgrades to required grades and sections as indicated. Verify that adjacent paving or work has been installed and accepted under another Section prior to commencement of work.

B. Verify that proposed surfaces shall be installed in strict accordance with all pertinent codes, regulations, the accepted design, ADA accessibility standards, and the referenced standards.

C. Based on site walk-through, Contractor shall furnish a surveyed layout of proposed surfacing including centerline and perimeter staking marked with stationing and other significant layout and grading information. Surveyor shall stake all proposed locations of site features and furnishings. Staking shall be reviewed and approved by State’s Representative. prior to beginning excavation for fine aggregate paving areas.

3.2 PATH EXCAVATION AND PREPARATION OF SUBGRADE

A. Contractor shall excavate fine aggregate paving areas to create a smooth, even subgrade for base rock material.

B. Bring all fine aggregate paving areas to required subgrade levels on undisturbed ground and compact by sprinkling with water, rolling and mechanical tamping. As depressions occur, refill with specified fill material and re-compact until the surface is at the proper grade. Rough grade subgrades to within 0.10 ft. of finish grades. Prior to placement the subgrade shall be inspected and approved by the State's Representative. Subgrade shall be compacted to not less than 92% relative compaction as determined by ASTM D 1557-00.

3.3 GEOTEXTILE FABRIC

A. Geotextile fabric shall be placed prior to the rock base course. Fabric shall be unrolled directly to the line and dimension shown on the Plans. Fabric shall be lapped a minimum of 24 inches in all directions. Secure all edges and overlap with 12-inch long, 11-gauge (minimum) steel wire 'U' staples driven vertically into the subgrade at 36-inch spacing. Ends of side strips shall be run up the side of the excavation and buried into the side taper by at least 6 inches. Contractor shall place base rock material in such a way as to not tear, puncture, or shift the filter fabric. Tears or rips in the fabric shall be patched with fabric lapped a minimum of 12-inches around the rip. Tracked or wheeled equipment shall not be permitted on the filter fabric.

3.4 BASE COURSE PLACEMENT

A. Place base rock in maximum of 3-inch lifts to reach designed thickness for a total depth of 6-inch. Compact base rock to 95% of maximum dry density at optimum moisture content as determined by ASTM D 698. Compact each lift to 95% compaction prior to placing additional lifts. Spread 3-inch depth of crushed base course on subgrade compacted to 95% relative compaction in two lifts. Compact aggregate course to 95% compaction and smooth to grades required, free from depressions and humps, and crowned or sloped as indicated on the Plans.

3.5 SURFACE COURSE PLACEMENT

A. Fine Aggregate Paving

1. Place fine aggregate paving only after acceptance of base rock by State's Representative.

2. Place fine aggregate paving in a maximum lift thickness of 3 inches.

3. Fine aggregate paving shall be pre-conditioned to maximum moisture content prior to being placed on base rock. Pre-conditioning may occur

onsite if sufficient storage and stockpile area is available or be conditioned at the plant prior to trucking.

B. Lines and Grades: Install fine aggregate paving true to grade, properly coinciding with adjacent work and elevations. Provide a finished surface uniform in texture and appearance. Do not permit finished work to vary more than ½ inch in 10 feet from true profile and cross section.

C. Compact fine aggregate paving to 95% of maximum dry density at optimum moisture content as determined by ASTM D 698 with a vibratory roller capable of rolling a min of 6-foot width in a single pass.

D. Field Quality Control Tests: Contractor to have the testing laboratory verify the degree of compaction for each lift. Recompact failed areas until specified compaction is achieved.

E. Place fine aggregate paving with a small paving machine (or manually) in 4-inch lose and 3-inch compacted lifts.

F. If unable to place material with a small paving machine, verify with State's Representative for normal aggregate placement methods.

G. Fine aggregate paving shall be delivered and placed at optimum moisture content.

H. Do not operate equipment on finished surface.

I. Damaged or Defective Installation: Repair and replace in accordance with these Specifications at no additional cost to the Owner.

J. Protection: Protect the fine aggregate paving against traffic, injury, defacement or damage until Final Acceptance.

K. Redress surface as necessary to correct any settlement or lack of crown which develops after initial placement. Water and thoroughly roll surface until uniformly compacted.

3.6 FINISH GRADING

A. After the fine aggregate paving is constructed, complete grading of path-side ditches, swales, and slopes as necessary.

B. Shoulder, or edge, material should be placed with enough coverage to create a min of 3:1 slope from the top of the finished fine aggregate paving surface to the adjacent native grade. Once placed the shoulder material shall be mechanically compacted along its top edge to work the material into the fine aggregate paved finished surfaces. Shoulder material shall then be hand raked along the slope to prepare the surface for planting.

C. Final grades should appear natural, with slope rounding as necessary.

3.7 FINAL INSPECTION AND CLEANUP:

A. Repair all fine aggregate paving surface irregularities. Fill low areas and fine grade as required and as accepted by the State's Representative.

B. Remove all construction debris from site.

C. Eliminate all areas of pooling or standing water on fine aggregate paving surface.

D. Remove all excess path materials from plant beds, walks, roadways or other adjacent paving surfaces. Contaminated Areas: Do not permit mixture to contaminate planting areas. Clean up immediately all mixtures spilled on adjacent paving.

END OF SECTION 32 15 40

**SECTION 32 33 00**
**SITE FURNISHINGS**

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Plans and General Provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

B. Qualifications

1. Experience: Assign a full-time employee to the job as foreman for the duration of the Contract with a thorough understanding of standard industry landscape practices and a minimum of four years of experience in landscape installation and maintenance supervision, with experience or training in entomology, pest control, soils, fertilizers and plant identification.

2. Labor Force: Provide a landscape installation and maintenance force thoroughly trained and familiar with the specified work and with the capacity and skill to accomplish the work in a competent, efficient manner acceptable to the State's Representative.

1.2 DESCRIPTION

A. Provide all labor, materials, equipment, services and layout required for and incidental to the installation of site furnishings.

B. Provide and install all site furnishings identified in these specifications or shown on the Plans.

C. Relocate existing sign kiosk on new posts, and other furnishings as noted on Plans or directed by State's Representative

1.3 DEFINITIONS

A. Owner, Client, Parks, or State, refers to the California State Parks, Clayton, CA. State's Representative or State, refers to the California State Parks representative(s), associates, or agents.

1.4 SUBMITTALS

A. Submit two weeks after award of contract

B. Procedures: In accordance with Section 01 33 00.

C. Product Data: Supply product data for all proprietary products specified herein.

D. Submit complete manufacturer's information, including color and material charts, catalog cuts, installation procedures and diagrams, maintenance instructions, etc. Provide three copies to the State's Representative. Should it be necessary to propose equipment other than that specified,

submit to State's Representative complete manufacturer's information including color and material charts, catalog cuts, installation procedures and diagrams, maintenance instructions, etc.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and protect products under provisions of Section 016100 and as specified below.

B. Materials Delivery and Storage: Deliver manufactured materials in original containers with brand and maker's name marked thereon. Materials in broken containers or showing evidence of damage will be rejected and must be immediately removed from the site. Odorous materials shall not be brought to the site until they are to be used. Deliver quantities necessary to complete the work shown on the Plans. Any discrepancy in the quantities given on the plans shall not entitle Contractor to additional remuneration.

C. Deliver Bulk materials to the job site and store to deter mixing with other bulk materials, saturation by rainwater, contamination and/or contact with other deleterious substances or materials.

PART 2 – PRODUCTS

2.1 GENERAL

A. Products named are indicative of the features, form, finish, and quality of the furnishings desired. Products of manufacturers other than those named may be acceptable upon proof of equality. Submit data as specified above for approval by the State's Representative.

B. All products shall be new, delivered to the site in manufacturer's original containers, and protected at all times from damage during shipping, storage, and handling prior to and during installation.

2.2 PRODUCTS

A. Benches-NIC

1. Timberform Colossus, with armrests (and skate deterrents if requested by State's Representative), 2219-8, Douglas Fir, no back. Provide spacing as noted for ADA companion seating.

B. Log Seating: Redwood. Debarked and detailed per Plans for use as benches. State's Representative to provide bulk logs to site for Contractor use.

C. Redwood Edging: for garden areas and pathway edges where noted or as needed to complete project installation. See Plans for details.

D. Bike Rack: NIC

1. RockyMounts, PostUp-SS, stainless steel, 2-inch diameter, U-type rack. Provide (4) or as noted on Plans. RockyMounts, 303.402.0190.

E. Signage: NIC Provide typical regulatory and traffic signage per code and State of California standards.

F. Bollard (at Trailhead): NIC

1. California Parks standard removable wooden bollard. Wood, 6x6 post fitted to metal sleeve embedded into concrete foundation

G. Picnic Tables: NIC

## PART 3 – EXECUTION

### 3.1 GENERAL

A. Installation of products shall be as shown on the Plans and according to manufacturer's instructions. If discrepancies are found, or if information is lacking, consult with State's Representative immediately, prior to beginning the work.

B. Coordinate in-ground installation of site furniture with installation of paving and other adjacent materials.

C. Protect site furnishings from damage until final acceptance of the work. If damage occurs to any equipment prior to final acceptance, Contractor shall, at his own expense, make replacements to the satisfaction of the State's Representative.

### 3.2 BENCHES-NIC

A. Install manufactured benches per manufacturer's recommendations. Ensure vandal resistant fasteners are utilized throughout installation.

### 3.3 BIKE RACKS-NIC

A. Install per manufacturer's recommendations and details to the surface finish of concrete paving. Provide layout mock-up for State's Representative review and approval prior to installation.

### 3.4 LOG SEATING, REDWOOD EDGING, SPLIT RAIL FENCING, BOLLARD

A. Install per Plans and State's Representative direction in field. Provide layout mock-up for State's Representative review and approval prior to installation.

END OF SECTION 33 32 00

**SECTION 32 84 00**
**IRRIGATION**

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Plans and general provisions of the Contract, including General Conditions and Special Provisions, and other Technical Specification Sections apply to this Section.

1.2 SUMMARY

A. Provide automated irrigation system as shown for both perimeter site restoration plantings areas (to limit of work), new Native Plant Garden areas around new Education Center building, and the restored Native Plant Garden.

1.3 DESCRIPTION

A. The work in this section consists of furnishing, layout and installing a partial irrigation system. Refer to notes on Plans for scope of work.

B. Related work specified elsewhere includes:

1. Section 32 93 00, Planting
2. Section ELECTRICAL stub-out(s) for controller(s).

1.4 DEFINITIONS

A. Owner, Client, Parks, or State, refers to the California State Parks, Clayton, CA. State's Representative or State, refers to the California State Parks representative(s), associates, or agents.

1.5 CALIFORNIA MODEL WATER EFFICIENT LANDSCAPE ORDINANCE REQUIREMENTS

A. Contractor shall be familiar with and follow the State of California Model Water Ordinance, California Code of Regulations, Title 23 Waters, Division 2, Department of Water Resources, Chapter 2.7. Also, the Contractor is responsible to follow all local water ordinances.

B. Pursuant to the requirements of the California Model Water Efficient Landscape Ordinance, the Contractor shall submit a Certification of Installation to the Local Jurisdiction /water purveyor as described in the construction documents and these specifications. Certification shall at a minimum include the following documents:

Part 1 Project Information Sheet

| | |
|---|---|
| Part 2 | Certification of Installation according to the landscape documentation package. |
| Part 3 | Irrigation Scheduling and Controller Programming |
| Part 4 | Schedule of Landscape and Irrigation |
| Part 5 | Landscape Irrigation Audit Report |
| Part 6 | Soil Management/Analysis Report with verifying implementation, see Planting Specification for analysis requirements. |

1.6 QUALITY ASSURANCE

A. Manufacturer's Specifications: Follow manufacturer's current printed specifications and drawings in all cases where the manufacturers of articles used in the Contract furnish directions covering points not specified or shown in the Plans.

B. Ordinances and Regulations: All local, municipal, and state laws, codes and regulations governing or relating to all portions of this work are hereby incorporated into and made a part of these Specifications. Anything contained in these Specifications shall not be construed to conflict with any of the above codes, regulations, or requirements of the same. However, when these Specifications and Plans call for or describe materials, workmanship or construction of a better quality, higher standard, or larger size than is required by the above codes and regulations, the provisions of these Specifications and Plans shall take precedence. Furnish without extra charge additional materials and labor required to comply with above rules and regulations.

C. References, Codes and Standards

1. AB 325 State of California Model Water Efficient Landscape Ordinance.
2. Water Use Classification of Landscape Species (WUCOLS).
3. American Society of Irrigation Consultants (ASIC) Design Guidelines.
4. California Landscape Standards, California Landscape Contractors Association, (CLCA) Sacramento, California.
5. CAL-OSHA, title 8, Subchapter 4-Construction Safety Orders and Subchapter 7-General Industry Safety Orders.
6. California Electric Code.
7. California Plumbing Code (UPC) published by the Association of Western Plumbing Officials.
8. NFPA 24, Section 10.4, Depth of Cover.
9. Underwriters Laboratories (UL): Electrical wiring, controls, motors and devices, UL listed and so labeled.
10. American Society of Testing Materials (ASTM).

D. Furnish without extra charge any additional material and labor when required for the compliance with all above mentioned codes and regulations, though the work be not mentioned in these specifications or shown on the Plans.

E. Reclaimed Water: Contact water company supplying reclaimed water prior to the commencement of installing the irrigation system to coordinate inspection of the work and to verify all codes and regulations regarding use of reclaimed water. Provide all required signage and other warnings.

F. Experience: Assign a full-time employee to the job as foreman for the duration of the Contract with a certified landscape technician, irrigation certification through CLCA or minimum of four years of experience in landscape irrigation installation.

G. Labor Force: Provide a landscape installation and maintenance force thoroughly familiar with, and trained in, the work to be accomplished to perform the task in a competent, efficient manner acceptable to the State's Representative.

H. Explanation of Plans

1. Due to the scale of the Plans, it is not possible to indicate all offsets, fittings, sleeves, etc., which may be required. Carefully investigate the conditions affecting the work. Plan accordingly, and furnish all required fittings. Install system in such a manner to avoid conflicts with existing and future planting, utilities and architectural features.

2. Do not install the irrigation system as shown on the Plans when it is obvious in the field that obstructions, grade differences or discrepancies in arc dimensions exist that might not have been considered in engineering. Bring such obstruction or differences to the attention of the State's Representative. In the event this notification is not given, the Contractor shall assume full responsibility for any revision necessary.

I. Trench Interference with Tree Root Systems:

1. Prior to trenching, layout main and lateral line locations within Drip Line of trees and review locations with State's Representative. Relocate any lines that may interfere with existing root systems to avoid or reduce damage to root systems as accepted by State's Representative.

2. Mechanical Trenching is not allowed within dripline of existing trees to be protected except as approved by State's Representative.

1.7 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

A. The Plans show, if applicable, existing above and below grade structures and utilities that are known to the State's Representative. Locate known existing installations before proceeding with construction operations that may cause damage to such installations. Existing installations shall be kept in service where possible and damage to them shall be repaired with no adjustment of Contract Sum. Verify with State's Representative. if As-Built Drawings are available.

B. If other structures or utilities are encountered, State's Representative to

provide direction on how to proceed with the work. If a structure or utility is damaged, take appropriate action to ensure the safety of persons and property.

C. Verify location of existing irrigation systems to be removed and replaced. Maintain any existing systems as required by the Plans and Specifications, including temporary retention of systems necessary to maintain existing on site and adjacent planting.

1.8 SUBMITTALS, IN ACCORDANCE WITH SECTION 01 33 00.

A. Materials List

1. Submit required copies of the cut sheets and a complete list of materials proposed for installation, along with any proposed substitutions clearly identified and obtain the State's Representative written approval thereof before proceeding. Use only accepted materials and items of equipment.
2. List all materials by manufacturer's name and model number.
3. Submit to Local Water Purveyor with copy to the State's Representative of the Certification of Installation as required by the State of California Model Water Ordinance.

B. Substitutions

1. If the Contractor desires to substitute a product, he shall list each item and note it as a "substitution" and provide the following information:
    a. Descriptive information describing its similarities to the specified product.
2. If the product is approved and, in the opinion of the State's Representative, the substituted product does not perform as well as the specified product, the Contractor shall replace it with the specified product at no additional cost to the State's Representative.

C. Manuals:

1. Prior to the final acceptance of the irrigation system, furnish three (3) individually bound Operation and Maintenance Manuals to the State's Representative. The manuals shall contain complete enlarged drawings, diagrams and spare parts lists of all equipment installed showing manufacturer's name and address. In addition, each Service Manual shall contain the following:
    a. Index sheet indicating the Contractor's name, address and phone number.
    b. Copies of equipment warranties and certificates.
    c. List of equipment with names, addresses and telephone numbers of all local manufacturer representatives.

d. Complete operating and maintenance instructions in sufficient detail to permit operating personnel to understand, operate and maintain all equipment.

e. Parts list of all equipment such as controllers, valves, solenoids and heads.

D. Record Drawings:

1. Dimension the location of the following items from two (2) permanent points of reference such as building corners, sidewalks, road intersections, etc.:

a. Connection to existing water lines/meter.

b. Connection to electrical power.

c. Gate valves.

d. Routing of sprinkler pressure lines (a dimension at least every 100 feet and as required to identify all changes in direction and location).

e. Remote control valves.

f. Routing of control valves.

g. Quick coupling valves.

h. All sleeve locations.

i. Routing of all control wiring.

j. Include all invert elevations below 12".

2. Deliver a reproducible record drawing to the State's Representative within seven (7) working days before the date of final review. Delivery of the Record Drawings shall not relieve the Contractor of the responsibility of furnishing required information in the future.

E. Controller Plan:

1. Provide one Irrigation Diagram plan in each controller housing. The plan shall show the area controlled by each valve in different colors and for orientation, any major permanent structure such as buildings and roads.

2. Charts to be waterproof and hermetically sealed between two pieces of transparent 10 mil thick plastic and installed in each controller on the door as accepted by the State's Representative no later than the time of the coverage test of the irrigation system.

F. Maintenance Material - supply the following tools to the State's Representative:

1. Three (3) sets of specialized tools required for removing,

disassembling and adjusting each type of sprinkler, valve or other equipment supplied on this project.

2. Two (2) keys for each type of equipment enclosure.
3. Two (2) keys for each type of automatic controller.
4. Two (2) quick-coupler keys and matching hose swivels for each type of quick-coupling valve installed.
5. All lock keys shall be keyed alike.
6. Two (2) keys for each type of valve (including square type key for valves larger than 2")

1.9 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Furnish and deliver materials in manufacturer's packaging, bearing original legible labeling.

B. The Contractor is cautioned to exercise care in handling, loading, unloading, and storing PVC pipe and fittings. All PVC pipe shall be transported in a vehicle which allows the length of the pipe to lie flat so as not to subject it to undue bending or concentrated external load at any point. Any section of pipe that has been dented, cracked, or otherwise damaged shall be discarded and, if installed, shall be replaced with new piping.

1.10 TRENCH INTERFERENCE WITH TREE ROOT SYSTEMS

A. Prior to trenching, layout main and lateral line locations within Drip Line of trees and review locations with State's Representative. Relocate any lines that may interfere with existing root systems to avoid or reduce damage to root systems as accepted by State's Representative.

1.11 SEQUENCING AND SCHEDULING

A. Acceptance: Do not install main line trenching prior to acceptance by State's Representative of rough grades completed under another Section.

B. Coordination: Coordinate with the work of other sections to insure the following sequence of events:

1. Sleeves and Conduits: Installation of all sleeves and conduits to be located under paving and through walls prior to placement of those materials.
2. Bubbler Heads: Install after placement of tree, but prior to backfill with planter soil mix.
3. On-Structure Equipment: Install piping and risers after waterproofing is accepted.
4. Sprinkler Head in Pots: Install riser and seal the penetration of the pot prior to backfill of pot with drainage materials and planter soil mix.

5. Coordinate work schedule with State's Representative to avoid disruption of landscape maintenance of existing landscaping.
6. Install piping prior to soil preparation (planting soil amendment installation).

1.12 WARRANTY, PER SECTION 01 77 00.

A. In addition to manufacturer's guarantees and warranties, work shall be warranted for one (1) year from date of final acceptance against defects in material, equipment and workmanship. Warranty shall also cover repair of damage to any part of the premises resulting from leaks or other defects in materials, equipment and workmanship to the satisfaction of the State's Representative.

B. Include a copy of the warranty form in the Operation and Maintenance Manual.

1.13 OPERATION

A. Routine: Inspect and adjust all spray heads and control valves including raising or lowering of spray head heights to accommodate plant growth and weather conditions.

B. Controller: Inspect regularly for power interruption and reset clock as required. Adjust station timing to accommodate changes in plant growth and weather conditions.

C. System Failure: Perform all repairs within one (1) operating period. Replacements to match removed products and materials in all respects. Report promptly all damage not resulting from Contractor's operations. Repair all damage caused by Contractor at no expense to State's Representative.

D. Climate Change: Set and program automatic controllers in response to seasonal requirements and requirements of newly planted materials.

PART 2 - PRODUCTS

2.1 PIPE – FOR RECLAIMED WATER USE

A. Pressure Main Line Pipe and Fittings: All PVC fittings shall bear the manufacturer's trademark name, material designation, size, applicable I.P.S. schedule and NSF seal of approval.

B. All main line pipe shall be solvent welded and shall be Schedule 40 with Schedule 80 fittings unless shown otherwise on the Plans. 24" minimum cover over pipe in pedestrian areas and 30" minimum cover in vehicular areas.

1. PVC Pressure Rated Pipe: ASTM D2241 NSF approved Type I, Grade I, solvent welded PVC with an appropriate standard dimension ratio

(S.D.R.).

2. PVC Scheduled Pipe: ASTM D1785 NSF approved, Type I,
3. Grade I, solvent welded PVC.
4. PVC Solvent-weld Fittings: ASTM D2466 Schedule 80, 1-2, II-I NSF approved.
5. Solvent Cement and Primer for PVC solvent-weld pipe and fittings: Type and installation methods prescribed by the manufacturer.
6. Connections between Main Lines and RCVs: Schedule 80 PVC (threaded both ends) nipples and fittings unless required otherwise by local jurisdiction.
7. Valves 2-inch and larger shall be flanged only.
8. Copper pipe shall be Type K or Red Brass where threaded joints are required and Type L otherwise.

C. All lateral line pipe shall be solvent welded and shall be Schedule 40 with Schedule 80 fittings unless shown otherwise on the Plans.

2.2 CONTROLLER ENCLOSURES

A. Type: Use one of the following (unless noted otherwise on the Plans):

1. Stainless steel, NEMA Type 3 rated, with back panel, padlocking hasp and padlock. See Detail for pedestal construction.
2. Le Meur, (714) 822-5100.
3. "Strong Box" available from John Deere, (800) 347-4272.
4. Rainmaster Controller Enclosure as recommended for controller

2.3 REMOTE CONTROL VALVE (RCV): As shown on Plans and with the following minimum requirements:

A. Remote control valves shall be those normally manufactured for irrigation systems and shall have a slow, consistent speed of closure through entire closing operation, including last portion. To ensure this, the effective diaphragm working area/valve seating opening ratio must be a minimum 3 to 1.

B. Shall be mechanically self-cleaning to help prevent diaphragm or solenoid port plugging. To ensure this, the flush rod should be tapered to vary the size of the port opening as the diaphragm rises and lowers, thus allowing trapped material to escape. Rod is to be finished with a serrated surface to help scrub trapped material out. Screens are not acceptable.

C. Shall have removable valve seat so valve can be repaired without removal from irrigation line.

D. Shall have ability to operate manually without the use of wrenches or

special keys.

E. Shall have one-piece solenoid that attaches directly to valve without shunts or clips that can be lost.

F. Shall have cross top handle to adjust maximum travel of diaphragm to allow "tuning" of valve and closure.

2.4 BOX FOR REMOTE CONTROL VALVE (RCV)

A. Rectangular plastic valve box with lid - Ametek, Brooks, Christy or accepted equal in purple color for reclaimed water (unless noted otherwise), with non-hinged bolt down lid marked “irrigation”. Box body shall have knock outs. Do not saw cut body. Minimum size box as shown on Plans. Increase box size as required to fit. Valve box lids are to indicate the controller letter and station number of valve as accepted by State’s Representative. Also, refer herein to required polyurethane tag at valve solenoid control wire under Control Wires. Locate the identification in center of the lid. Provide separate box for each valve. Provide H/20 Loading concrete boxes with bolt-down concrete lids for all valves that occur in paved areas.

2.5 CONTROLLER GROUND

A. Provide each pedestal controller with its own ground rod, model as recommended by manufacturer. Separate the ground rods by a minimum of eight feet. The ground rod shall be an eight foot long by 5/8" diameter U.L. approved copper clad rod or as recommended by controller manufacturer. Install no more than 6" of the ground rod above finish grade. Connect #8 gauge wire with a U.L. approved ground rod clamp to rod and back to ground screw at base of controller with appropriate connector. Make this wire as short as possible, avoiding any kinks or bending. Install within pedestal housing base unless otherwise noted.

B. Provide irrigation controller with its own independent low voltage common ground wire.

2.6 CONTROLLER: AS SHOWN ON PLANS AND WITH THE FOLLOWING MINIMUM requirements:

A. Shall be user-friendly. The controller must have a minimum 20-character readout display describing actions or options, or a full visible panel of buttons, dials, or switches that control all different functions separately.

B. Shall have the ability to start a programmed sequence of valves a minimum of 5 times a day per program.

C. Shall have ability to easily and quickly change watering schedules due to change in weather.

2.7 CONTROL WIRES

A. Connections between automatic controllers and the solenoid-operated electric control valves shall be made with direct burial copper wire 14-AWG-UF 600 volt (minimum size). Pilot wires shall be a color other than white, and shall be a different color for each automatic controller with wires sharing a common trench. Common wires shall be white in color, with a different color stripe for each controller with wiring sharing the same common trench. No stripe is required if multiple controller wiring is not present.

B. Size of wire shall conform to the remote control valve manufacturer's specification for control wire sizes, but in no case shall the control wire be smaller than #14. Runs over 2,000 lineal feet shall be #12- AWG-UF 600 volt copper wire.

C. All wire splices are to be made within a valve box, with a copper crimp-type connector, and a "3-M" #DBY splice kit, or as recommended by controller manufacturer.

D. Use continuous control wiring between controllers and remote control valves (no splices).

E. Provide polyurethane tag at valve solenoid control wire that shows the controller number and station number. Also refer to valve box lid identification.

F. Provide a spare control wire in each RCV box for future.

2.8 BUBBLER HEADS

A. NIC

2.9 QUICK COUPLER VALVES:

A. Quick coupler valves shall be as listed on the Plans with 10" diameter box and lid similar to isolation valve box described below. Purple color for reclaimed water.

2.10 ISOLATION/GATE VALVE:

A. Valves smaller than 3 inches: 125 lb. WSP bronze gate valve with union bonnet, non-rising stem and solid wedge disc. Valves shall be line size. Leemco, LGT-SS Series, or approved equal.

B. Valves larger than 3 inches: 125 lb. WSP bronze gate valve with union bonnet, non-rising stem and solid wedge disc. Valves shall be line size. Nibco P-619-RW, or approved equal.

2.11 SUBSURFACE DRIP IRRIGATION: NIC

A. As specified herein and as shown on the Plans and in accordance with manufacturer’s recommendations. Provide all miscellaneous valves, filters fittings etc. required for a complete, operable system including the

following:

1. Emitters shall be Toro DL 2000 Techline, in-line Treflon impregnated emitter with Netafim Automatic Flush Valves, Toro DL 2000 Air/Vacuum Relief Valves in accordance with “Toro DL-2000 Low-Volume Irrigation Bidding Specifications and Design Details” and as shown on the Plans as required for a complete working system.

B. Drip Valve Assembly: Size valve box large enough and deep enough to contain assembly and allow convenient access and easy removal of filter screen. Position filter pointed down, approximately 45 degrees.

C. Pressure regulator: Size regulator in accordance with flow rate. Do not over size. Use factory pre-set regulator at 30 PSI.

2.12 BOX FOR ISOLATION VALVE: 10" DIAMETER PLASTIC, AMETEK, BROOKS, CHRISTY WITH bolt down lid marked "irrigation," or accepted equal. Avoid locating valve in paved areas. Provide H/20 Loading concrete box with bolt-down concrete lid if valve is located in paved area. Obtain location approval by State’s Representative.

2.13 SWING JOINTS-
NIC UNLESS NECESSARY TO COMPLETE INSTALLATION

A. Bubblers: Use Dura, Lasco or equal pre-assembled swing joints with O-rings.

B. Quick Coupling Valve: Dura 1-inch 1-A2-1-11-18 pre-assembled swing joint with O-rings and Dura quick lock to receive stabilizing rod.

2.14 Y-STRAINER

A. “Y”-Strainer upstream of remote control valves, Brass, 100 mesh.

2.15 RCV IDENTIFICATION TAGS: Plastic or brass tags with valve number, approximately 2” by 2” with number imprinted, as accepted by State’s Representative.

2.16 BACKFLOW PREVENTION DEVICE

A. As required by Code and as shown on Plans. Verify with State’s Representative if Anti-freeze Jacket is required and provide as required.

B. Riser assemblies from main line burial depth to backflow preventers shall be Schedule 40 brass pipe.

C. All metallic pipe and fittings installed below grade shall be painted with two coats of Koppers #50 Bitumastic, or approved equal. Pipes may be wrapped with an approved asphaltic tape in lieu of the liquid-applied coating.

2.17 BACKFLOW PREVENTION DEVICE ENCLOSURE

A. “Smooth Touch” enclosure without sharp edges, by Strong Box, available

from V.I.T., Escondido, CA (800) 729-1314 or equal. Coordinate size of enclosure with plumbing for minimum clearance and size. Enclosure to include hasp and staple to receive padlock. Padlock N.I.C.

2.18 MISCELLANEOUS INSTALLATION MATERIALS

A. Solvent Cement and Primers for Solvent-weld Joints: Make and type approved by manufacturer(s) of pipe and fittings. Maintain cement proper consistency throughout use.

B. Pipe and Joint Compound: Permatex: Do not use on sprinkler inlet port.

2.19 MISCELLANEOUS EQUIPMENT/ACCESSORIES

A. Concrete For Thrust Blocks and Pads: Poured-in-place Class A concrete per Section 90 of the Caltrans Standard Specifications.

B. Sleeves and Conduits: See Plans.

C. Key(s) for Quick-Coupling Valves:

1. Type: Same manufacturer as Quick-Coupling Valve.

2.20 OTHER EQUIPMENT: As shown on Plans and required for a fully functional irrigation system.

PART 3 EXECUTION

3.1 EXAMINATION

A. Sleeves and Conduits: Verify that all installed sleeving and conduits are undisturbed and are free of defects or errors introduced by the work of other sections.

B. Water Meter/Water Pressure: Test and verify that existing water pressure is the minimum pressure at maximum system g.p.m. to operate the irrigation system as indicated on the Plans

C. Stub-outs: Verify that all stub-outs to be provided under another contract are correctly sized, located and installed as noted on Plans.

D. Notification: Submit written notification to State Representatve within ten (10) working days of above inspections describing all acceptable and non-acceptable site conditions.

3.2 CONNECTIONS TO SERVICES

A. Provide and coordinate connection to water meter.

B. Provide and coordinate connection of irrigation controller to electrical power source.

3.3 INSTALLATION

A. Install irrigation system components in accordance with this Section, with the Plans, with the manufacturer's recommendations, and with established industry standards. The Contractor shall do nothing that may jeopardize any manufacturer warranty.

B. Conduits and Sleeves:

1. Coordination: Provide conduits and sleeves and coordinate installation with other trades.

2. Extent: Install conduits and sleeves where control wires and pipes pass under paving or through walls as shown on Plans. Extend twelve inches (12") beyond edges of paving and walls and cap ends until ready for use.

C. Excavating and Trenching:

1. Dig trenches wide enough to allow a minimum of three inches (3") between parallel pipe lines. Provide a minimum cover from finish grade as follows:

a. 24-inches Deep: Over pipe on pressure side of irrigation control valve, control wires and quick-coupling valves.

D. Pipeline Assembly:

1. General:

a. Install pipe and fittings in accordance with manufacturer's current printed Specifications.

b. Clean all pipes and fittings of dirt, scale and moisture before assembly.

2. Solvent-welded Joints for PVC Pipes:

a. Solvents: Use solvents and methods specified by pipe manufacturer.
b. Curing Period: Minimum of one (1) hour before applying any external stress on the piping and at least 24 hours before placing the joint under water pressure.

3. Threaded Joints for Plastic Pipes:

a. Use Permatex on all threaded PVC fittings except sprinkler heads and quick coupler valve ACME threads.

4. Joining:

a. Use strap-type friction wrench only. Do not use metal-jawed wrench. Assemble finger tight plus one or two turns.

5. Laying of Pipe:

a. Bedding On-grade: Remove from trench all rocks or clods. Bed pipe in at least 2 inches of soil excavated from trench. Backfill on all sides of piping to provide a uniform bearing.

b. Snaking: Snake pipe from side to side of trench bottom to allow for expansion and contraction. Minimum allowance for snaking is one (1) additional foot per 100 ft. of pipe.

c. Moisture Restrictions: Do not lay PVC pipe when there is water in the trench. Do not assemble PVC pipe unless the pipe is dry.

E. Remote Control Valves

1. Install in valve boxes where shown on Plans and group together where practical. Install box flush with finish grade, not necessarily level. If valve occurs in drainage swale, relocate out of drainage swale as approved by State's Representative.

2. Where two or more valves are installed adjacent to each other, provide at least six inches (6") separation. Align boxes in a row, perpendicular with pavement edge.

3. Permanently mark valve box lid with 2" black valve number and controller letter or with numbered metal tag inside box as approved by State's Representative.

4. Refer to control wiring for required spare wire in each valve box.

F. Install "Y"-Strainer upstream of remote control valves at backflow preventer with two pressure gauges, one upstream and one downstream of each strainer/filter.

G. Bubblers: NIC

1. Coordinate installation with planting contractor to insure timely and proper placement of heads at new planting.

H. Subsurface Irrigation: NIC

1. Install emitters at uniform 18 inches on center and 6 inches deep except where shown otherwise. Adjust spacing on slopes to prevent overwatering at base of slopes. Install system in accordance with "Toro DL-2000 Low-Volume Irrigation Bidding Specifications and Design Details" and as shown on the Plans as required for a complete working system.

2. Provide air/vacuum relief valves at all high points on systems.

3. Provide filter as shown and as recommended by emitters manufacturer.

4. Tape pipe ends during installation and do not allow dirt or debris to enter pipe.

5. Use emitter line with the specified emitter flow rate and emitter

spacing. Assemble dripper line to allow water to flow continuously and directly, with no dead ends or dead-end loops between control valve and flush valve.

6. Use fittings at sharp bends and do not allow dripper line to kink.
7. Install emitter line around perimeter of planter not more than 3 inches off edge for ground cover and turf, 18 inches maximum for shrub planting.
8. Adjust alternate rows so emitters are spaced in a triangular pattern.
9. Collect water from multiple dripper lines and convey the water to automatic line flush valve.
10. Install flush valve at end(s) of collector laterals so that entire system will flush and be free of dirt and debris.
11. Flush valves shall be open when water is turned on for the first time and after a break in the main or lateral lines. Extend collector lateral as required and locate flush valve at convenient accessible location.
12. Flush the systems weekly through the first month of the maintenance period.
13. Thoroughly saturate soil prior to planting. Provide additional surface watering as required to keep plant root systems moist during planting establishment period.

I. Automatic Controller:

1. General: Install with lock box cutoff switch per local code and manufacturer's current printed specifications.
2. Connection to Valves: Connect remote control valves to controller in clockwise sequence to correspond with station setting beginning with Stations 1, 2, 3, etc.
3 Labeling: Affix controller letter (i.e., "A") on inside of controller cabinet door with minimum of one-inch (1") high permanent letter.
4. Irrigation Diagram: Affix a non-fading, waterproof copy of irrigation diagram to cabinet door below controller name. Irrigation diagram to be sealed between two plastic sheets, 20 mil. minimum thickness. Use a legible reduced copy of the Record Drawing for the irrigation diagram clearly showing all valves operated by the controller, station, number, valve size, and type of planting irrigated. Color code area operated by each valve.

J. Control Wiring:

1. General: Install control wires in common trenches with sprinkler mains and laterals wherever possible. Lay to the bottom side of pipe line. Provide looped slack at valves. Snake wires in trench to allow for contraction of wires. Tie wires in bundles at 10 ft. intervals.

2. Extra Length: Provide 30 inches (30") extra control wire at each remote control valve splice to facilitate the removal of the remote control bonnet to finish grade without cutting wires.
3. Spare: Install one unconnected spare control wire running from the controller through each intermediate control valve box.
4. Size: Minimum size of wire is to be determined strictly by the manufacturer's current printed specifications for remote control valves, but not smaller than #14.
5. Detection Wire: Install a bare #12 copper wire or greater on top of the PVC supply line for the purpose of possible future mine detection search. Install the control wires on the bottom of the PVC supply line with electrical tape every ten feet (10').
6. Splicing: Crimp control wire splices at remote control valves. Seal with specified splicing materials. In-line splices will be allowed only on runs exceeding 2500 feet and only in junction boxes.

K. Closing of Pipe and Flushing of Lines:

1. Capping: Cap or plug all openings as soon as lines have been installed to prevent entrance of materials that would obstruct the pipe. Leave in place until removal is necessary for completion of installation.

L. Rain Shutoff Switch:

1. Install switch in area not affected by irrigation or rain shadow. Provide wires in rigid conduit as accepted by State’s Representative.

M. Detection Wire and Warning Tape:

1. Install a bare # 12 copper wire or greater on top of the PVC supply line for the purpose of possible future mine detection search.
2. Install a continuous PVC irrigation mainline warning tape 12” above the supply line.

N. RCV IDENTIFICATION TAGS: Install in remote control valve box as recommended by manufacturer and as accepted by State’s Representative.

3.4 MISCELLANEOUS EQUIPMENT

A. Install miscellaneous equipment with concrete footings, brackets, etc., as required and as recommended by manufacturer.

3.5 FIELD QUALITY CONTROL

A. Testing of Irrigation System:

1. Make hydrostatic tests with risers capped when welded PVC joints have cured at least 24 hours. Center load piping with backfill to prevent pipe from moving under pressure. Keep all couplings and fittings exposed.

2. Install two (2) pressure gauges at opposite ends of main line system. Pump system up to a minimum of 125 psi the day preceding the scheduled test and verify that pressure is holding. Inspect system early following day and immediately notify State's Representative if the test confirmation must be postponed.
3. Apply continuous static water pressure of 125 psi in accordance with Caltrans Standard Specifications Section 20-5.03H, except after a drop in pressure (5 psi maximum), then the pressure must stabilize and remain stable for a one (1) hour minimum period before acceptance of the test.
4. Leaks detected during tests shall be repaired and test repeated until system passes tests at no additional cost to State's Representative.

B. Adjustment of the System: NIC

1. Flush and adjust all sprinkler heads for optimum performance and to prevent overspray onto walks, roadways and buildings. Adjust the arc and radius as applicable.
2. Include as a part of the work any nozzle changes or arc adjustments necessary due to daytime windy conditions during grass establishment period. After grass has been established and watering can be performed during calm early morning or evening hours, make any required adjustments to nozzles and arcs.
3. Set all sprinkler heads perpendicular to finished grades unless otherwise noted on the Plans.
4. When the landscape sprinkler system is completed and before planting, perform a coverage test in the presence of the State's Representative to determine if the water coverage for planting areas is adequate.
5. Test controllers individually in the presence of the State's Representative demonstrating that all control valves operate electronically. Provide vehicles and radio equipment as necessary to expedite this process.
6. Demonstrate to State's Representative that irrigation scheduling programmed into controller is adequate for plant requirements without causing runoff, and that scheduling capacities of controller are utilized.

3.6 IRRIGATION SCHEDULING AND CONTROLLER PROGRAMMING-NIC

A. Per the requirements of the California Model Water Efficient Landscape Ordinance All irrigation schedules and programs shall be developed, managed and evaluated to utilize the minimum amount of water required to maintain plant health.

B. Irrigation controller Scheduling and Programming Parameters to be conducted by a CLCA Certified Irrigation manager and submitted to the

local agency as part of the Certificate of Completion.

C. Parameters used to set the automatic controller shall be developed for each of the following:

1. Plant establishment period
2. Established landscape period
3. Temporary irrigated area (if applicable)

D. Each irrigation schedule shall consider for each station all the following that apply:

1. Irrigation interval (days between irrigation)
2. Irrigation run times per irrigation event to avoid runoff
3. Number of cycle starts required for each irrigation event to avoid runoff
4. Amount of applied water scheduled to be applied monthly
5. Application rate setting
6. Root depth setting
7. Plant type setting
8. Soil type
9. Slope factor setting
10. Shade factor setting
11. Irrigation uniformity or efficiency setting

E. Total annual applied water shall be less than or equal to Maximum Applied Water Allowance (MAWA). Actual irrigation schedules shall be regulated by automatic irrigation controllers using current reference evapotranspiration data (CIMIS or soil moisture sensor data).

3.7 BACKFILL AND COMPACTING

A. General: After system is operating and required tests and reviews have been made, backfill excavations and trenches with clean soil, free of debris.

B. Backfill for All Trenches: Regardless of the type of pipe covered, compact to minimum 95% relative compaction density under pavements and 85% relative compaction under planted areas.

C. Finishing: Dress off areas to finish grades. Re-dress any areas which subsequently settle.

D. State’s Representative’s testing agency will test backfill compaction in areas under paving.

3.8 MAINTENANCE

A. The entire sprinkler irrigation system shall be under full automatic operation for a period of 2 days prior to any planting.

B. The State’s Representative reserves the right to waive or shorten the operation period.

C. Maintain/repair system for full duration of plant maintenance period.

3.9 REVIEWS PRIOR TO ACCEPTANCE

A. Notify the State's Representative in advance for the following reviews, according to the time indicated:

1. Supply line pressure test and control wire installation - 72 hours.
2. Coverage and controller test - 72 hours.
3. Final review - 7 days.

B. No reviews will commence without Record Drawings, without completing previously noted corrections, or without preparing the system for review.

3.10 FINAL REVIEW AND CLEANUP, PER SECTION 01 74 00.

A. Operate each system in its entirety for the State's Representative at time of final review. Any items deemed not acceptable by the State's Representative shall be reworked to the complete satisfaction of the State's Representative.

B. Provide evidence to the State's Representative has received all accessories and equipment as required before final review can occur.

C. Final acceptance and start of warranty period will occur no earlier than the end of the plant maintenance period.

D. For time of final review, Contractor shall arrange a meeting with the State's Representative's maintenance personnel to demonstrate the operation of the irrigation systems automatically to verify acceptance and to familiarize the maintenance personnel with the system and recommended programming.

END OF SECTION 32 84 10

**SECTION 33 11 66**
**WATER DISTRIBUTION SYSTEM**

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Site water distribution system for irrigation water, domestic water and fire protection service up to 5 feet of any on-site commercial building being served.

B. Irrigation water, domestic water and fire protection water transmission or distribution system within a roadway or street right-of-way.

C. Protective coating or wrap for metallic pipe, fittings, restraining devices, and appurtenances.

1.2 RELATED SECTIONS

A. Section 31 23 33, Utility Trenching and Backfilling.

1.3 RELATED DOCUMENTS

A. ASTM:
1. A 536: Specification for Ductile Iron Castings.
2. B 88: Specifications for Seamless Copper Water Tube.
3. D 1785: Specifications for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
4. D 2564: Specifications for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.

B. AWWA:
1. C104: Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
2. C105: Polyethylene Encasement for Ductile-Iron Pipe Systems.
3. C110: Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (76 mm Through 1,219 mm) for Water.
4. C111: Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
5. C115: Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
6. C150: Thickness Design of Ductile Iron Pipe.
7. C151: Ductile-Iron Pipe, Centrifugally Cast, for Water.
8. C153: Ductile- Iron Compact Fittings for Water Service.
9. C200: Steel Water Pipe-6 In. (150 mm) and larger.
10. C203: Coal-Tar Protective Coatings and Linings for Steel Water Pipelines-Enamel and Tape-Hot Applied.
11. C205: Cement-Mortar Protective Lining and Coating for Steel Water Pipe-

4 In. and Larger-Shop Applied.

12. C207: Steel Pipe Flanges for Waterworks Service-Sizes 4 In. Through 144 In. (100 mm Through 3,600 mm).
13. C208: Dimensions for Fabricated Steel Water Pipe Fittings.
14. C209: Cold Applied Tape Coatings for the Exterior of Special Sections, Connections and Fittings for Steel Water Pipelines.
15. C210: Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines.
16. C213: Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines.
17. C214: Tape Coating Systems for the Exterior of Steel Water Pipelines.
18. C218: Coating the Exterior of Aboveground Steel Water Pipelines and Fittings.
19. C219: Bolted, Sleeve-type Couplings for Plain-End Pipe.
20. C500: Metal-Seated Gate Valves for Water Supply Service.
21. C502: Dry-Barrel Fire Hydrants.
22. C503: Wet Barrel Fire Hydrants.
23. C504: Rubber Seated Butterfly Valves.
24. C507: Ball Valves 6 In. Through 8 In. (150 mm Through 1,200 mm).
25. C508: Swing-check Valves for Waterworks Service, 2 In. (50mm) Through 24 In. (600 mm) NPS.
26. C509: Resilient-Seated Gate Valves for Water Supply Service.
27. C510: Double Check Valve Backflow-Prevention Assembly.
28. C511: Reduced-Pressure Principle Backflow-Prevention Assembly.
29. C512: Air-Release, Air/Vacuum, and Combination Air Valves for Waterworks Service.
30. C550: Protective Epoxy Interior Coatings for Valves and Hydrants.
31. C600: Installation of Ductile-Iron Water Mains and Their Appurtenances.
32. C605: Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings.
33. C606: Grooved and Shouldered Joints.
34. C651: Disinfecting Water Mains.
35. C800: Underground Service Line Valves and Fittings.
36. C900: Polyvinyl Chloride (PVC) Pressure Pipe and Fittings, 4 In. Through 12 In. (100mm Through 300mm) for Water Distribution.
37. C901: Polyethylene (PE) Pressure Pipe and Tubing, ½ In. (13mm) Through 3 In. (76mm) for Water Service.
38. C905: Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 48 In. (350 mm Through 1,200 mm) for Water Transmission and Distribution.
39. C906: Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) through 63 In (1,575 mm), for Water Distribution and Transmission.
40. C907: Polyvinyl Chloride (PVC) Pressure Fittings for Water – 4 In. through 8 In. (100 mm Through 200 mm).
41. C908: PVC Self-Tapping Saddle Tees for Use on PVC Pipe.
42. M11: Steel Pipe - A Guide for Design and Installation.
43. M23: PVC Pipe – Design and Installation.

44. M41: Ductile-Iron Pipe and Fittings.

1.4 DEFINITIONS

A. AASHTO: American Association of State Highway and Transportation Officials.

B. ASTM: American Society for Testing Materials.

C. AWWA: American Waterworks Association

D. DI: Ductile iron.

E. DIP: Ductile iron pipe.

F. FM: Factory Mutual.

G. NFPA: National Fire Protection Association.

H. NSF: National Sanitation Foundation.

I. PCC: Portland cement concrete.

J. PE: Polyethylene.

K. PVC: Polyvinyl Chloride.

L. UL: Underwriters Laboratory.

1.5 SYSTEM PERFORMANCE REQUIREMENTS

A. Minimum Internal Pressures
1. Working Pressures: 150-psi.
2. Test Pressure: 200-psi.

B. External Load: Earth load indicated by depth of cover plus AASHTO H20 live load unless indicated otherwise.

1.6 SUBMITTALS

A. Follow submittal procedure outlined in the Project Manual.

B. Product Data: For the following:
1. Piping materials and fittings.
2. Pipe couplings.
3. Flexible pipe fittings.
4. Restrained pipe fittings.
5. High deflection fittings/ball joints.

6. Expansion joints.
7. Flexible expansion joints.
8. Gate valves.
9. Butterfly valves.
10. Check valves.
11. Air and vacuum relief valves.
12. Blow-off valves.
13. Pressure reducing valves.
14. Pressure sustaining valves.
15. Ball valves.
16. Fire hydrants.
17. Post indicator valves.
18. Fire department connections.
19. Backflow preventers.
20. Precast valve boxes and box covers.

C. Shop drawings: Include plans, elevations, details and attachments.
   1. Precast and cast in-place vaults and covers.
   2. Wiring diagrams for alarm devices.

D. Field test reports: Indicate and interpret test results for compliance with the Project requirements.

## 1.7 QUALITY ASSURANCE

A. Comply with requirements of utility supplying water. Do not operate existing valves or tap existing piping without written permission and/or presence of utility company representative.

B. Comply with the following requirements and standards:
   1. NSF 61: "Drinking Water System Components-Health Effects" for materials for potable water.
   2. NFPA 24: "Installation of Private Fire Service Mains and Their Appurtenances" for materials, installations, tests, flushing, and valve and hydrant supervision.
   3. NFPA 70: "National Electric Code" for electrical connections between wiring and electrically operated devices.

C. Provide listing/approval stamp, label, or other marking on piping and specialties made to a specified standard.

## 1.8 MATERIAL DELIVERY, STORAGE AND HANDLING

A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:
   1. Ensure that valves are dry and internally protected against rust and corrosion.

2. Protect valves against damage to threaded ends and flange faces.
3. Set Valves in best position for handling. Set valves closed to prevent rattling.

B. Deliver piping 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.

C. Handling: Use slings to handle valves and fire hydrants whose size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

D. During Storage: Use precautions for valves, including fire hydrants according to the following.
1. Do not remove end protectors, unless necessary for inspection, then reinstall for storage.
2. Protection from Weather: Store indoors and maintain temperature higher than ambient dew-point temperature. Store indoors and maintain temperature higher than ambient dew point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

E. Do not store plastic pipe and fittings in direct sunlight.

F. Protect pipe, fittings, flanges, seals and specialties from moisture, dirt and damage.

G. Protect linings and coatings from damage.

H. Handle precast boxes, vaults and other precast structures according to manufacturer's written instructions.

I. Protect imported bedding and backfill material from contamination by other materials.

## 1.9 COORDINATION

A. Coordinate connection to existing water mains with water utility supplying water.

B. Coordinate piping materials, sizes, entry locations, and pressure requirements with building domestic water distribution piping and fire protection piping.

## 1.10 HAZARDOUS MATERIAL – ASBESTOS CONCRETE PIPE AND ASBESTOS CONTAINING MATERIAL

A. Asbestos cement pipe (ACP) exists within the project area and replacement of existing ACP is anticipated but shall be abandoned in place unless otherwise

noted in the plans. The contractor shall make every attempt to protect all asbestos containing items during the execution of this contract. However, there will be instances where ACP or asbestos containing material will need to be removed, handled, cut, disturbed, or disposed of and the contractor shall comply with all local, state and federal regulations regarding construction activities near asbestos containing materials.

## PART 2 - PRODUCTS

### 2.1 LARGE SIZE SERVICE AND DISTRIBUTION PIPES

A. PVC Pipe: Sizes 4-inch through 48-inch.
   1. Pipe:
      a. 4-inch through 12-inch: AWWA C900.
      b. 14-inch through 48-inch: AWWA C905.
   2. Fittings: DI
   3. Unrestrained Joints:
      a. Push-On Bell and Spigot Joint: AWWA C900.
   4. Restrained Joints:
      *a.* Push-On Bell and Spigot Joint: Harness assembly as manufactured by Ebaa Iron (Eastland, TX) (Tel. 800-433-1716) or approved equal.
      b. Plain End PVC to DI Mechanical Joint: Ebaa Iron (Eastland, TX) (Tel. 800-433-1716) or approved equal.
   5. Steel or Ductile Iron Couplings:
      a. Plain End Pipe to Plain End Pipe: Ductile iron or steel bolted couplings, manufacturer's shop coating with low alloy steel bolts and nuts. Steel couplings to conform to AWWA C219. Smith-Blair, Inc, (Texarkana, AR) (Tel. 501-773-5127), Dresser (Bradford, PA) (Tel.-814-368-3131) or approved equal.
      b. Plain End Pipe to DI or Steel Flanged Pipe: Ductile iron or steel bolted flanged coupling adapters, manufacturer's shop coating with low alloy steel bolts and nuts. Steel flanged couplings to conform to AWWA C219. Smith-Blair, Inc, (Texarkana, AR) (Tel. 501-773-5127), Dresser (Bradford, PA) (Tel.-814-368-3131) or approved equal.
   6. PVC Couplings
      a. Unrestrained Plain End to Plain End Pipe: AWWA C900, as manufactured by CertainTeed (Valley Forge, PA) (Tel. 610 341-6820) or approved equal. *[*
      b. Restrained Plain End to Plain End Pipe: AWWA C900, "Certa-Lock" as manufactured by CertainTeed (Valley Forge, PA) (Tel. 610 341-6820) or approved equal.

### 2.2 CORROSION PROTECTION

A. All ductile iron fittings shall be protected against corrosion with the installation of

corrosion protection wrapping.

B. POLY-WRAP AND POLYETHYLENE ADHESIVE TAPE

1. Poly-wrap shall be continuous tubing formed from 8-mil (0.2-mm) thick virgin polyethylene, in accordance with AWWAC105. Minimum polyethylene tube size shall be as follows:

| PIPE SIZE | POLY-WRAP FLAT TUBE WIDTH |
|---|---|
| 4 to 8 inches (100 to 200 mm) (100 through 200mm) | 21" (530mm) |
| 10" through 12" (250 through 300mm) | 29" (735mm) |
| 14" through 16" (350through 400mm) | 37" (940mm) |

2. Adhesive tape shall be a general-purpose polyethylene adhesive tape, 2-inches (50-mm) wide and at least 8 mil (0.2mm) thick.

2.3 HIGH DEFLECTION FITTINGS/BALL JOINTS

A. Plain End Pipe: Xtra Flex Restrained Joint High Deflection Fittings, 4-inch through 24-inch, U. S. Pipe, (Birmingham, AL) (Tel. 205-254-7442) or approved equal.

B. Mechanical or Flanged Joint: Flex 900, 4-inch through 12-inch, Ebaa Iron Sales, (Eastland, TX) (Tel. 800-433-1716) or approved equal.

2.4 EXPANSION JOINTS

A. TR Flex Joints: TR Flex Telescoping Sleeve, 4-inch through 64 inch, U. S. Pipe, (Birmingham, AL) (Tel. 205-254-7442).

B. Mechanical or Flanged Joint: Ex-Tend 200, 4-inch through 36-inch, EBAA Iron Sales, (Eastland, TX) (Tel. 800-433-1716) or approved equal.

2.5 FLEXIBLE EXPANSION JOINTS

A. Plain End to Plain End Pipe: “Xtra Flex,” sizes 4-inch through 24-inch, U. S.

Pipe, (Birmingham AL) (Tel. 205-254-7442) or approved equal.

B. Flanged or mechanical Joint: “Flex-Tend,” sizes 3-inch through 48-inch, Ebaa Iron (Eastland TX) (Tel. 800-433-1716) or approved equal.

C. Flanged Joint: Starflex, Series 500, Star Pipe Products, (Tel. 800-999-3009) or approved equal.

## 2.6 SERVICE LINE VALVES AND FITTINGS

A. General: AWWA C-800

B. Includes service lines, ½ inch through 2 inch, from main to meter valve, including corporation stops and curb stops.

## 2.7 GATE VALVES

A. Provide on lines 10-inch and smaller.

B. Valves, 3-Inch through 20-Inch: AWWA C509, resilient-seated, non-rising stem, gray or ductile-iron body and bonnet, with bronze or gray or ductile-iron gate, bronze stem and square stem operating nut unless noted otherwise. All bolts, nuts and washers, except operating nut, shall be stainless steel. Stem operating nut to be 2-inches square and open counter-clockwise. Stem extensions shall be installed to bring the stem operating nut to within 2-feet of finish grade where the depth from finish grade to the stem operating nut exceeds 4-feet. Equip valves in pump stations and other interior or vault installations with hand-wheels. Provide protective epoxy interior and exterior coating according to AWWA C550 and manufacturer’s recommendations.

C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:
   1. Mueller Company (Decatur, IL) (Tel.800-423-1323).
   2. M&H Valve Company (Anniston, AL) (Tel. 205-237-3521).
   3. Clow Corporation (Oskaloosa, IA).

D. Valve Box and Cover: 9-inch minimum diameter PCC box with extensions of length required for depth of bury of valve, and cast iron or ductile iron cover with lettering “WATER”. Both the box and the cover shall be rated for AASHTO H20 loading.

## 2.8 AIR RELEASE, AIR/VACUUM AND COMBINATION AIR VALVES

A. AWWA C512, specific type of valve, size, details and valve box as indicated.

B. Available Manufacturers: Subject to compliance with requirements,

manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:

1. Apco Valves, Valve and Primer Corporation (Schaumburg, IL) (Tel. 708-529-9000).
2. Crispin Valve (Berwick, PA) (Tel. 570-752-4524)

## 2.9 BLOW-OFF VALVES

A. Blow-off valve assemblies, details and boxes as indicated.

## 2.10 SWING CHECK VALVES

A. Valves 2-Inch through 24-Inch: AWWA C508, details as indicated.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:

1. Mueller Company (Decatur, IL) (Tel.800-423-1323).
2. M&H Valve Company (Anniston, AL) (Tel. 205-237-3521).

## 2.11 BALL VALVES

A. Valves 6-Inch through 48-Inch: AWWA C507, details as indicated.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:

1. Crane Company (New York, NY).

## 2.12 PRESSURE-REGULATING VALVES

A. Valve: Automatic, pilot-operated, cast-iron body with interior coating according to AWWA C550. 250-psi Working-pressure, bronze pressure-reducing pilot valve and tubing, and means for discharge pressure adjustment. Details as indicated.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:

1. Cla-Val Company (Newport Beach, CA) (Tel. 714-548-2201).
2. Bermad (Porterville, CA) (Tel. 209-781-6630).
3. Ames Company (Woodland, CA) (Tel. 916-666-2493).

## 2.13 FLOW-REGULATING VALVES

A. Valve: Automatic, pilot-operated, cast-iron body with interior coating according to AWWA C550. 250-psi working-pressure, bronze pressure-reducing pilot valve and tubing, and means for flow adjustment. Details as indicated.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:
   1. Cla-Val Company (Newport Beach, CA) (Tel. 714-548-2201).
   2. Bermad (Porterville, CA) (Tel. 209-781-6630).
   3. Ames Company (Woodland, CA) (Tel. 916-666-2493).

## 2.14 SERVICE CONNECTIONS AND WATER METERS

A. Service connections and water meter details and boxes per current water purveyor standard details.

## 2.15 FIRE HYDRANTS

A. Wet Barrel: AWWA C503, details as indicated.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:
   1. Clow (800 Series) Model 860
   2. Clow (Ranger) Model 960
   3. Jones Model J-3760

C. Available Paint Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:
   1. Kelly Moore – Kel Guard Enamel “Sunburst/Safety Yellow” No 1700-63
   2. Sherwin Williams – Metalex ”Safety Yellow” No.B42Y37

## 2.16 REDUCED PRESSURE ASSEMBLY BACKFLOW PREVENTER – IRRIGATION AND DOMESTIC

A. Provide as indicated and as required by State or local agency.

B. General: AWWA C511, with OS gate valve on inlet and outlet, and strainer on inlet. Include test cocks and pressure-differential relief valve with ASME A112.1.2 air gap fitting located between 2 positive-seating check valves for continuous-pressure application.

C. Body:
   1. 2-Inch and Smaller: Bronze with threaded ends.
   2. 2-1/2-Inch and Larger: Bronze, cast iron steel, or stainless steel with

flanged ends.

D. Interior Lining: AWWA C550, epoxy coating for cast iron or steel bodies.

E. Interior Components: Corrosion-resistant materials.

F. Manufacturer shall be approved by water purveyor, Materials List Attached.

2.17 DOUBLE DETECTOR CHECK BACKFLOW PREVENTER – FIRE

A. FM approved or UL listed, with OS&Y gate valve on inlet and outlet, and strainer on inlet. Include two positive-seating check valves and test cocks, and bypass with displacement-type water meter, valves, and double-check backflow preventer, for continuous pressure application.

B. Manufacturer shall be approved by water purveyor. Materials List Attached.

2.18 POST INDICATOR VALVE

A. General: UL 789, FM approved, vertical-type, cast-iron body with operating wrench extension rod, and adjustable cast-iron barrel of length required for depth of bury of valve.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:
1. Mueller Co. (Decatur, IL) (Tel.800-423-1323).
2. Clow Corporation (Oskaloosa, IA).

2.19 FIRE DEPARTMENT CONNECTION

A. Exposed, Freestanding Fire Department Connection: UL 405, cast brass body with threaded inlets according to NFPA 1963 and matching local fire department hose threads and threaded bottom outlet. Include lugged caps, gaskets and chains; lugged swivel connections and drop clapper for each hose-connection inlet; 18-inch high brass sleeve; and round escutcheon plate. Two 2-1/2-inch NPS inlets and 4-inch NPS outlet.

2.20 UNDERGROUND VAULTS/PITS

A. General: Portland cement concrete, precast or cast-in-place as indicated.

B. Exterior Concrete Pavement: Section 32 05 23.

C. Access Openings: As indicated.

D. External Load: Earth load plus AASHTO H20 live load if located in traffic area.

## 2.21 TRACER WIRE

A. General: Minimum #12 AWG stranded copper wire with blue THW, THWN, or THHN rated insulation.

## 2.22 WARNING TAPE

A. General: Non-detectable 3-inch warning tape made of solid blue film with continuously printed black-letter message reading “CAUTION—WATER LINE BURIED BELOW.”

## 2.23 PCC THRUST BLOCKS

A. Portland Cement Concrete and Reinforcing Steel: Section 32 05 23.

# PART 3 - EXECUTION

## 3.1 PIPE INSTALLATION

A. General: Install pipe, fittings, and appurtenances utilizing best practices, manufacturer’s instructions, and in accordance with the following:
   1. PVC pipe: AWWA M23 and AWWA C605.

B. Pipe Depth and Trench Configuration: Conform to elevations, profiles and typical trench section(s) indicated.

C. Excavation, Bedding, Backfill, and Compaction: Section 31 23 33.

D. Handling: Carefully handle during loading, hauling, unloading and placing operations to avoid breakage or damage. Use strap type slings for lifting and placing; no chains or hooks will be permitted. Comply with manufacturer’s recommendations.

E. Laying: Before lowering pipe into the trench, remove all stakes, debris, loose rock and other hard materials from the bottom of the trench. Lay accurately in conformance with lines and grades indicated. Lay pipe on a bed of bedding material specified and prepared by handwork, dug true to grade. Furnish firm bearing for pipe throughout its entire length with bell holes provided at the ends of each pipe length of sufficient size to permit making up the particular type of joint being used. Adjust pipe to line and grade by scraping away or filling and tamping material under the body of the pipe for the entire pipe length and not by blocking or wedging. After final positioning, hold pipe in place in trench with backfill material placed equally on both sides of the pipe at as many locations

as required to hold the pipe section in place.

F. Curved Alignment: When necessary to conform to the alignment specifically indicated, lay pipe on a curved alignment by means of asymmetrical closure of joints or bending of the pipe barrel. If necessary, use shorter than the standard lengths of pipe to achieve curvature specified. Do not exceed the recommendations of the pipe manufacture for deflections at the joints or pipe bending.

G. Closure: Close open ends of pipes and appurtenance openings at the end of each day's work or when work is not in progress.

## 3.2 CONNECTING TO EXISTING MAINS

A. Pressure Tap Connections: Perform in accordance with the requirements of the owner of the system being tapped. Maintain a positive pressure flow from the main being tapped to the tapping device to flush plastic chips, metal ribbons, etc. into the tapping devise and not into the pipe being tapped.

B. Other Connections: As indicated and in accordance with the requirements of the owner of the line being connected to.

## 3.3 ANCHORAGE INSTALLATION

A. Mechanically Restrained Joints: Install where indicated for lengths indicated in accordance with manufacturer's instructions.

B. PCC Thrust Blocks: Install where required and as indicated. Bearing area indicated is to be against undisturbed earth. Allow a minimum of 24-hours curing time before introducing water into the pipeline and allow a minimum of 7-days curing time before pressure testing.

## 3.4 HIGH DEFLECTION FITTINGS/BALL JOINTS, EXPANSION JOINTS, AND FLEXIBLE EXPANSION JOINTS

A. Install as indicated and in accordance with the manufacturers recommendations.

## 3.5 VALVE INSTALLATION

A. Install all valves in accordance with the manufacturer's instructions and the following:
   1. General:
      a. Gate Valves: Appendix A of AWWA C509.
      b. Butterfly Valves: Appendix A of AWWA C504.

2. Joints:
   a. Valves on DI, PE and PVC Pipe: Mechanical joint valves for buried locations. Flanged-end valves for installation in vaults/pits.
   b. Valves on Steel Pipe: As indicated for buried locations. Flanged-end valves for installation in vaults/pits.

## 3.6 SERVICE CONNECTIONS INSTALLATION

A. Install as indicated and in accordance with the requirements of the owner of the system.

## 3.7 WATER METER INSTALLATION

A. Installed by water purveyor. Contractor shall coordinate installation.

## 3.8 FIRE HYDRANT INSTALLATION

A. Install as indicated and in accordance with the requirements of the owner of the system and the fire department.

## 3.9 REDUCED-PRESSURE PRINCIPLE ASSEMBLY BACKFLOW PREVENTER INSTALLATION

A. Install as indicated and in accordance with the requirements of the owner of the system and the local health department requirements.

## 3.10 DOUBLE CHECK DETECTOR ASSEMBLY INSTALLATION

A. Install as indicated and in accordance with the requirements of the owner of the system and the fire department.

## 3.11 POST INDICATOR VALVE INSTALLATION

A. Install as indicated and in accordance with the requirements of the owner of the system and the fire department.

## 3.12 FIRE DEPARTMENT CONNECTION INSTALLATION

A. Install as indicated and in accordance with the requirements of the owner of the system and the fire department.

## 3.13 UNDERGROUND VAULT/PIT INSTALLATION

A. Install as indicated.

B. Excavation and Backfill: Section 31 23 33.

## 3.14 TRACER WIRE INSTALLATION

A. Place and secure to top of pipe and fittings at about 3-foot intervals with 6" length of 1" wide filament tape, Scotch brand No. 898 or equal.

B. Form a mechanically and electrically continuous line throughout the pipeline, extending to the nearest valve or other pipeline appurtenance designated by the owner of the system or the Owner's Representative. Extend the wire up the outside of the valve box/riser and cut a hole that is 8-inches from the top, extend a 12-inch wire lead to the inside of the box. At other pipeline appurtenances, designated by the owner of the system or the Owner's Representative, terminate the 12-inch wire lead inside the enclosure.

C. Splice wire with a splicing device consisting of and electro-tin plated seamless copper sleeve conductor. Install as recommended by the manufacturer. Wrap splices and damaged insulation with electrician's tape.

## 3.15 WARNING TAPE INSTALLATION

A. Install tape approximately 1-foot above and along the centerline of the pipe.

B. Where tape is not continuous, lap tape ends a minimum of 2-feet.

## 3.16 PLASTIC PROTECTIVE WRAPPING FOR DUCTILE IRON PIPING

A. Cover underground ductile iron piping, including connecting galvanized steel spools, fittings, and like items with a loose, polyethylene plastic-film wrap to provide a continuous barrier between the pipe and the surrounding backfill.
   1. Wrap in accordance with AWWA¬C105.
   2. Wrapping isolates the pipe surfaces from contact with corrosive environments, and is not intended to provide complete sealing or to prevent ground water intrusion.

B. Cut poly-wrap tube to a length approximately 2-feet (600¬mm) longer than the length of the pipe section.
   1. Slip the poly-wrap around the pipe, centering it to provide a 1-foot (300-mm) overlap of each adjacent pipe section and bunching it accordion fashion until it clears the pipe ends.
   2. Lower the pipe into the trench and make-up the pipe joint with the preceding section of pipe. Make a shallow bell hole at joints to facilitate installation of the poly-wrap.

C. After completing the joint, make the overlap.
   1. Pull the bunched-up poly-wrap from the preceding length of pipe, slip it over the end of the new length of pipe, and secure it in place with two circumferential turns of tape plus enough overlap to assure firm adhesion.
   2. Slip the end of the poly-wrap from the new pipe section over the end of the first wrap until it overlaps the joint at the end of the preceding length of pipe.
   3. Tape it in place using three circumferential turns of tape. Take up the slack width to make a snug, but not tight, fit along the barrel of the pipe, securing the fold as necessary with adhesive tape at approximately 3-foot (900-mm) centers.

D. Repair any rips, punctures, or other damage to the poly-wrap with short length of poly-wrap tube cut open, wrapped around the pipe, and secured with tape.

E. Wrap the next section of pipe in the same manner.

F. Cover bends, reducers, and offsets with poly-wrap in the same manner as the pipe.

G. Wrap valves and other odd-shaped pieces that cannot practically be wrapped in a tube, with a flat sheet obtained by splitting open a length of poly-wrap tube.
   1. Pass the flat sheet under the valve and bring it up around the body of the stem.
   2. Make the seams by bringing the edges together, folding over twice, and taping down. Slack width and overlaps at joints shall be handled as described above.
   3. Tape poly-wrap securely in place at valve stem and other penetrations.

H. Where poly-wrapped pipe joins a pipe that is not poly-wrapped, extend the poly-wrap tube to cover the unwrapped pipe a distance of 2 feet (600¬mm), unless shown otherwise on the drawings. Secure the end with at least three circumferential turns of tape.

## 3.17 HYDROSTATIC PRESSURE AND LEAKAGE TEST

A. General:
   1. Provide all necessary materials and equipment, including water.
   2. Backfill all trenches sufficient to hold pipe firmly in position.
   3. Allow time for thrust blocks to cure prior to testing.
   4. Flush all pipes prior to testing to remove all foreign material.
   5. Perform pressure and leakage test concurrently.
   6. Test pressure: See Subsection titled “System Performance Requirements.”
   7. Apply test pressure by means of a pump connected to the pipe.
   8. Base test pressure on the elevation of the lowest point in the line.
   9. Fill each closed valve section or bulk-headed section slowly. Expel air from section being tested by means of permanent air vents installed at

high points or by means of temporary corporation cocks installed at such points. Remove and plug the temporary corporation cocks at the conclusion of the test.

10. Allow water to stand in the pipe for 24 hours before test pressure is applied.
11. Allow the system to stabilize at the test pressure before conducting the leakage test.
12. Do not operate valves in either the opening or closing direction at differential pressures above the valves rated pressure.
13. Maintain test pressure as specified for type of pipe being tested.
14. Pressure Test: Examine any exposed pipe, fittings, valves, hydrants and joints during the test, if no leaks are observed the section of line has passed the pressure test. If leaks are observed, repair any damaged or defective pipe, fittings, valves, or hydrants, and repeat the pressure test.
15. Leakage Test: Perform as specified hereafter for the type of pipe being installed.

B. DIP Leakage Test: Perform in accordance with AWWA C600. Selected requirements of AWWA C600 are repeated as follows:
   1. Maintain the test pressure, +/- 5 psi, for a minimum of two hours.
   2. No piping will be accepted if the leakage is greater than that determined by the following formula:

      $L = (S \times D \times P^{1/2})/133,200$

      L = Allowable leakage, gallons per hour.
      S = Length of pipe tested, feet.
      D = Nominal diameter of pipe, inches.
      P = Average test pressure during the leakage test, pounds per square inch (gauge).

C. PE Pipe Leakage Test: [The following leakage test for PE water pipe was taken from the Phillips Petroleum Company (Richardson, TX) (Tel. 800 527 0662) catalog for “Driscopipe.”
   1. Apply the test pressure and allow the pipe to stand, without makeup pressure, for sufficient time to allow for diametric expansion or pipe stretching to stabilize, approximately two to three hours.
   2. After the above stabilization has occurred, return the section being tested to the test pressure. Hold the test pressure for one to three hours. If the pressure in the test section drops, and it is determined the drop may be the result of expansion resulting from increasing temperature, a limited amount of additional water may be added to bring the pressure back to the test pressure. Allowable amounts of make-up water, to compensate for expansion due to increasing temperature, are as shown in the following table. Make-up water is only allowed during this final test period and not during the initial stabilization described in the previous paragraph. If the

additional water added is less than the allowable shown in the table and there are no visual leaks or significant pressure drops, the tested section passes the test.

| Nominal Pipe Size (in.) | Allowance for Expansion (U.S. Gals./100 Feet of Pipe) | | |
|---|---|---|---|
| | 1-Hour Test | 2-Hour Test | 3-Hour Test |
| 3 | 0.10 | 0.15 | 0.25 |
| 4 | 0.13 | 0.25 | 0.40 |
| 6 | 0.30 | 0.60 | 0.90 |
| 8 | 0.50 | 1.0 | 1.50 |
| 10 | 0.75 | 1.3 | 2.1 |
| 11 | 1.0 | 2.0 | 3.0 |
| 12 | 1.1 | 2.3 | 3.4 |
| 14 | 1.4 | 2.8 | 4.2 |
| 16 | 1.7 | 3.3 | 5.0 |
| 18 | 2.2 | 4.3 | 6.5 |
| 20 | 2.8 | 5.5 | 8.0 |
| 22 | 3.5 | 7.0 | 10.5 |
| 24 | 4.5 | 8.9 | 13.3 |
| 28 | 5.5 | 11.1 | 16.8 |
| 32 | 7.0 | 14.3 | 21.5 |
| 36 | 9.0 | 18.0 | 27.0 |
| 40 | 11.0 | 22.0 | 33.0 |
| 48 | 15.0 | 27.0 | 43.0 |

D. PVC Pipe Leakage Test: Perform in accordance with AWWA M23. Selected requirements of AWWA M23 are repeated as follows:
   1. Maintain the test pressure, +/- 5 psi, for a minimum of two hours.
   2. No piping will be accepted if the leakage is greater than that determined by the following formula:

      $L = (N \times D \times P^{1/2})/7,400$
      L = Allowable leakage, gallons per hour.
      N = Number of joints in the length of the pipeline tested.
      D = Nominal diameter of pipe, inches.
      P = Average test pressure during the leakage test, pounds per square inch (gauge).

E. Cement Mortar Lined and Coated Steel Pipe Leakage Test: Perform in accordance with AWWA M11. Selected requirements of AWWA M11 are repeated as follows:
   1. Maintain the test pressure, +/- 5 psi, for a minimum of two hours.
   2. There shall be no significant leakage for pipe with welded joints or mechanical couplings.

3. For pipe joined with O-ring rubber gaskets, a leakage of 25 gallons per inch of diameter per mile per 24-hours is allowed.

## 3.18 DISINFECTION

A. All New Pipelines shall be disinfected in accordance with one of the three methods specified in AWWA C651 and the following:
   1. Disinfect after pressure and leakage test have been performed and accepted.
   2. The method used shall be at the Contractor's option, unless specified by the owner of the water system.
   3. Engage the services of a commercial testing laboratory, approved by the owner of the water system, to perform the bacteriological tests specified in Section 5.1 of AWWA C651. Direct the testing laboratory to send the original report of the bacteriological testing to the owner of the water system. Should the laboratory report show that any sample taken was not acceptable, repeat the sterilization process shall until a satisfactory sterilization is accomplished.
   4. Lawfully dispose of the chlorinated water.

END OF SECTION 33 11 66

**SECTION 33 31 00**
**SANITARY SEWER SYSTEM**

# PART 1 - GENERAL

## 1.1 SECTION INCLUDES

A. Roadway and/or site sanitary gravity sewers and force mains up to 5 feet of any on-site building.

## 1.2 RELATED SECTIONS

A. Section 31 23 33, Utility Trenching and Backfill

## 1.3 RELATED DOCUMENTS

A. AASHTO:
   1. M 199: Precast Reinforced Concrete Manhole Sections.
   2. M 252: Corrugated Polyethylene Drainage Tubing.
   3. M 294: Corrugated Polyethylene Pipe, 12 to 48-inch Diameter.

B. ASTM:
   1. A 615/A615M: Deformed and Billet-Steel Bars for Concrete Reinforcement.
   2. A 674 Practice for Polyethylene Encasement for Ductile Iron Pipe for Water and Other Liquids.
   3. C 443: Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
   4. C 478: Precast Reinforced Concrete Manhole Sections.
   5. C 1173: Flexible Transition Couplings for Underground Piping Systems.
   6. C 1244: Test Method for Concrete Sewer Manholes by Negative Air Pressure (Vacuum) Test.
   7. D 1785: Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
   8. D 2235: Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
   9. D 2321: Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications.
   10. D 2564: Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.
   11. D 2751: Acrylontrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
   12. D 3034: Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
   13. D 4101: Propylene Injection and Extrusion Materials.
   14. F 477: Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
   15. F 656: Primers for Use in Solvent Cement Joints of Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings.

16. F 679: Poly(Vinyl Chloride) (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings.
17. F-1336: Poly(Vinyl Chloride) (PVC) Gasket Sewer Fittings.

C. AWWA:
1. C104: Cement Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
2. C105: Polyethylene Encasement for Ductile-Iron Pipe Systems.
3. C110: Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (76 mm Through 1,219 mm) for Water.
4. C111: Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
5. C150: Thickness design of Ductile Iron Pipe.
6. C151: Ductile-Iron Pipe, Centrifugally Cast, for Water.
7. C153: Ductile-Iron Compact Fittings for Water Service.
8. M41: Ductile Iron Pipe and Fittings.

D. Caltrans 2025 Standard Specifications.
1. Division 6 Section 51, Concrete Structures.
2. Division 7 Section 65, Concrete Pipe
3. Division 7 Section 75, Miscellaneous Metal.

## 1.4 DEFINITIONS

A. AASHTO: American Association of State Highway and Transportation Officials.

B. ABS: Acylonitrile-butadiene-styrene.

C. ASTM: American Society for Testing Materials.

D. AWWA: American Water Works Association.

E. PVC: Polyvinyl Chloride.

NPS: Nominal pipe size.

## 1.5 SUBMITTALS

A. Submittal procedure shall be as outlined in Division 1 – General Requirements.

B. Product data for the following:
1. Piping materials and fittings.
2. Special pipe couplings.
3. Joint sealants.
4. Cleanout plugs or caps.
5. Sewage air relief valves.

C. Shop drawings: Include plans, elevations, details and attachments for the following:
1. Precast concrete manholes, frames and covers.

2. Precast concrete clean out boxes and box covers.
3. Force main piping access openings.

D. Design Mix Reports and Calculations: For each class of cast in place concrete.

E. Field Test Reports: Indicate and interpret test results for compliance with performance.

## 1.6 DELIVERY, STORAGE AND HANDLING

A. Do not store plastic pipe and fittings in direct sunlight.

B. Protect pipe, fittings, and seals from dirt and damage.

C. Handle precast concrete pipe, manholes and other precast structures according to manufacturer's written instructions.

D. Protect imported bedding and backfill material from contamination by other materials.

# PART 2 - PRODUCTS

## 2.1 PIPING MATERIALS FOR GRAVITY FLOW

A. PVC Pipe:
1. Pipe:
   a. 4-inch through 15-inch: ASTM D 3034, SDR 26. Bell and spigot joints.
2. Fittings:
   a. 4-inch through 27-inch: ASTM F 1336.
3. Joint Gasket: Elastomeric seal, ASTM F 477.

## 2.2 GRAVITY PIPE CLEANOUTS

A. Piping: Same as sanitary sewer line if possible.

B. Top Cap: Threaded and of same material as piping if possible.

C. Box Size: As required to provide access and allow easy removal and reinstallation of cap.

D. Box Types:
1. Non-Traffic Areas: Portland cement concrete box and box cover, light duty.
2. Traffic Areas: Portland cement concrete box and box cover or steel or cast iron cover, heavy duty, both box and cover to be rated for AASHTO

H20 loading.

E. Box Cover Markings: "S.S.," unless otherwise specified.

F. Available Manufacturers: Subject to compliance with requirements, box manufacturers offering products that may be incorporated into the Project include, but are not limited to the following:
   1. Associated Concrete Products, Inc. (Santa Ana, California) (Tel. 714-557-7470).
   2. Brooks Products Inc. (El Monte, California) (Tel. 818-443-3017).
   3. Christy Concrete Products, Inc. (Fremont, California) (Tel. 800-486 7070).

## 2.3 MANHOLES

A. General: Size, shape, configuration, depth, etc. of manhole and frame and cover shall be as indicated.

B. Portland Cement Concrete and Reinforcing:
   1. Poured-in-Place Portion: Section 32 05 23.
   2. Precast Portion: ASTM C 478. Rate for AASHTO H20 loading in traffic areas.

C. Frames and Covers: As indicated and in accordance with Caltrans Standard Specification Section 75-1.

D. Steps: Manufacture from deformed, ½-inch steel reinforcement rod complying with ASTM A 615/A 615M and encased in polypropylene complying with ASTM D 4101. Include pattern designed to prevent lateral slippage off step. Acceptable manufacturer is Hanson Concrete Products, (Milpitas, CA) (Tel 408-262-1091) or equal.

E. Force Main Piping Access Openings:
   1. General: As indicated.

## 2.4 JOINT SEALANT FOR STRUCTURES AND MANHOLES

A. Mortar: Caltrans Standard Specification Section 51-1.
   1. Use to seal around pipes at connections to structures and manholes. Also use to seal joints between precast sections of structures and manholes.

B. Gaskets: Preformed flexible rubber or plastic gasket.
   1. Rubber Gaskets: ASTM C 443.
   2. Plastic Gaskets: Federal Specification SS-S-00210 (GSA-FSS), Type I, Rope Form; or alternate standard which may exist. Acceptable material is "Ram-Nek," as manufactured by the K. T. Snyder Company (Houston TX), or approved equal.

# PART 3 - EXECUTION

## 3.1 GRAVITY PIPE INSTALLATION

A. General: Install pipe, fittings, and appurtenances utilizing best practices, manufacturer's instructions, and in accordance with Section 6 and 7 of ASTM D 2321 for plastic pipe, Caltrans Standard Specification Section 65-2 for reinforced concrete pipe and chapter 11.3 of AWWA M41 for ductile iron pipe.

B. Pipe Depth and Trench Configuration: Conform to typical trench section(s) indicated.

C. Excavation, Bedding, Backfill, and Compaction: Section 31 23 33.

D. Handling: Carefully handle during loading, hauling, unloading and placing operations to avoid breakage or damage. Use strap type slings for lifting and placing; no chains or hooks will be permitted. Comply with the manufacturer's recommendations.

E. Laying: Before lowering pipe into the trench, remove all stakes, debris, loose rock and other hard materials from the bottom of the trench. Lay accurately in conformance with lines and grades indicated. Start laying the pipeline at the low end and proceed upstream. Lay bell and spigot pipe with the bell end facing upstream. Lay pipe on a bed prepared by handwork, dug true to grade. Furnish firm bearing for pipe throughout its entire length with bell holes provided at the ends of each pipe length of sufficient size to permit making up the particular type of joint being used. Adjust pipe to line and grade by scraping away or filling and tamping material under the body of the pipe for the entire pipe length and not by blocking or wedging. After final positioning, hold pipe in place in trench with backfill material placed equally on both sides of the pipe at as many locations as required to hold the pipe section in place.

F. Curved Alignment: When necessary to conform to the alignment specifically indicated, lay pipe on a curved alignment by means of asymmetrical closure of joints or bending of the pipe barrel. Use shorter lengths of pipe than the standard length if necessary to achieve curvature specified. Do not exceed the recommendations of the pipe manufacture for deflections at the joints or pipe bending.

G. Closure: Close open ends of pipes and appurtenance at the end of each day's work or when work is not in progress.

## 3.2 SPECIAL PIPE COUPLINGS

A. General: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.

B. Installation: Manufacturer's instructions.

## 3.3 CLEANOUT INSTALLATION

A. General: Install as indicated.

## 3.4 MANHOLE INSTALLATION

A. General: Install as indicated.

## 3.5 TESTING OF GRAVITY PIPING MAINS

A. Obstructions: After backfilling and compacting, but before paving or other surface improvements, test sewer for obstructions either by rodding or by the sewer ball method. Provide for intercepting all grit, rocks and other flushed debris to keep debris from entering the existing system.

B. At the option of the Contractor, either the following hydrostatic or air test shall be performed.

C. Hydrostatic Test:
   1. Test after backfilling to finish grade or pavement structural section subgrade in paved areas.
   2. Test sewer mains between successive manholes by closing the lower end of the sewer main to be tested and the inlet sewer main of the upper manhole with stoppers.
   3. Fill pipe and manholes with water to a point four feet below the ground surface of the upper manhole, but in no case less than four feet above the pipe invert. If ground water is present, the water surface at the upper manhole shall be at least four feet above the level of the ground water.
   4. Fill piping at least one hour prior to testing.
   5. Test piping at least two hours by maintaining the head specified above with measured additions of water. The sum of these additions of water, in the two-hour test period, shall be the leakage amount.
   6. The maximum allowable head of water above any portion of sewer being tested shall be 15-feet. Where the difference in elevation between successive manholes exceeds 15-feet, a test tee shall be installed between manholes, and the testing shall be carried on between the tee and the manhole.
   7. The allowable leakage shall not exceed 0.1-gallons per minute per inch diameter, per 1000-feet of sewer main being tested.
   8. If the leakage exceeds the above amount, determine the cause and remedy it prior to retesting.
   9. If the leakage is less than the allowable, but leaks are observed, repair the observed leaks.

D. Air Test:

1. Test after backfilling to finish grade or pavement structural section subgrade in paved areas.
2. Apply to each length between adjacent manholes.
3. Supply pressure gauge with minimum divisions of 0.10-psi and with an accuracy of +/- 0.04-psi. When requested by the Owner's Representative, provide certification that the gauge has been tested for accuracy within the last six months by a reliable testing firm.
4. Pressurize the test section to 3.5-psi, and then hold the pressure above 3.0-psi during a saturation period of at least 5 minutes. At the end of the saturation period, note the pressure, which must be a minimum of 3.0-psi, and begin the timed period. If the pressure drops 0.5-psi in less than the time given in the following table the section of pipe has not passed the test.

| Pipe Size | Minimum Time Allowed for Pressure to Drop 0.5-PSI |
|---|---|
| 4” | 125 seconds |
| 6” | 185 seconds |
| 8” | 245 seconds |
| 10” | 310 seconds |
| 12” | 370 seconds |
| 15” | 460 seconds |
| 18” | 555 seconds |
| 21” | 10 minutes |
| 24” | 12 minutes |

5. If the time for the pressure to drop 0.5-psi is 125% or less of the time indicated, the line shall immediately be re-pressurized to 3.0-psi and the test repeated. If, during the 5-minute saturation period, the pressure drops less than 0.5-psi after the initial pressurization and air is not added, the section undergoing the test shall have passed.
6. If the test did not pass, find and repair the leak to the satisfaction of the Owner's Representative.
7. When the prevailing ground water is above the line being tested the air pressure shall be increased 0.43-psi for each foot the water table is above the invert of the pipe at the highest manhole.

## 3.6 TESTING OF LATERALS

A. At the option of the Contractor, either the following hydrostatic or air test shall be performed.

B. Hydrostatic Test:
   1. Test laterals before backfilling.
   2. Plug lateral at its ends and fill with water through the cleanouts.
   3. Maintain the water level in the cleanouts as high as possible throughout the test period.
   4. One hour after filling with water, examine the lateral for leakage.
   5. Repair all leaks to the satisfaction of the Owner's Representative.
   6. Do not backfill the trench until testing and repairs of the lateral are complete, and approved by the Owner's Representative.
   7. Following approval of the Owner's Representative, remove all plugs, dispose of the water and complete the connection to the main.

C. Air Test
   1. Test after backfilling to finish grade or pavement structural section subgrade in paved areas.
   2. Test in accordance with subsection above titled "Testing of Gravity Piping Mains," paragraph titled "Air Test."

## 3.7 TESTING OF MANHOLES ON GRAVITY LINES

A. At the option of the Contractor, either the following hydrostatic or vacuum test shall be performed.

B. Hydrostatic Test:
   1. Insert inflatable plugs in all sewer inlets and outlets.
   2. Fill the manhole with water to a point six inches below the base of the manhole frame.
   3. Maintain the water at this point for one hour to allow time for absorption.
   4. Begin one-hour test period. Measure the amount of water added in one-hour period to maintain the water level at six inches below the base of the manhole frame. Do not allow water level to drop more than 25% of the manhole depth.
   5. Determine the allowable leakage by the following formula.

      $L = 0.0002 \times D \times H^{1/2}$

      L = Allowable leakage, gallons per minute.
      D = Depth of manhole from top to bottom, feet.
      H = Head of water in feet as measured from the surface of the water in the manhole to the sewer line invert or to the prevailing ground water surface outside the manhole. The lesser height governs.
   6. If the leakage exceeds the allowable, determine the cause, take remedial action and re-test the manhole. If the leakage is less than the allowable and leaks are observed, repair the leaks.

C. Vacuum Test:
   1. General: Test in accordance with ASTM C 1244.
   2. Test prior to backfilling around the manhole.
   3. Test Preparation: Plug all lift holes and pipes entering or exiting the manhole.
   4. Place test head inside the top section of the manhole's cone section and inflate in accordance with the manufacturer's instructions.
   5. Draw a vacuum of 10-inches of mercury and shut the pump off.
   6. With the valve closed, the time for the vacuum to drop 9-inches shall be measured.
   7. The manhole shall pass the test if the time is greater than 60 seconds for a 48-inch diameter manhole, 75 seconds for a 60-inch diameter manhole and 90 seconds for a 72-inch diameter manhole.
   8. If the manhole fails the initial test, make necessary repairs with a non-shrink grout while the vacuum is still being drawn. Retest until a satisfactory test is obtained.

END OF SECTION 33 31 00

**SECTION 33 41 00**
**STORM DRAIN SYSTEM**

PART 1 - GENERAL

1.1 SUMMARY

A. Provide and install all appurtenances as necessary to complete the storm drainage system and bioretention system, as shown on the plans, including piping and joints, flexible joints, manholes, catch basins, drain inlets, and area drains.

1.2 RELATED SECTIONS

A. Section 31 23 33, Utility Trenching and Backfill

B. Section 32 05 23, Exterior Concrete Pavement

1.3 RELATED DOCUMENTS:

A. AASHTO:

1. M 199: Precast Reinforced Concrete Manhole Sections.

B. ASTM:

1. A615/A615M: Deformed and Billet-Steel Bars for Concrete Reinforcement.

2. C 443: Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.

3. C 478: Precast Reinforced Concrete Manhole Sections.

4. C 1103: Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.

5. C 1173: Flexible Transition Couplings for Underground Piping Systems.

6. D 1785: Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

7. D 2321: Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications.

8. D 2564: Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping

Systems.

9. D 3034: Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

10. F 477: Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

11. F 656: Primers for Use in Solvent Cement Joints of Poly(Vinyl Chloride) (PVC)Plastic Pipe and Fittings.

12. F 679: Specification for Poly(Vinyl Chloride) (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings.

13. F-1336: Poly(Vinyl Chloride) (PVC) Gasket Sewer Fittings.

C. AWWA:

1. C104: Cement Mortar Lining for Ductile-Iron Pipe and Fittings for Water.

2. C105: Polyethylene Encasement for Ductile-Iron Pipe Systems.

3. C110: Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (76 mm Through 1,219 mm) for Water.

4. C111: Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

5. C150: Thickness design of Ductile Iron Pipe.

6. C151: Ductile-Iron Pipe, Centrifugally Cast, for Water.

7. C153: Ductile-Iron Compact Fittings for Water Service.

8. M41: Ductile Iron Pipe and Fittings.

D. Caltrans 2025 Standard Specifications

1. Division 6 Section 52 Reinforcement

2. Division 7 Section 65 Reinforced Concrete Pipe

1.4 REGULATORY REQUIREMENTS:

A. California State Parks Specifications and Details.

1.5 DEFINITIONS

A. AASHTO: American Association of State Highway and Transportation Officials.

B. ASTM: American Society for Testing Materials.

C. AWWA: American Water Works Association.

D. HDPE: High-density polyethylene.

E. NPS: Nominal pipe size.

F. PVC: Polyvinyl chloride.

G. RCP: Reinforced concrete pipe.

1.6 SUBMITTALS

A. Submittal procedure shall be as outlined in Division 1 – General Requirements.

B. Product Data Shop Drawings, etc. for the following:

1. Piping materials and fittings.

2. Special pipe couplings.

3. Joint sealants.

4. Plastic area drains.

5. Cleanout plugs or caps.

6. Precast manholes

7. Precast concrete catch basins, inlets, curb inlets, junction structures and area drains, including frames and grates.

8. Precast clean out boxes and box covers.

9. Bio-retention soil

C. Design Mix Reports and Calculations: For each class of cast in place concrete.

D. Field Test Reports: Indicate and interpret test results for compliance with performance.

1.7 DELIVERY, STORAGE AND HANDLING

A. Do not store plastic structures, pipe and fittings in direct sunlight.

B. Protect pipe, fittings, and seals from dirt and damage.

C. Handle precast concrete pipe, manholes and other precast structures according to manufacturer's written instructions.

D. Protect imported bedding and backfill material from contamination by other materials.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS FOR GRAVITY FLOW

A. PVC Pipe and Fittings: Pipes 12" and smaller in diameter shall be SDR 26 PVC conforming to ASTM D3034 using elastomeric gasket joint in a bell and spigot assembly system or as shown on plans. Minimum 2 feet cover, maximum 15 feet cover.

1. Fittings: Shall conform to ASTM F 1336.

2. Joint Gasket: Shall conform to elastomeric seal, ASTM F 477.

B. Reinforced Concrete Pipe: Pipes greater than 12" in diameter shall be Class III, Type II Portland Cement conforming to ASTM C76 and C150 or as shown on plans.

C. HDPE Pipe and Fittings: (As alternate to PVC only) pipes can be HDPE (High Density Polyethylene Pipe) DR-11 (160 psi), conforming to ASTM F714 and AASHTO designation M-294.

D. Manholes

1. General:

a. Size, shape, configuration, depth, etc. of manhole and frame and cover shall be as indicated.

2. Portland Cement Concrete and Reinforcing:

a. Poured-in-Place Portion: Section 03 30 00 – Cast in Place Concrete

b. Precast Portion:

1) Pre-cast Concrete manhole conforming to ASTM C478 and shall be Type II modified cement with a minimum compressive strength of 4,000 psi at 28 days. Iron Castings

for manhole covers and frames shall conform to ASTM A48, Class 25

2) ASTM C 478. Rate for AASHTO H20 loading in traffic areas.

3. Frames and Covers: As indicated and in accordance with Caltrans Standard Specification Section 75-1.02.

4. Steps: Manufacture from deformed, ½-inch steel reinforcement rod complying with ASTM A 615/A 615M and encased in polypropylene complying with ASTM D 4101. Include pattern designed to prevent lateral slippage off step.

   a. Acceptable manufacturers include:

      1) Hanson Concrete Products, (Milpitas, CA) (Tel 408-262-1091)

      2) Or approved equal.

E. Concrete Trench Drains

1. Modular system of concrete channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling. Include number of units required to form total length required.

2. Include the following components:

   a. Channel Sections: Interlocking-joint, precast modular units with end caps. Inside width as indicated with deep, rounded bottom, with built in slope or flat invert as indicated and outlets in number, sizes, and locations indicated. Include extension sections necessary for required depth.

   b. Frame and Grate: Ductile iron as indicated. Where drain is located in traffic areas, rate for AASHTO H20 loading.

3. Locking Mechanism: Manufacturer's standard device for securing grates to channel sections.

4. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:

   a. "Polydrain" by ABT Inc. (Troutman, NC) (Tel 704-528-9806).

   b. "ACO Drain" by ACO Polymer Products Inc. (Chardon, OH) (Tel. 800-543-4764).

   c. Or approved equal.

F. Cleanouts

1. Piping: Same as storm drain line if possible.

2. Top Plug or Cap: Same material as piping if possible. Plug or cap to be secure but removable, threaded or non-threaded.

3. Box Size: As required to provide access and allow easy removal and reinstallation of plug or cap.

4. Box Types:

   a. Non-Traffic Areas: Portland cement concrete box and box cover, light duty.

   b. Traffic Areas: Portland cement concrete box and box cover or steel or cast iron cover, heavy duty, both box and cover to be rated for AASHTO H20 loading.

5. Box Cover Markings: "S.D.," unless otherwise specified.

6. Available Manufacturers: Subject to compliance with requirements, box manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:

   a. Associated Concrete Products, Inc. (Santa Ana, California) (Tel. 714-557-7470).

   b. Brooks Products Inc. (El Monte, California) (Tel. 818-443-3017).

   c. Christy Concrete Products, Inc. (Fremont, California) (Tel. 800-486-7070).

G. Area drains shall only be used on 6 inch in diameter or smaller storm drain lines.

1. Area drains shall be polyvinyl chloride.

2. Grates shall be brass and comply with accessibility requirements.

3. Rate for AASHTO H20 loading in traffic areas.

H. Catch Basins shall be pre-cast or cast-in-place with 3,000 psi concrete and 1-1/2 inch max aggregate size.

I. Frames, Grates and Covers for Catch Basins: Caltrans Standard Specification Section 75-1.02, 75-1.03 and 75-1.05.

1. Galvanize steel frames, grates and covers.

2. Grates and covers shall be non-rocking.

3. Rate for AASHTO H20 loading in traffic areas.

2.2 SPECIAL PIPE COUPLINGS

1. Gravity Piping: ASTM C 1173. Rubber or elastomeric sleeve and band assembly fabricated to match outside diameters of pipes to be joined.

2.3 JOINT SEALANT FOR PRECAST STRUCTURES AND MANHOLES

A. Mortar: Caltrans Standard Specification Section 51-1.135.

1. Use to seal around pipes at connections to structures and manholes. Also use to seal joints between precast sections of structures and manholes.

B. Gaskets: Preformed flexible rubber or plastic gasket.

1. Rubber Gaskets: ASTM C 443.

2. Plastic Gaskets: Federal Specification SS-S-00210 (GSA-FSS), Type I, Rope Form; or alternate standard which may exist.

PART 3 - EXECUTION

3.1 GRAVITY PIPE INSTALLATION

A. Construct all storm drainage utilities to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations.

B. Install pipe, fittings, and appurtenances utilizing best practices, manufacturer's instructions, and in accordance with Section 6 and 7 of ASTM D 2321 for plastic pipe, Caltrans Standard Specification Section 65-1.07 for reinforced concrete pipe, and chapter 11.3.3 of AWWA M41 for cast iron and ductile iron pipe.

C. Pipe Depth and Trench Configuration: Conform to typical trench section(s) indicated.

D. Excavation, Bedding, Backfill, and Compaction: Section 31 23 33 – Utility Trenching and Backfill

E. Handling: Carefully handle during loading, hauling, unloading and placing operations to avoid breakage or damage. Use strap type slings for lifting

and placing; no chains or hooks will be permitted. Comply with manufacturer's recommendations.

F. Laying: Before lowering pipe into the trench, remove all stakes, debris, loose rock and other hard materials from the bottom of the trench. Lay accurately in conformance with lines and grades indicated. Start laying the pipeline at the low end and proceed upstream. Lay bell and spigot pipe with the bell end facing upstream. Lay pipe on a bed prepared by handwork, dug true to grade. Furnish firm bearing for pipe throughout it's entire length with bell holes provided at the ends of each pipe length of sufficient size to permit making up the particular type of joint being used. Adjust pipe to line and grade by scraping away or filling and tamping material under the body of the pipe for the entire pipe length and not by blocking or wedging. After final positioning, hold pipe in place in trench with backfill material placed equally on both sides of the pipe at as many locations as required to hold the pipe section in place.

G. Curved Alignment: When necessary to conform to the alignment specifically indicated, lay pipe on a curved alignment by means of asymmetrical closure of joints or bending of the pipe barrel. Use shorter lengths of pipe than the standard length if necessary to achieve curvature specified. Do not exceed the recommendations of the pipe manufacture for deflections at the joints or pipe bending.

H. Closure: Close open ends of pipes and appurtenance openings at the end of each days work or when work is not in progress.

## 3.2 SPECIAL PIPE COUPLINGS

A. General: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.

B. Installation: Manufacturers instructions.

## 3.3 CLEANOUT INSTALLATION

A. General: Install as indicated.

## 3.4 INSTALLATION OF CURB INLETS, CATCH BASINS, DROP INLETS, JUNCTION STRUCTURES, AREA DRAINS, ETC. AND MANHOLES

A. Excavation, Bedding, Backfill, and Compaction: Section 31 23 33 – Utility Trenching and Backfill

B. Poured in Place Structures: Install as indicated and Caltrans Standard Specification Section 51.

1. Shape bottoms to convey flows as indicated.

C. Precast Structures: Install as indicated.

1. Seal all joints and pipe entrances and exits.

2. Place concrete in bottom and shape to convey flows as indicated.

## 3.5 CONCRETE TRENCH DRAIN INSTALLATION

A. Excavation, Bedding, Backfill, and Compaction: Section 31 23 33 – Utility Trenching and Backfill

B. Install: As indicated and in accordance with the manufacturer's instructions.

C. Valve shall be installed in accordance with manufacturer's written Installation and Operation Manual and approved submittals.

## 3.6 TRENCHING AND EXCAVATION

A. Existing PCC or AC Areas: Cut PCC or AC to full depth at a minimum distance of 12-inches beyond the edge of the trench.

B. Excavate by hand or machine. For gravity systems begin excavation at the outlet end and proceed upstream. Excavate sides of the trench parallel and equal distant from the centerline of the pipe. Hand trim excavation. Remove loose matter.

C. Excavation Depth for Bedding: Minimum of 4-inches below bottom of pipe or as otherwise allowed or required by the Owner's Representative, except that bedding is not required for nominal pipe diameters of 2-inches or less.

D. Excavation Width at Springline of Pipe:

1. Up to a nominal pipe diameter of 24-inches: Minimum of twice the outside pipe diameter, or as otherwise allowed or required by the Owner.

2. Nominal pipe diameter of 30-inches through 36-inches: Minimum of the outside pipe diameter plus 2-feet, or as otherwise allowed or required by the Owner.

3. Nominal pipe diameter of 42-inches through 60-inches: Minimum of the outside pipe diameter plus 3-feet, or as otherwise allowed or required by the Owner.

E. Over-Excavations: Backfill trenches that have been excavated below bedding design subgrade, with approved bedding material.

F. Comply with the Owner limitations on the amount of trench that is opened or partially opened at any one time. Do not leave trenches open overnight without the approval of the Owner.

G. Where forming is required, excavate only as much material as necessary to permit placing and removal of forms.

H. Bottoms of trenches will be subject to testing by Owner. Correct deficiencies as directed by the Owner.

I. Grade bottom of trench to provide uniform thickness of bedding material and to provide uniform bearing and support for pipe along entire length. Remove stones to avoid point bearing.

## 3.7 BACKFILLING

A. Backfill per Section 31 23 33: Utility Trenching and Backfill.

## 3.8 CLEANUP

A. Upon completion of utility earthwork all lines, manholes catch basins, inlets, water meter boxes and other structures shall be thoroughly cleaned of dirt, rubbish, debris and obstructions of any kind to the satisfaction of the Owner.

## 3.9 TESTING

A. General: 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 authorities having jurisdiction.

3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours advance notice.

4. Submit separate reports for each test.

5. Where authorities having jurisdiction do not have published procedures, perform tests in accordance with latest edition of the Uniform Plumbing Code (UPC) Section 1109.0, Testing.

6. Leaks and loss in test pressure constitute defects that must be repaired.

7. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

B. Storm Drain Pipe:

1. Storm drain pipe, shall be hydrostatically joint tested, (air test is not to be used), in the field for water-tightness in accordance with ASTM Standard C 1103.

2. Perform test after pipe is bedded but prior to any backfill.

3. Testing may be done by manufacturing pipe with double gasket joints, or by utilizing a joint tester. Contractor shall obtain the Owner's Representative's approval of details of the Contractor's selected method prior to performing the testing.

4. Inspect all joints for leakage.

5. If the pressure holds, or drops less than 1psi in 5 seconds, the joint is acceptable.

6. After backfill of storm drain, the Contractor shall video inspect the pipeline. The video shall be supplied to the Owner for review.

## 3.10 DISPOSAL

A. Lawfully dispose of all unsuitable and excess or surplus material off-site at no cost to the Owner.

## 3.11 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

A. Construction Waste shall be managed in accordance with provisions of Standard Construction Waste Management and Disposal Practices. Documentation shall be submitted to satisfy the requirements of that section.

END OF SECTION 33 41 00

# APPENDIX A

## Flow Test Report

MARQUEE FIRE PROTECTION
a company of: PYE-BARKER

☒ Corporate:
3875 Atherton Rd. Ste. 200
Rocklin, CA 95765
Phone: (916) 641-7997
(707) 642-7905
Fax: (916) 641-0775

☐ Bay Area:
Phone: (925) 691-0744
Fax: (925) 691-0742

Contractor Lic #: CA 570970
OR 111387

# FLOW TEST REPORT

For:

## Mount Diablo State Park – Mitchell Canyon

## 96 Mitchell Canyon Rd,
## Clayton, CA 94517

**OFFICE OF THE STATE FIRE MARSHAL**
**APPROVED FIRE AND PANIC ONLY**

**11/10/25**

**25-0403**

**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.**

# Table of Contents

Page 3: Computer Generated Test Reports

Page 4: Hydrant Flow Test Field Data

Page 5: Photos From Flow Test

# Hydrant Flow Test Report

**Test Date** 6/16/2025 **Test Time** 10:00 AM

## Location

Mount Diablo State Park-Mitchell Canyon
96 Mitchell Canyon Rd
Clayton, CA 94517

## Tested by

Marquee Fire Protection
3875 Atherton Rd. Ste. 200
Rocklin, CA 956765
916-641-7997

## Notes

1. Gauged "READ" hydrant was Residence #1 - Hydrant #5
2. Flowing hydrant was located in front of Visitor Center Building

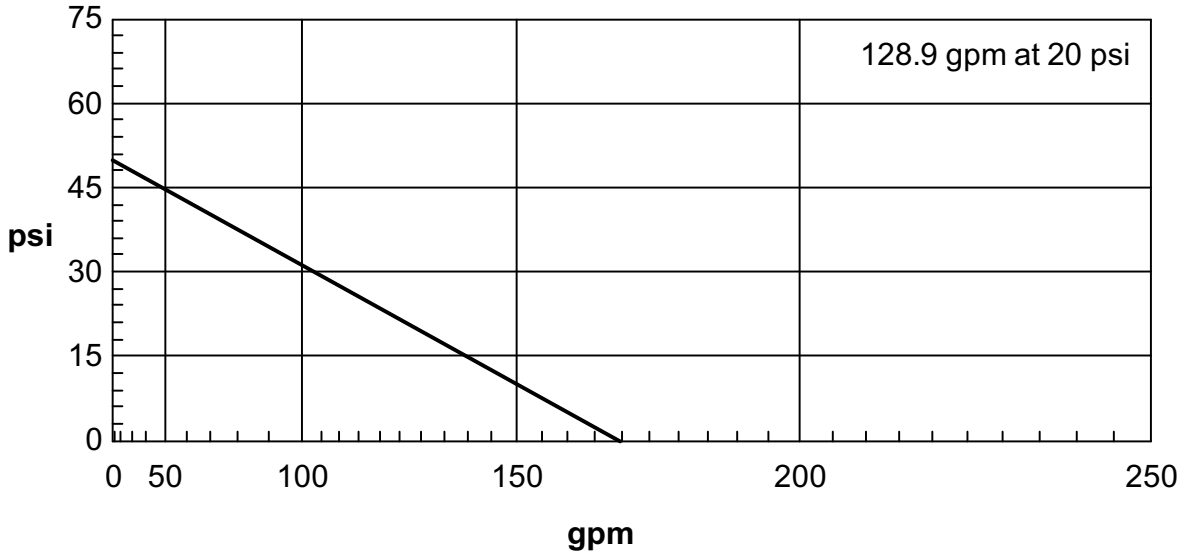
## Read Hydrant

50 psi **static pressure**
1 psi **residual pressure**
600 ft **hydrant elevation**

## Flow Hydrant(s)

| Outlet | Elev | Size | C | Pitot Pressure | Flow |
|---|---|---|---|---|---|
| #1 | 587 | 2.5 | .9 | 1 | 168 gpm |

## Flow Graph




Created with the free hydrant flow test program from www.igneusinc.com

# HYDRANT FLOW TEST FIELD DATA REPORT

Hydrant Flow Information for:

MOUNT DIABLO STATE PARK - MITCHELL CANYON

96 MITCHELL CANYON RD

**Location:** CLAYTON CA 94517

DATE: JUNE 16, 2025 TIME: 10 AM

| | | | |
|---|---|---|---|
| Static (psi) **Before Test** | 50 | Static (psi) **After Test** | |
| *Residual (psi) | 0 | *Residual (psi) w/ 2 outlets *if required | |
| Gallons (gpm) (from Chart, see computer report for calculated flow) | | †Gallons (gpm) w/ 2 outlets (from Chart, see computer report for calculated flow) | |
| **Pitot (psi) | 0 | **Pitots (psi) @ each outlet *if required | |
| Outlet Size | 2½ | †Number of Outlets | |
| Outlet Coefficient | | | |

**HYDRANT LOCATIONS:**

Pressure Hydrant: RESIDENCE #1 HYDRANT #5 Elevation: 600

Flowing Hydrant: VISITOR CENTER BUILDING

**TESTING AGENCY: Marquee Fire Protection** (916) 641-7997

NAME: DAN AUSTREY (SIGNATURE) D Austrey

NAME: JACOB BARRON (SIGNATURE) Jacob Barron

**WITNESSED By;**

(NAME) BRIAN MUNOZ (AGENCY) CAL FIRE - OSFM

(SIGNATURE): (PHONE):

(NAME) (AGENCY)

(SIGNATURE): (PHONE):

(NAME) (AGENCY)

(SIGNATURE): (PHONE):

(NAME) (AGENCY)

(SIGNATURE): (PHONE):

Footnotes:
*Achieve 10% drop (NFPA 291; 4.4.6)
**Avoid Pitot Readings of <10 if possible (NFPA 291; 4.8.6)
† The discharge in gpm from all hydrants shall be added together.

STATIC READING