STATE OF CALIFORNIA DEPARTMENT OF GENERAL SERVICES

REAL ESTATE SERVICES DIVISION
PROJECT MANAGEMENT AND DEVELOPMENT BRANCH

PROJECT MANUAL – Book I of I

INTRODUCTORY INFORMATION
BIDDING REQUIREMENTS
CONTRACTING REQUIREMENTS
SPECIFICATIONS
APPENDICES
FOR:

OXNARD FIELD OFFICE RENOVATION
DEPARTMENT OF MOTOR VEHICLES

OXNARD, VENTURA COUNTY, CALIFORNIA

Project Director:
Diana Tibor
Department of General Services
Project Management and Development Branch
West Sacramento, California

Architect:
Candace Epstein
Department of General Services
Project Management and Development Branch
West Sacramento, California

Consultants:
IDS Group, Inc.
PSOMAS
JCCA Engineering

September 2026
PROJECT ID: 0000000002765

CALIFORNIA DEPARTMENT OF GENERAL SERVICES

REAL ESTATE SERVICES DIVISION
PROJECT MANAGEMENT AND DEVELOPMENTBRANCH

PROJECT MANUAL:

SPECIFICATIONS

FOR:

DEPARTMENT OF MOTOR VEHICLES

OXNARD FIELD OFFICE RENOVATION

4050 SAVIERS ROAD

OXNARD, CA 93033

OFFICE OF THE STATE FIRE MARSHAL
APPROVED FIRE AND PANIC ONLY



4/21/2026
25-0272

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.

Diana Tibor, Project Director III
Telephone Number: 916-376-1716
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Address: 707 3rd St. Fourth Floor
West Sacramento, California, 95605

PROJECT NUMBER 000000000002765
MAY 2025

V1

SECTION 00 01 05

CERTIFICATIONS PAGE

PROJECT TITLE	:	OXNARD FIELD OFFICE RENOVATION
LOCATION	:	4050 SAVIERS ROAD, OXNARD, CA 93033
PROJECT NUMBER	:	000000000002765
OWNER	:	STATE OF CALIFORNIA
PROJECT MANAGER	:	Diana Tibor, Project Director III

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP: 02-123431 INC:
REVIEWED FOR
SS ☐ FLS ☐ ACS ☑
DATE: 05/19/2026

State of California
Department of General Services
Real Estate Services Division
Project Management and Development Branch
707 Third Street, 4th. Floor
West Sacramento, California 95605

Telephone Number : 916-376-1716

	 06/13/2025	 06/13/2025
ARCHITECT	MECHANICAL ENGINEER	ELECTRICAL ENGINEER
 06/13/2025	 06/13/2025	
STRUCTURAL ENGINEER	CIVIL ENGINEER	LANDSCAPE ARCHITECT

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END OF DOCUMENT

STATE OF CALIFORNIA
DEPARTMENT OF GENERAL SERVICES
REAL ESTATE SERVICES DIVISION
PROJECT MANAGEMENT AND DEVELOPMENT BRANCH

DOCUMENT 00 11 00

INVITATION FOR BIDS

SEALED BIDS: DGS will receive sealed bids at 707 Third Street, West Sacramento, California 95605, **before 2:00 P.M. December 12, 2026. Bids received after this date/time will not be considered received on time.**

A public bid opening will be held on **December 17, 2026 at 2:00 P.M**. at 707 Third Street, West Sacramento, CA 95605. Bidders may attend virtually or in person. Bidders attending the bid opening in-person will need to meet and sign in at the security guard station in the lobby at the mailing address below. At the public bid opening, all bids received before **2:00 P.M., December 16, 2026** will be opened and recorded onto a Preliminary Bid Tabulation. Bidders do not need to attend the bid opening as the Preliminary Bid Tabulation will be made available immediately after the bid opening is completed and it will be emailed to invited bidders.

The bid opening may be attended virtually via the following link:

Teams meeting link: https://teams.microsoft.com/meet/21775016046338?p=pCpW7YxckmSapCeBIE

Teams meeting ID: 217 750 160 463 38

Teams Passcode: fH2LE2Mo

HAND DELIVERED BIDS: Shall be placed in the DGS/OBAS Bid/Proposal Drop Box located in the lobby at 707 3rd Street in West Sacramento. The Drop Box will be opened at 2:00 p.m. Tuesday through Thursday and bids/proposals in the box will be certified as being received before 2:00 p.m. that day.

If mailing bids, ensure the outside of the mailing reads:

ATTENTION: ANNA BEAHM
OXNARD FIELD OFFICE RENOVATION
DEPARTMENT OF MOTOR VEHICLES
DO NOT OPEN
DEPARTMENT OF GENERAL SERVICES
OFFICE OF BUSINESS AND ACQUISITION SERVICES
707 3RD STREET, MS 508, WEST SACRAMENTO, CA 95605

The bids shall include all Work pursuant to the Drawings and Project Manual, and Addenda as may be issued prior to bid opening date.

Scope of Work: Major components of Project Work consist new site work, including but not limited to underground utilities, sidewalks, curbs, ramps, signage, parking spaces, tree removal, spaces, upgrade landscaping, exterior shade structure, site fencing and gates and EV charging stations. Building modifications include, but not limited to, building exterior finishes, interior/exterior walls and ceilings, structural components, modifications to MEP systems, sprinkler irrigation system, fire sprinkler system,

and hazardous material abatement.

License: Contractors' State License Classification required to bid Project is **B.**
Refer to Document 00 22 00, Supplementary Instructions to Bidders, Subparagraph 2.1.3 and 2.1.4, regarding performance of work of a Fire Protection specialty contractor license classification C-16

Certificate of Reported Compliance (CRC) – Fleet Vehicles: As a condition of Contract award, prior to Contract execution, Contractor shall submit copies of the valid CRCs for any fleet retained by the Contractor or any listed Subcontractor, for which any vehicles subject to the California Air Resources Board In-Use Off-Road Diesel Fueled Fleet Regulations, Section 2449(i), Title 12, California Code of Regulations, are used in the completion of the work included in the Contract.
More information on the In-Use Off-Road Diesel-Fueled Fleets Regulation can be found at the following link: https://ww2.arb.ca.gov/our-work/programs/use-road-diesel-fueled-fleets-regulation

Generative Artificial Intelligence (GenAI): 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 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 non-disclosure.

Upon notification by a Bidder 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.

Availability of Funds: Award of this contract is subject to the availability of funds through the State’s normal budget process and/or transfer of funds to the Department of General Services through the Architecture Revolving Fund.

Pre-bid Site Inspection: Bids will only be accepted from those Contractors having attended the **MANDATORY** pre-bid site inspection tour on **November 18, 2026 at 8:00 A.M.,** at which time representatives of the State and prospective bidders shall meet at Oxnard DMV Field Office, 4050 Saviers Road, Oxnard CA Outside of main entrance, The State’s requirements for Disabled Veteran Business Enterprise (DVBE) participation and other Contract requirements will be presented. Prime Contractors are encouraged to have their Key Administrator and DVBE office coordinator attend to receive this information and to have their questions answered. **Attendance for the entire inspection is required in order for bidders to be eligible to submit a bid.**

Executive Order N-6-22: The Bidder must be advised of Executive Order N-6-22 Russia Sanctions. On March 4, 2022, Governor Gavin Newsom issued Executive Order (EO) N-6-22 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, Bidder represents that it is not a target of Economic Sanctions. Should the State determine Bidder is a target of Economic

Sanctions or is conducting prohibited transactions with sanctioned individuals or entities, that shall be grounds for rejection of the Bidder's bid any time prior to contract execution, or, if determined after contract execution, shall be grounds for termination by the State.

Drawings and Project Manual: Bid forms, plans, specifications, and addenda will be available for download at http://www.caleprocure.ca.gov. Click on "Start Search". In the Event Name field, enter the project number and click "Search". While viewing the Event Details, click on "View Event Package" to view bid forms.

It is recommended that all vendors register as a bidder through the Cal eProcure website at https://www.caleprocure.ca.gov/pages/bidder-vendor.aspx. This will allow for automatic notifications if there is any modification to the Event such as the posting of an addendum or additional documentation.

Bid: Submit on Lump Sum basis

DVBE: Participation in Disabled Veterans Business Enterprises (DVBE) program **may** be required for this project. Refer to Project Manual Document 00 21 00, Project Manual Document 00 22 10 and Bid Forms for requirements. Bidders are advised to commence the required DVBE procedures immediately upon receipt of drawings and project manual.

DVBE Bid Incentive: The DVBE Incentive program is being applied on this project. Refer to Project Manual Document 00 21 00, Article 18.5.

Small Business Preference: Refer to Project Manual Document 00 21 00, Article 5.5

Non-Small Business Subcontractor Preference: Refer to Project Manual Document 00 21 00, Article 5.6

Bonds: Successful bidder shall furnish payment and performance bonds, each in the amount of 100 percent of the Contract price.

Non-Discrimination Program (Government Code § 12990): Refer to Project Manual Document 00 72 00, General Conditions of the Contract for Construction.

Labor Code: Pursuant to Labor Code § 1774, the Contractor to whom the contract is awarded, and any subcontractor under him, shall pay not less than the specified general prevailing rates of per diem to all workers employed in the execution of the contract. Pursuant to Labor Code § 1770 et seq., the Department of Industrial Relations (DIR) has ascertained general prevailing rate of per diem wages in the locality in which the work is to be performed. Copies of the general prevailing rate of per diem wages are available from the Department of Industrial Relations, Labor Statistics & Research Division, P.O. Box 420603, San Francisco, CA 94142, (415) 703-4780; or general prevailing rate of per diem may be accessed on the internet at Department of Industrial Relations website (https://www.dir.ca.gov) for the August 2026 published general prevailing rate of per diem wages for this contract. Copies of the general prevailing rate of per diem wages are on file at DGS' principal office, which shall be made available to any interested party on request. Note that when the general prevailing rate of per diem determination shows an expiration date (noted by a double asterisk**), to expire during the term of the contract, the Contractor must call or write the DIR to obtain the new rates and incorporate them in this contract for submittal of bid. The Contractor is responsible to comply with the Labor Code Sections and general prevailing rate of per diem determinations, including all the guidelines and the fine print in the general prevailing rate of per diem determinations. Refer to Project Manual Document 00 72 00, General Conditions of the Contract for Construction.

Labor Compliance Monitoring and Enforcement: This project is subject to monitoring and

enforcement by the Department of Industrial Relations (DIR), Compliance Monitoring Unit. All Contractors and subcontractors, regardless of tier, shall be required to comply with the Monitoring and Enforcement Program, including, but not limited to, contractor registration, submittal of electronic certified payroll reports directly to the DIR as applicable and cooperation with on-site monitoring by DIR personnel. Refer to Labor Code § 1771.4 et seq. and the General Conditions of the Contract for Construction, Document 00 72 00, Article 3.3.3 for more information.

END OF DOCUMENT

STATE OF CALIFORNIA

DEPARTMENT OF GENERAL SERVICES

REAL ESTATE SERVICES DIVISION

DOCUMENT 00 21 00

INSTRUCTIONS TO BIDDERS

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February 2026 Edition

DOCUMENT 00 21 00
INSTRUCTIONS TO BIDDERS

1. GENERAL

1.1 Bidder shall examine these instructions carefully and be responsive to conditions with which must be complied with prior to bid.

1.2 Bidders shall be aware of the requirements of codes referenced in the Bidding Requirements and in the Contract Documents. Bidders may access codes included in California law through publications or through the Internet. The web site for California law is: http://leginfo.legislature.ca.gov/faces/codes.xhtml.

2. COMPETENCE OF BIDDERS

2.1 License:

.1 Bidder may only bid on work for which Bidder is properly licensed by the Contractors' State License Board.

.2 Joint venture Bidders must possess a joint venture license. Each party to a joint venture shall be properly licensed for the Work of this Project.

2.2 Prior Disqualification: Public Contract Code Section 10162 provides that a bid may be rejected on the basis of a Bidder, any officer of such Bidder, or any employee of such Bidder who has a proprietary interest in such Bidder, having been disqualified, removed or otherwise prevented from bidding on, or completing a Federal, State or Local project because of a violation of a law or a safety regulation.

If the answer to the questionnaire included in the Bid Form is "yes" the Department will review the circumstances presented and if the Director deems acceptance of the bid is not in the best interest of the State, bid may be rejected.

2.3 Employment of Undocumented Aliens: Pursuant to Section 6101 of the Public Contract Code, the State may not award a public works contract to a bidder or contractor, nor shall a bidder or contractor be eligible to bid for or receive a public works contract, who has, in the preceding five years, been convicted of violating a state or federal law respecting the employment of undocumented aliens.

2.4 Contractor Registration:

.1 Pursuant to Sections 1725.5 and 1771.1 of the Labor Code, all contractors and subcontractors must be currently registered with the Department of Industrial Relations in order to qualify to bid on; be listed in a bid proposal, subject to the requirements of Section 4104 of the Public Contract Code; or engage in the performance of any contract for public work.

.2 Limited exceptions for Joint Venture Bidders and Projects with Federal Funds may apply pursuant to Section 1771.1 of the Labor Code.

2.5 Ineligible Subcontractors: Pursuant to Section 1777.1 or 1777.7 of the Labor Code, a contractor is prohibited from bidding on, being awarded or performing work on a public works project with a subcontractor who is ineligible to perform work on the public works project. Refer to the General Conditions of the Contract for Construction, Article 4.1.3.

2.6 Asbestos Abatement Certification: If Contractor performs the asbestos abatement work; Contractor must be certified for asbestos abatement work by the Contractors' State License Board. If Contractor subcontracts the asbestos abatement work, Contractor need not be certified for asbestos abatement, but the subcontractor must be certified by the Contractor's State License Board.

2.7 Hazardous Substance Removal Certification: If Contractor performs the hazardous substance removal work or remedial action; Contractor must be certified for hazardous substance removal work by the Contractors' State License Board. If Contractor subcontracts the hazardous substance removal work or remedial action, Contractor need not be certified for hazardous substance removal, but the subcontractor must be certified by the Contractor's State License Board.

3. EXAMINATION OF BID DOCUMENTS AND SITE

3.1 Bidder's Responsibility:

.1 Bidder shall carefully examine the Work site, Drawings, and Specifications (contract documents). This includes reference only documents that will not be part of the agreement, but are provided in addition to documents that will be part of the agreement. See the Office of State Publishing Plan Room https://www.ospplanroom.com/ (Details tab, Documents folder) for reference only documents.

.2 By submitting a bid, Bidder acknowledges that the Bidder understands the character, quality and quantity of surface, locations of utilities, subsurface materials, or obstacles to be encountered; insofar as this information is reasonably ascertainable from inspection of the Work site, Drawings, and Specifications.

.3 Bidder's examination shall include all exploratory work done by the State, as well as information presented in the Drawings, Specifications, and other documents as available.

3.2 Refer to Document 00 11 00, Invitation to Bid, for availability of bidding documents.

3.3 Failure by Bidder to acquaint itself with available information will not relieve Bidder from responsibility for estimating properly the difficulty or cost of successfully performing the Work.

3.4 In connection with the foregoing, Bidder's attention is invited to Paragraphs 3.1 and 9.1 of Document 00 72 00, General Conditions of the Contract for Construction.

4. DISCREPANCIES, CONFLICTS, OMISSIONS, OR ERRORS

4.1 If discrepancies, conflicts, omissions or errors are found in the Drawings and the Project Manual prior to the date of bid opening, Bidder shall request clarification from the State's Representative identified in the Project Manual. Bidder shall submit request on Request for Bidding Interpretation Form, Appendix 00 21 00.1.

4.2 Clarifications will be given only in the form of Addenda to all Bidders.

4.3 If no Addenda are issued related to supposed discrepancy, conflict, omissions or errors in figuring the Work, Bidders shall consider that discrepancies, conflicts, or omission between Drawings and Specifications shall be governed by Paragraph 1.5 of Document 00 72 00, General Conditions of the Contract for Construction.

4.4 Omission of an item in either the Specifications or Drawings does not create a discrepancy or conflict.

5. BIDDING DOCUMENTS

5.1 Bid Form: All bids must be on the forms provided by the Department of General Services. Bid not on the forms provided will be considered nonresponsive.

5.2 Completing the Bid Form:

.1 Bidder's name should be the same as listed on Bidder's license.

.2 Price(s) shall be in the manner required by the Bid Form.

.3 Bid Form shall be signed by Bidder or duly authorized representative.

1) If Bidder is an individual, name must be shown.
2) If Bidder is a partnership, name of the partnership must be shown and one or more partners shall sign the Bid Form.
3) If Bidder is a corporation, name of the corporation must be shown, the state of incorporation must be listed, the title of the signor must be shown, and the corporate seal must be used.
4) Bidder business and mailing address should be shown.

5.3 Required Listing of Proposed Subcontractors:

.1 Failure to list kind of Work, Name, or Location shall cause the bid to be rejected as non-responsive.

.2 Bidders' attention is directed to other provisions of the Subletting and Subcontracting Fair Practices Act, beginning with Public Contract Code Section 4100, related to penalties for failure to comply with the Act by using unauthorized subcontractors or by making unauthorized substitutions. See General Conditions of the Contract for Construction, Paragraph 1.1, for definition of subcontractor, and Article 4 for further reference to subcontractors.

.3 Bidder's attention is directed to Labor Code Section 1771.1, relating to inadvertent errors in the listing of subcontractors not currently registered with the Department of Industrial Relations.

5.4 Bidders Security:

.1 All bids shall be accompanied by the following forms of bidder's security: Bidder's Bond, cashier's check, certified check or cash. Bidder's Bond shall be executed by an admitted surety insurer, authorized to issue surety bonds in the State of California. Bond and checks shall be made payable to the director of the Department of General Services. The security shall be in an amount equal to at least 10 percent of the amount bid. A bid shall not be considered responsive unless one of the forms of bidder's security is enclosed with it.

.2 If Bidder's security is a Bidder's Bond, it must be executed on the form attached to the Bid Form.

5.5 Small Business:

.1 A five percent (5%) small business preference will be granted to Bidders certified as "Small Business" in accordance with Section 1896 et. Seq., Title 2, California Code of Regulations.

.2 If the Bidder is not already a Certified Small Business, applications for certification as "Small Business" must be submitted to the Office of Small Business and DVBE Certification (OSDS), 707 3rd Street, First Floor, Suite 1-400, West Sacramento, CA 95605; https://www.dgs.ca.gov/PD-OSDS. Firms can apply for small business certification online at https://www.dgs.ca.gov/PD/Services/Page-Content/Procurement-Division-Services-List-Folder/Apply-for-or-Re-apply-as-Small-Business-Disabled-Veteran-Business-Enterprise.

.3 Submit a copy of your OSDS certification letter with the Bid Form.

.4 Pursuant to Section 1896.14, in order to receive the small business preference, bidders must have a completed application (including proof of annual receipts) on file with the OSDS. The bidder must have requested a preference from OSDS and meet all applicable requirements under the subchapter and the State Small Business Procurement and Contract Act, (including but not limited to evidence to rebut presumptions) not later than five o'clock (5:00 p.m.) on the date on which the subject bid is opened.

5.6 Non-Small Business:

.1 The application of the five percent (5%) small business bidding preference is now extended to a bidder, whose business is not certified as a small business but commits to subcontracting at least twenty-five percent (25%) of its net bid price to businesses that are California certified small businesses and/or microbusinesses.

When applicable this preference will be granted when the non-small business:

- Has been determined to be a responsible bidder and submitted a timely responsive bid.
- Completes Document 00 43 16-2 list of California Certified Small Businesses that he/she commits to subcontract with for a commercially useful function in the performance of the project and submits this document no later than forty-eight (48) hours after the time of receipt of bids. Ascertain that the Bidder's Name and project Work Order number are noted. **If bidder fails to submit a properly completed Document 00 43 16-2 within 48 hours after the time of receipt of bids, the claim for non-small business preference will be denied.**

Submit completed Document 00 43 16-2 to Department of General Services, Administration Division, Office of Business and Acquisition Services, Contract Management Section, 707 3rd Street, Suite 2-300, West Sacramento, CA 95605 or by fax to (916) 376-1778.

6. SUBMISSION OF BID FORMS

6.1 It is the sole responsibility of the Bidder to see that its bid is received in proper time. Bid received after scheduled closing time for receipt of bids will be returned to Bidder unopened.

6.2 Bid Forms shall be submitted under sealed cover, plainly identified as a bid for the work of the Project being bid upon and addressed as directed in the Invitation to Bid and the Bid Form. Failure to do so may result in a premature opening of, or failure to open such bid. Bid Forms improperly marked may be disregarded.

7. WITHDRAWAL OF BID FORMS

7.1 Bids may be withdrawn prior to the time fixed in the public notice for opening of bids, provided that a request in writing, executed by Bidder or Bidder's authorized representative, for withdrawal of such bid is filed with the Administration Division, Office of Business and Acquisition Services,

Contract Management Section, or the Director of General Services at the location of the bid opening. Oral, facsimile, electronic, telegraphic, or telephonic request to withdraw the Bid Form is not acceptable. Withdrawal of a bid shall not prejudice the right of a Bidder to file a new bid.

7.2 This article does not authorize withdrawal of any bid after the time fixed in the Invitation to Bid for opening of bids.

8. PUBLIC OPENING OF BIDS

Bids will be publicly opened and read at time and place indicated in Invitation to Bid. Bidders or their authorized agents are invited to be present.

9. REJECTION OF IRREGULAR BIDS

9.1 Bids may be rejected if they show any alterations of form, additions not called for, conditional bids, incomplete bids, erasures, or irregularities of any kind. If bid amount is changed after the amount is originally inserted, the change must be initialed.

9.2 When Bid Form is signed by an agent, other than the officer or officers of a corporation authorized to sign contracts on its behalf, or are signed by an agent other than a partner of a partnership, or by an agent for an individual, a power of attorney must be on file with the Department of General Services prior to opening bids or shall be submitted with the Bid Form; otherwise the bid will be rejected as irregular and unauthorized.

10. COMPETITIVE BIDDING

10.1 If more than one Bid Form is offered by an individual, firm, partnership, corporation, association, or any combination thereof, under the same or different names, all such Bid Forms may be rejected. A party who has quoted prices on materials or work to a Bidder is not thereby disqualified from quoting prices to other Bidders, or from submitting a bid directly for materials or work.

10.2 Bidders are put on notice that any collusive agreement fixing the prices to be bid so as to control or affect awarding of the Contract is in violation of competitive bidding requirements of the State Contract Act and may render void any Contract let under such circumstances.

11. AWARD OF CONTRACT

11.1 The right is reserved to reject any and all bids and waive any irregularity in any bid received.

11.2 Award of the Contract, if awarded, will be to the lowest responsible Bidder whose Bid Form complies with all requirements prescribed.

.1 Such award, if made, will be made within 45 days after opening of bids.

.2 If lowest responsible Bidder refuses or fails to execute the Contract, the Director of General Services may award the Contract to the second lowest responsible Bidder. Such award, if made, will be made within 60 days after opening of bids.

.3 If second lowest responsible Bidder refuses or fails to execute the Contract, the Director of General Services may award the Contract to the third lowest responsible Bidder. Such award if made, will be made within 75 days after opening of bids.

11.3 The above time periods within which award of Contract may be made are subject to extension of such further period as may be agreed upon in writing between the Department of General Services and the Bidder concerned.

11.4 When Project is segregated into more than one prime Contract, and a Bidder upon one of the prime Contracts fail or refuses to execute the Contract, then the time for award of such Contract will be extended as provided by this Article, and the time for award of each of the other segregated prime Contracts will be extended by an equivalent length of time, if required.

12. SUBSTITUTION OF ALTERNATIVE MATERIALS, ARTICLES, OR EQUIPMENT

12.1 Pursuant to Public Contract Code Section 3400, alternative material(s), article(s), or equipment that are of equal quality and of required characteristics for the purpose intended may be proposed during the bidding period; for use in the Work, provided the Bidder complies with the following requirements:

.1 Proposals for alternative material(s), article(s), or equipment, requested during the bidding period, shall be submitted in writing, not later than the deadline date and time identified on the Request for Bidding Interpretation (RFBI), Appendix 00 21 00.1.

.2 The proposal will not be considered unless the submittal is accompanied by complete information and descriptive data necessary to determine equality of offered material(s), article(s) or equipment. Samples shall be provided when requested by the State. Burden of proof as to comparative quality, suitability, and performance of offered material(s), article(s), or equipment shall be upon the Bidder submitting the proposal. The State will be the sole judge as to such matters. In the event the State rejects the use of such alternative(s) submitted, then one of the particular products originally specified in the Contract Documents shall be furnished. If the proposal is accepted, all Bidders will be notified by Addendum.

.3 Refer to the General Conditions of the Contract for Construction, Clauses 2.2.7 and 3.12.10, for substitution requests after Contract Award.

13. RETURN OF BIDDER'S SECURITY

13.1 Within 10 days after the award of the Contract, the Department of General Services will return all Bidder's security, other than Bidder's Bonds, accompanying the Bid Forms that are not to be fully considered in making the award.

13.2 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.

14. CONTRACT BONDS

Contractor will be required to furnish in duplicate the Performance Bond and Payment Bond required by the State Contract Act, each in the amount of 100 percent of the Contract amount; as set forth in Paragraph 11.3 of Document 00 72 00, General Conditions of the Contract for Construction.

15. INSURANCE

Contractor will be required to furnish to the State, concurrently with execution of the Contract, a certificate of insurance coverage as required by Paragraph 11.1 of Document 00 72 00, General Conditions of the Contract for Construction.

16. EXECUTION OF CONTRACT

16.1 Contract shall be signed by successful Bidder and returned within 7 days of receipt. The Contract shall not be binding upon the State until it is executed by the Contractor and the State. Contract Documents required for execution of the Contract consist of the following:

.1 Agreement, Document 00 52 00.

.2 Contract Bonds.

.3 Certificate of Insurance.

.4 Signed set of Drawings and Project Manual for filing with the Contract.

16.2 Should Contractor begin work in advance of receiving notice that the Contract has been approved, any work performed in advance of the date of approval shall be considered as having been done at risk as a volunteer. In no event shall Contractor commence work until Contractor has received notification from the State that the certificate of insurance has been approved.

17. FAILURE TO EXECUTE CONTRACT

Failure to execute Contract within 7 days after successful Bidder has received Contract for execution may be cause for forfeiture of Bidder's security. Failure to provide required bonds and insurance constitutes failure to execute Contract.

18. PARTICIPATION IN DISABLED VETERANS BUSINESS ENTERPRISES (DVBE) PROGRAM

18.1 Pursuant to Section 10115 et seq. of the Public Contract Code, and Section 999 et seq. of the Military and Veterans Code, the Department of General Services has established an overall goal of not less than 3% participation by Disabled Veteran Business Enterprises (DVBE). However, these DVBE Participation Requirements may be modified for this project; reference Document 00 22 10 of the Project Manual for the percentage requirements.

18.2 Bids will only be accepted from those Bidders that certify that they have achieved the required participation, as outlined in Document 00 22 10 of the Project Manual, and as set forth in the Bid Form.

18.3 Applicants for DVBE certification may apply online at https://www.dgs.ca.gov/PD/Services/Page-Content/Procurement-Division-Services-List-Folder/Apply-for-or-Re-apply-as-Small-Business-Disabled-Veteran-Business-Enterprise. DVBE applicants must submit specific support documentation to the OSDS.

18.4 Bidder's attention is directed to the requirement that certifications and documentation must be submitted with the bid; otherwise bids will be considered non-responsive.

BIDDERS ARE ADVISED TO COMMENCE THE REQUIRED DVBE PROCEDURES IMMEDIATELY UPON RECEIPT OF DRAWINGS AND SPECIFICATIONS, OR NOT LESS THAN THREE (3) WEEKS PRIOR TO THE BID OPENING, WHICHEVER OCCURS FIRST.

18.5 DVBE INCENTIVE

.1 A DVBE Incentive will be granted to Bidders in accordance with Section 999.5(a) and (d) of the Military and Veterans Code and California Code of Regulations 1896.98 et seq.

.2 The DVBE Incentive will be applied during the bid evaluation process and will only be applied to responsive bids from responsible bidders proposing the percentage(s) of DVBE Participation

for the DVBE Incentive specified in the solicitation. Any Small Business Preference must be calculated prior to the DVBE Incentive calculation and evaluation.

.3 The incentive will be applied when a Bidder's DVBE Participation exceeds 3% the DVBE Mandatory participation Requirement, in an attempt to displace the apparent low bidder.

The DVBE Incentive is as follows:

Confirmed DVBE Participation	Incentive
7% and above	5%
6% to 6.99%	4%
5% to 5.99%	3%
4% to 4.99%	2%
3.01% to 3.99%	1%
0% -3%	No incentive – minimum 3% participation required

.4 The percentage of DVBE Incentive will not exceed 5% and will not exceed $500,000.00.

.5 For every bidder qualifying for the DVBE incentive, the amount (dollar value) of the incentive is computed using the qualifying bidder's percentage of DVBE incentive and the lowest responsive and responsible bid price. Calculations to determine adjusted bid price are for consideration only. Bids will be awarded for the actual bid amount as verified by the State.

.6 A certified Small Business may only be displaced by another certified Small Business with a higher percentage of DVBE participation and a lower adjusted bid price.

1) A certified Small Business shall not be displaced by a non-small business.
2) When applying the DVBE Incentive program, bidders claiming the "Non-Certified Small Business preference" are considered a non-small business.

19. CERTIFICATE OF REPORTED COMPLIANCE – FLEET VEHICLES

19.1 For any project using vehicles subject to the California Air Resources Board In-Use Off-Road Diesel Fueled Fleets Regulation, Section 2449(i), Title 12, California Code of Regulations, prior to the execution of a contract, Contractor shall be required to submit copies of the valid Certificates of Reported Compliance (CRC), issued by the California Air Resources Board. CRCs shall be provided for any fleet used by the Contractor or any listed Subcontractors.

19.2 CRCs are required for any contract involving the operation of self-propelled off-road diesel vehicles 25 horsepower or greater and most two-engine vehicles owned and operated in California, including vehicles that are rented or leased.

19.3 Certificates of Reported Compliance must be retained by the Contractor for three years after the completion of the project.

19.4 If no vehicles subject to the California Air Resources Board In-Use Off-Road Diesel Fueled Fleets Regulation shall be used on a project by the Contractor or any Subcontractor, Contractor shall provide a certification that no vehicles subject to these regulations will be used on the project.

END OF DOCUMENT

REQUEST FOR BIDDING INTERPRETATION (RFBI)

(Email no later than December 4 5:00 p.m.)

PMDB RFBI No.: _____
Requestor RFBI No.: _____
Request Date:_____
From (Bidder): _____

To: **Diana Tibor, Project Director III**
Project Management and Development Branch
Real Estate Services Division
Phone: 916-376-1716

Email: Diana.Tibor@dgs.ca.gov

Contact: _____
Phone: _____
Fax: _____
Email: _____

All RFBIs received prior to deadline identified above, and responses from the State will be published on http://www.caleprocure.ca.gov. Click on "Start Search." In the event name field, enter the project number and click search. While viewing the Event Details, click on "View Event Package" to view RFBI responses.

Project No.: 0000000002765
Project Name: Oxnard Field Office Renovation
Location: Oxnard, CA

Drawing Reference: _____ **Project Manual Reference**: _____

Question:

Bidder's Authorized Signature: _____

[ ] Check here if additional pages attached

Page 1 of ____

DOCUMENT 00 22 00

SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

The following requirements supplement Document 00 21 00, Instructions to Bidders:

1. PAYEE DATA RECORD

   Add the following to Subarticle 6.2:

   Bidders are requested to complete and return the State's Payee Data Record form, Std.204 (and Std. 205 if applicable), included with the Bid Forms. The Payee Data Record form is required in lieu of IRS W-9 when doing business with the State of California, and will be used by the State to prepare tax information returns as stated on the form.

   .1 Completion and submission of the form with the Bid Forms will expedite processing of the Award of Contract.

   .2 Failure to submit the completed form with the Bid will not be cause for rejection of a Bid.

   .3 Forms of all Bidders will be kept on file by the State for use in future awarded Contracts.

   .4 Bidders who have a completed and current Payee Data Record form on file with the Department of General Services, Real Estate Services Division, Contracts Section, may so state on the form and will not be required to submit a duplicate form.

   .5 The form is subject to Section 7(b) of the Privacy Act of 1974 (Public Law 93-5791). Refer to the Privacy Statement on the back of the form.

2. BIDDERS SECURITY

   Article 5.4 is removed.

3. SMALL BUSINESS

   Article 5.5 is removed.

4. NON-SMALL BUSINESS

   Article 5.6 is removed.

5. PUBLIC BID OPENING

   Article 8 is removed.

6. DVBE Incentive

   Article 18 is removed.

7. COMPETENCE OF BIDDERS

Add the following Subparagraph 2.1.3 to Paragraph 2.1 of Document 00 21 00, Instructions to Bidders:

.3 Bidders' attention is directed to Business and Professions Code Sections 7026.12 and 7057(c) which require the installation of a fire protection system to be performed only by a Contractor holding a Fire Protection specialty contractor license classification C-16. The Contractor for this Project must hold the C-16 license classification or contract directly with a first tier subcontractor with the C-16 license classification.

8. AWARD OF CONTRACT

Pursuant to Article 11 of Document 00 21 00, Instructions to Bidders, award of Contract, if awarded, will be made within 90 days, in lieu of 45 days as specified. Award period for second and third lowest responsible bidders will similarly be extended 15 days each.

END OF DOCUMENT

DOCUMENT 00 22 10

DISABLED VETERAN BUSINESS ENTERPRISE PARTICIPATION PROGRAM REQUIREMENTS

Public Contract Code Section 10115 establishes a contract participation goal of at least three percent (3%) for Disabled Veteran Business Enterprise (DVBE) for State agencies.

DVBE participation is required for this contract. Mandatory participation has been set at 3%. Participation above and beyond the requirement is strongly encouraged. This bid package provides information for the DVBE Participation Program. Bidders must meet DVBE Participation Program requirements to be viewed as a responsive bidder and considered for contract award.

PLEASE READ THESE INSTRUCTIONS CAREFULLY

Bidders must fully comply with DVBE Participation Program requirements. Bidders that do not submit a complete response may find their bid determined to be non-responsive and the bid rejected.

For assistance with meeting the DVBE participation program requirements, please contact:

Department of General Services
Administrative Division
Office of Business and Acquisition Services
Contract Services Section – SB-DVBE Advocate
707 Third Street, MS 508
West Sacramento, CA 95605
Email: OBASAdvocate@dgs.ca.gov

The **Office of Small Business and DVBE Services** (OSDS) offers program information and may be reached at:

Department of General Services
Office of Small Business and DVBE Services (OSDS)
707 3RD Street, 1st Floor, Room 400
West Sacramento, CA 95605-2811
Homepage: Apply for or Re-Apply for Certification as a Small Business and/or Disabled Veteran Business Enterprise
Receptionist: (916) 375-4940
FAX: (916) 375-4950
Email: OSDSHelp@dgs.ca.gov

Mailing Address:
Office of Small Business and DVBE Services (OSDS)
Room 1-400, MS 210
P.O. Box 989052
West Sacramento, CA 95798-9052

INSTRUCTIONS FOR
DVBE PARTICIPATION PROGRAM COMPLIANCE OPTIONS

If for any reason you fail to meet the DVBE Participation Requirement for this bid, your bid will be considered non-responsive.

Meet or exceed the DVBE participation requirements for the proposed contract by one of the following two (2) ways:

1. **DVBE Bidder -** If you are a DVBE bidder, agree to perform the required percentage of the contract bid amount or value with your firm or in combination with other DVBE firms. You **must** write that commitment on Article 9.2 of the Bid Form, Document 00 41 00. Instructions on how to complete this document are on that page.

2. **Non-DVBE Bidder -** If you are a non-DVBE bidder, agree to use other firms for at least the required percentage of the contract bid amount or value. You **must** write that commitment on Article 9.2 of the Bid Form, Document 00 41 00. Instructions on how to complete this document are on that page.

DVBE Certification: OSDS-DVBE certification is the only acceptable certification. To verify if a contractor is certified refer to the Cal eProcure web-site at The State of California Certifications . Bidders must provide certification verification for each participating DVBE bidder, subcontractor, and/or supplier. Applicants for DVBE certification may apply online at Apply for or Re-Apply for Certification as a Small Business and/or Disabled Veteran Business Enterprise. DVBE applicants must submit specific support documentation to the OSDS.

DVBE Bid Incentive: A DVBE Incentive will be granted to Bidders who have achieved DVBE participation exceeding 3% or greater of the value of the bid in accordance with Section 999.5(a) and (d) of the Military and Veterans Code and California Code of Regulations 1896.98 et seq. Refer to Project Manual Document 00 21 00, Article 18.5.

Pursuant to Military and Veterans Code §999.7, the awarding department shall withhold, on a contract entered into on or after January 1, 2021, ten thousand dollars ($10,000) from the final payment, or the full final payment if less than ten thousand dollars ($10,000), until a prime contractor complies with the certification requirements of subdivision (d) of Section Military and Veterans Code §999.5. A prime contractor that fails to comply with the certification requirement shall, after notice, be allowed to cure the defect. Notwithstanding any other law, if, after at least 15 calendar days but not more than 30 calendar days from the date of notice, the prime contractor refuses to comply with the certification requirements, the awarding department shall permanently deduct ten thousand dollars ($10,000) from the final payment, or the full payment if less than ten thousand dollars ($10,000).

ANSWERS TO FREQUENTLY ASKED QUESTIONS:

The following questions are among the most frequently asked regarding DVBE requirements:

Q: ***If I am awarded the contract, am I required to use the subcontractor/supplier proposed in my bid?***

A: Yes, unless you have requested and received approval from the State for substitution. Written requests should include the person's or firm's name to be substituted, the substitution reason, the reason a non-DVBE subcontractor is proposed, if applicable and describe the business to be substituted including its business status as a sole proprietorship, partnership, corporation or other entity and the certification status of the firm, if any. See Title 2, California Code of Regulations, Section 1896.64 (c) & (d) for substitution criteria.

The request and the State's approval or disapproval is not construed as an excuse for non-compliance with any other provision of the law, including but not limited to the Subletting and Subcontracting Fair Practices Act, or any other contract requirements relating to substitution of subcontractors. Failure to adhere to at least the DVBE participation proposed by the successful Contractor may be cause for contract termination and recovery of damages under the rights and remedies due the State for default section of the contract(s) and any other penalties provided for by statute.

Q: ***Who notifies the subcontractor when an award is made?***

A: Upon award to a prime Contractor, the Awarding Department notifies listed subcontractors of their contract participation. Primes are encouraged to notify their listed subcontractors immediately after an award is made to formalize their business agreements.

Q: ***What happens to bids considered non-responsive to the DVBE Participation Program requirements?***

A: Non-responsive bids are subject to rejection. Many are rejected because of:

- Incomplete documentation
- Documentation not received by bid due date
- Mathematical error related to the percentages

Q: ***If I am a disabled veteran business enterprise, can I meet the percentage requirements as a single company?***

A: Yes.

Q: ***If my submitted bid meets the contract goal and the State decides to make multiple awards to the bid/contract, could my bid be considered non-responsive?***

A: No. The State's decision to make multiple awards will not jeopardize bid compliance.

END OF DOCUMENT

BID FORM

THE STATE OF CALIFORNIA
DEPARTMENT OF GENERAL SERVICES
REAL ESTATE SERVICES DIVISION
PROJECT MANAGEMENT AND DEVELOPMENT BRANCH

FROM: _____
(Name of Bidding Firm)

DELIVER TO: Project Management and Development Branch
707 Third Street, 2nd Floor Reception Area
West Sacramento, CA 95605

BEFORE 2:00 P.M., December 16, 2026

FOR: OXNARD FIELD OFFICE RENOVATION
DEPARTMENT OF MOTOR VEHICLES
OXNARD, VENTURA COUNTY, CALIFORNIA
0000000002765

Plainly mark outside of envelope with "Bid For"; followed by the above title and Project Number.

The undersigned hereby proposes and agrees to furnish all labor, materials, and equipment, and to perform all work required for the above-named Project in the manner and time prescribed in the Drawings and Project Manual, dated September 28, 2026 and such addenda thereto as may be issued prior to bid opening date and in accordance with prevailing wage rates ascertained by the Department of Industrial Relations and set forth on the DIR web site (Prevailing Wage Requirements) for General Prevailing Wage Rates as determined by the August 2026 DIR prevailing wage published rates. The Bid Price, set forth below in clear legible figures, includes the cost of Bonds, insurance, sales tax, and every other item of expense, direct or indirect, incidental to the Bid Price.

SCHEDULE OF WORK AND PRICES

WORK ITEM	DESCRIPTION	ITEM TOTAL IN FIGURES
1.	**Performing all other work of this Project, not included in Work Item 2 below, for the lump sum of:**	**$_____**
2.	**Allowance(s) as specified in Section 01 21 00, not included in Work Items 1 above for the sum of:**	**$450,000.00**
COMPLETE WORK: Total of Work Items 1 and 2 for the lump sum of:		**$_____**

DETERMINATION OF BID: Determination of amount of bid will be on the basis of total sum of Work Items as verified by the State.

SAMPLE

IMPORTANT - READ BEFORE SIGNING: Bid Form must be executed in same name-style in which the bidder is licensed. Bidder bidding jointly or as a combination of several business organizations is specially cautioned that such bidder must be jointly licensed in the same form and style in which the bid is executed. If making a bid as a joint venture, each person submitting the bid shall provide the information required below with respect to his or her licensure. The undersigned Bidder certifies and agrees to provide the information and comply with the requirements contained in Articles 1 through 10 on the following pages of the Bid Form. By signing, Bidder swears under penalty of perjury that the conditions of Article 2; Article 4, Paragraph 4.2; Article 7 and Article 9, Paragraph 9.2.1 are true.

Legal Name of Bidder:_____ Federal I.D. No.: _____

Contractor's License No.: _____ License Expiration Date: _____License Classification:_____

Contractor's Public Works Registration No. (Dept. of Industrial Relations): _____

Contractor's DGS Small Business/DVBE Certification Number: _____

Business Address: _____
(Street and/or P.O. Box) (City) (State) (Zip)

E-Mail Address:_____

Business Telephone No.:_____ Facsimile No.:_____

SIGN HERE ------>_____
Signature of Bidder

_____
Print Name and Title of Bidder

Executed this _____day of_____, 20_____at_____, California.

ARTICLE 1 – BIDDER'S BUSINESS IDENTIFICATION

THIS BID IS SUBMITTED BY (check one):

☐ Individual ☐ Partnership
☐ Joint Venture ☐ Corporation

_____
State in which Incorporated

NOTE: If Bidder is a corporation, the State in which incorporated shall be inserted above and the legal name of the corporation shall be set forth on Page 1, together with the signature of the officer or officers authorized to sign contracts on behalf of the corporation; if Bidder is a partnership, the true name of the firm shall be set forth on Page 1, together with the signature of a partner authorized to sign contract in behalf of the partnership; and if Bidder is an individual, that person's signature shall be placed on Page 1. If signature is by an agent, other than an officer of a corporation or a member of a partnership, a Power of Attorney must be on file with the Department prior to opening bids or submitted with the bid; otherwise, the bid will be regarded as irregular and unauthorized. If bid is submitted by partnership or joint venture, the members are:

_____

_____

SAMPLE

ARTICLE 2 – PREFERENCES AND INCENTIVES

2.1 **Small Business Preference** - By checking "yes" below, Bidder requests preference as a "Small Business" and further certifies under penalty of perjury, that the firm still meets the requirements of Section 1896 et. seq. Title 2, of the California Code of Regulations, and has either: 1) been approved by the Office of Small Business and Disabled Veteran Business Enterprise (DVBE) Services (OSDS) or; 2) submitted a complete application pursuant to Section 1896.14 to the OSDS by 5:00 p.m. on the bid opening date.

The Legal Name of Bidder and the Bidder's OSDS Certification must be executed in the same name-style in which bidder is licensed. A Bidder bidding jointly or as a combination of several business organizations is specially cautioned that such bidder must be jointly licensed in same form and style in which the bid is executed.

Special attention is directed to Section 1896.16 for penalties for furnishing incorrect supporting information in obtaining preference.

2.1.1 Small Business Preference Claimed? ☐ **Yes** _____ ☐ **No**
(List date filed if not yet certified)

2.2 **Non-Small Business Subcontractor Preference** - By checking "yes" below Bidder requests preference as a Non-Small Business and agrees to complete and submit Document 00 43 16-2 attached hereto, no later than forty-eight (48) hours after the time of receipt of bids (or the following business day if a weekend or state holiday). Special attention is directed to Section 1896.16 for penalties for furnishing incorrect supporting information in obtaining preference.

2.2.1 Non-Small Business Subcontractor Preference Claimed? ☐ **Yes** ☐ **No**

2.3 **Disabled Veteran Business Enterprise Bid Incentive** - By checking "yes" below, Bidder certifies and claims credit for achieving 1% or greater of DVBE Participation on this bid as is shown in Article 9 of this bid form and also requests that the corresponding DVBE Incentive be applied to this bid.

2.3.1 DVBE Incentive Claimed? ☐ **Yes** ☐ **No**

ARTICLE 3 – BONDING ASSISTANCE

In the event Bidder has received assistance in obtaining bonding for this Project, Bidder shall set forth name and nature of firm providing such assistance. Should that firm be listed as subcontractor, Bidder shall set forth the percentage of contract to be performed by that subcontractor.

_____

Firm Providing Assistance and Nature of Assistance

Subcontractor: ☐ Yes ☐ No Percentage _____

ARTICLE 4 – CERTIFICATIONS - BID DEPOSITORY AND FEDERAL COURT FINDINGS

4.1 By signing this Bid Form, Bidder certifies that in preparation of this Bid Form, no bid was received by the bidder from a bid depository, which depository (as to any portion of the work) prohibits or imposes sanctions for the obtaining by bidder, or the submission to bidder by any subcontractor or vendor or supplier of goods and services, of a bid outside the bid depository. This certification shall constitute a warranty, the falsity of which shall entitle the State to pursue any remedy authorized by law, and shall include the right, at the option of the State, of declaring any contract made as a result thereof to be void.

4.2 By signing this Bid Form, Bidder swears under penalty of perjury that representations of the bid with respect to bidder's license are true and that no more than one final un-appealable finding of contempt of court by a Federal Court has been issued against the Contractor within the immediately preceding two-year period because of the Contractor's failure to comply with an order of a Federal Court which orders the Contractor to comply with an order of the National Labor Relations Board.

SAMPLE

4.3 By signing this Bid Form, Bidder acknowledges that in in accordance with the provisions of Section 3700 of the Labor Code, every contractor will be required to secure the payment of compensation to his employees. The Bidder agrees that they are aware of the provisions of Section 3700 of the Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and will comply with such provisions before commencing the performance of the work of this contract.

4.4 By signing this Bid Form, Bidder certifies they 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.

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.

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.

ARTICLE 5 – STATEMENT OF COMPLIANCE - NONDISCRIMINATION

Bidder (hereinafter referred to as "prospective contractor" in this Statement), by signing this Bid Form, hereby certifies, unless specifically exempted, compliance with Government Code Section 12990 (a-f), and CCR, Title 2, Division 4, Chapter 5, Section 8103, in matters relating to reporting requirements and the development, implementation and maintenance of a Nondiscrimination Program; as set forth in the General Conditions of the Contract for Construction. Prospective contractor agrees not to unlawfully discriminate, harass or allow harassment against any employee or applicants for employment because of sex, race, color, ancestry, religious creed, national origin, physical disability (including HIV and AIDS), medical disability (cancer), age (over 40), marital status, and denial of family care leave.

ARTICLE 6 – QUESTIONNAIRE

6.1 In accordance with Public Contract Code, Section 10162, the Bidder shall complete the following questionnaire:

6.1.1 Has the Bidder, any officer of the Bidder, or any employee of the Bidder who has a proprietary interest in the Bidder, 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 a safety regulation?

☐ Yes ☐ No

6.1.2 Has the Bidder, any officer of the Bidder, or any employee of the Bidder who has a proprietary interest in the Bidder, ever received a safety violation or failed to file notifications to the Cal-OSHA, Federal OSHA, or EPA Agencies for employee records as required by CCR, Title 8, Section 5208 and CFR 40, Part 61?

☐ Yes ☐ No

If the answer to either 6.1.1 or 6.1.2 above is "Yes", then give the date(s) of the citation(s) or failure to make notifications, and explain the circumstances by attachment to this Bid Form.

6.2 In order to verify compliance with California Air Resources Board In-Use Off-Road Diesel Fueled Fleets Regulation, Section 2449(i), Title 13, California Code of Regulations, the Bidder shall complete the following questionnaire:

6.2.1. Does the work for the above-named Project involve use of vehicles subject to California Air Resources Board In-Use Off-Road Diesel Fueled Fleets Regulation?

☐ Yes ☐ No

If the answer to 6.2.1 above is "Yes", successful low Bidder shall, prior to the execution of a contract, submit copies of the valid Certificates of Reported Compliance, issued by the California Air Resources Board, for the fleet selected for the contract and listed subcontractors.

SAMPLE

ARTICLE 7 – NON-COLLUSION DECLARATION TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID

By signing this Bid Form, Bidder, being first duly sworn, deposes and says that he or she is the authorized representative of the Bidder, the party making the foregoing bid, that the bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and is not collusive or sham; that the Bidder has not directly or indirectly induced or solicited any other Bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any Bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the Bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the Bidder or any other Bidder, or to fix any overhead, profit, or cost element of the bid price, or that of any other Bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and, further, that 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, or paid, and will not pay, any fee to any corporation, partnership, company association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

ARTICLE 8 – ADDENDA

In submitting this bid, Bidder represents that Bidder has examined copies of all the Contract Documents and acknowledges receipt of the following addenda:

Addendum No.: _____ Date: _____ Addendum No.:_____ Date: _____

Addendum No.: _____ Date: _____ Addendum No.:_____ Date: _____

Addendum No.: _____ Date: _____ Addendum No.:_____ Date: _____

Failure to acknowledge on the Bid Form receipt of an addendum shall not in itself be cause for withdrawal or rejection of bids, if it can be shown that bidder did, in fact, receive such addendum prior to bid opening.

ARTICLE 9 – DVBE COMPLIANCE & PARTICIPATION SUMMARY

9.1 In accordance with Public Contract Code Section 10115, et seq., the Department of General Services has established criteria to implement the DVBE Program Goal as set forth in Document 00 22 10 of the Project Manual. Document 00 22 10, DVBE PARTICIPATION PROGRAM REQUIREMENTS cites the specific percentage of DVBE Participation required for this contract. **Failure to meet this requirement will result in a non-responsive bid.**

If DVBE Participation is a requirement for this bid, Bidder must complete Article 9.2.1 - DVBE PARTICIPATION SUMMARY. Failure to meet the full percentage of required DVBE participation will cause the bid to be deemed non-responsive and the bid will be rejected by the State. Listed DVBE vendor or subcontractor relationships should be first tier.

Any DVBE person, firm, corporation or organization committed by the bidder to fulfill DVBE Participation must: 1) be certified with the OSDS, and; 2) perform or provide a Commercially Useful Function as defined in Military and Veterans Code Section 999. Failure to comply with these requirements will deem the bid non-responsive and the bid will be rejected by the State.

If DVBE participation is set at zero percent, Bidder may still claim DVBE Incentive for voluntary DVBE Participation of 1% or greater. To have DVBE Incentive applied to this bid, Bidder must claim the Incentive in ARTICLE 2.3 - PREFERENCES & INCENTIVES and complete ARTICLE 9.2 - DVBE PARTICIPATION SUMMARY of the Bid Form.

If any DVBE subcontractor will be performing work in excess of 1/2 of 1% of the bid amount, the subcontractor **MUST** be listed under ARTICLE 9.2.1 - DVBE PARTICIPATION SUMMARY.

SAMPLE

9.2 DVBE PARTICIPATION SUMMARY NAME OF BIDDER:_____

Completion Instructions: Capture all required and non-required first tier DVBE Participation in the space below. Identify the proposed work (services, trade or materials) to be completed by the DVBE. List the Company name, contact information, OSDS Certification Number, and the DIR Registration Number. If the Bidder is a DVBE, list only the Bidder's information as 100%; do not list additional subcontractors. Indicate the dollar amount of the work to be performed by each DVBE company and the corresponding percentage of this bid price rounded to two decimals. Add up each Dollar Amount and identify the total on the bottom row marked, TOTAL DVBE PARTICIPATION. Calculate and list the percentage of the bid price this amount represents.

Pursuant to Military and Veterans Code §999.7, the awarding department shall withhold, on a contract entered into on or after January 1, 2021, ten thousand dollars ($10,000) from the final payment, or the full final payment if less than ten thousand dollars ($10,000), until a prime contractor complies with the certification requirements of subdivision (d) of Section Military and Veterans Code §999.5. A prime contractor that fails to comply with the certification requirement shall, after notice, be allowed to cure the defect. Notwithstanding any other law, if, after at least 15 calendar days but not more than 30 calendar days from the date of notice, the prime contractor refuses to comply with the certification requirements, the awarding department shall permanently deduct ten thousand dollars ($10,000) from the final payment, or the full payment if less than ten thousand dollars ($10,000).

9.2.1 Listed hereinafter is the certified DVBE company(s) proposed to perform work if the contract is awarded to Bidder:

TYPE OF WORK PERFORMED (Service, Trade or Materials)	NAME OF DVBE COMPANY, CONTACT PERSON AND PHONE NUMBER	OSDS CERTIFICATION NUMBER	DIR REGISTRATION NUMBER	DOLLAR AMOUNT OF WORK PERFORMED	PERCENTAGE OF BID PRICE
			TOTAL DVBE PARTICIPATION:		

DETERMINATION OF TOTAL DVBE PARTICIPATION: Determination of total DVBE participation will be on the basis of total sum of all listed DVBE above and as verified by the State. When there is a discrepancy between the Dollar Amount and the Percentage of Bid, the higher of the two will prevail.

SAMPLE

NAME OF BIDDER: _____

ARTICLE 10 – LIST OF PROPOSED SUBCONTRACTORS

Listed hereinafter are the **name**, **location, license number, and registration number** of all subcontractors who will be employed, and the **kind of work** which each will perform if the contract is awarded to the undersigned. I understand that under Public Contract Code Section 4100, et. seq., I must here clearly set forth the name and location of each subcontractor who will perform work or labor or render service to me in or about the construction of the work in an amount in excess of one-half of one percent (1/2 of 1%), of my total bid, and that as to any work in which I fail to do so, I agree to perform that portion myself or be subject to penalty under the act. (Note: In case more than one subcontractor is named for the same kind of work, state the portion that each will perform.) I also understand that listed subcontractors must be registered with the Department of Industrial Relations in order to be listed for and to engage in the performance of work on Public Works projects. Notwithstanding General Conditions Paragraph 1.1, the definition of a **SUBCONTRACTOR** for the purposes of the Subletting and Subcontracting law is as follows: A trade Contractor who is licensed with the Contractors' State License Board with an A, B, C or D classification, as defined pursuant to PCC Section 4113.

- Vendors or suppliers of materials only need not be listed.
- C-16 or C-57 subcontractors must contract directly with the prime contractor, and must be first tier subcontractors. If a C-16 or C-57 subcontract is for more than 1/2 of 1% of the total bid, it must be listed below.

Failure to list Kind of Work, Name, Location or License Number shall cause the bid to be rejected as non-responsive.

Kind of Work	Name	Location (City)	CSLB License No.	DIR Registration No.

If further space is required below, copy this page and attached hereto to be made a part of the Bid Form. Sub List Page _____of _____

SAMPLE

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. EMPLOYER DISCRIMINATORY POLICIES: For contracts executed or renewed after January 1, 2017, if a Contractor has an internal policy against a sovereign nation or peoples 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).

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	

SAMPLE

NONCOLLUSION DECLARATION TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID

The undersigned declares:
I am the _____ of _____, the party making the foregoing bid.

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

Any person executing this declaration on behalf of a bidder that is a corporation, partnership, joint venture, limited liability company, limited liability partnership, or any other entity, 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 that the foregoing is true and correct and that this declaration is executed on _____ [date], at _____ [city], _____ [state].”

_____
Signed

SAMPLE

END OF DOCUMENT

BIDDER'S BOND

STATE OF CALIFORNIA

DEPARTMENT OF GENERAL SERVICES

KNOW ALL MEN 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 General Services, 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 General Services, 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)

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 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)

Name of Principal and Address for Service

By_____

Contractor Signature

_____ (SEAL)

_____ (SEAL)

_____ (SEAL)

Name of Surety and Address for Service

By_____

Attorney-in-Fact Signature

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

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

CERTIFICATE OF ACKNOWLEDGMENT

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, _____ and proved to me on the basis of satisfactory evidence to be the person whose name is subscribed to the within instrument and proved to me on the basis of satisfactory evidence to be the attorney-in-fact of _____ and acknowledged to me that he/she subscribed the name of the said company thereto as surety, and his/her own name as attorney-in-fact.

(SEAL)

_____

Notary Public

SAMPLE

DOCUMENT 00 43 16-1

LIST OF CERTIFIED SMALL BUSINESS SUBCONTRACTOR(S)

COMPLETION INSTRUCTIONS

PLEASE READ THESE INSTRUCTION CAREFULLY

IN ORDER TO GRANT A FIVE PERCENT (5%) NON-SMALL BUSINESS SUBCONTRACTOR PREFERENCE TO A NON-SMALL BUSINESS, THE BIDDER MUST COMPLETE THE CERTIFIED SMALL BUSINESS SUBCONTRACTOR SUMMARY (CSBSS) FORM 00 43 16-2. THIS FORM **MUST** BE COMPLETED BY THE NON-SMALL BUSINESS BIDDER AND RETURNED TO THE AWARDING AGENCY NO LATER THAN FORTY-EIGHT (48) HOURS AFTER THE TIME OF RECEIPT OF BIDS. IF THE BIDDER FAILS TO RETURN THE COMPLETED FORM 00 43 16-2 WITHIN 48 HOURS, THE CLAIM FOR SMALL BUSINESS PREFERENCE WILL BE DENIED.

CSBS COMPANY NAME – list the name(s) of the certified small business subcontractor(s) to be used to complete this project.

CSBS COMPANY ADDRESS – list the address(es) of the certified small business subcontractor(s) to be used to complete this project.

CSBS COMPANY TELEPHONE NUMBER – list the telephone number(s) of the certified small business subcontractor(s) to be used to complete this project.

CSBS PERCENTAGE (%) OR DOLLAR ($) AMOUNT – list the percentage(s) or dollar amount(s) that will be given to the certified small business subcontractor(s) used to complete this project.

DESCRIPTION OF WORK – identify the proposed work including services or materials to be performed by the certified small business subcontractor(s) to complete this project.

TO OBTAIN THE 5% NON-CERTIFIED SMALL BUSINESS PREFERENCE, THE LISTED SUBCONTRACTOR(S) AND/OR SUPPLIER(S) FIRM(S) MUST BE FORMALLY CERTIFIED BY THE OFFICE OF SMALL BUSINESS AND DVBE CERTIFICATION (OSDC) AS A SMALL AND/OR MICROBUSINESS. (Prime contractors should ask Subcontractor/Supplier to provide them with a copy of their OSDC certification letter)

SAMPLE

CERTIFIED SMALL BUSINESS SUBCONTRACTOR(S) SUMMARY

BIDDER NAME _____ PROJECT NUMBER _____

STATE OF CALIFORNIA
CERTIFIED SMALL BUSINESS SUBCONTRACTOR(S) SUMMARY

Form date 09/28/2004

Listed hereinafter is the **name of business**, **address**, **telephone number**, **dollar amount or percentage** of all certified subcontractors who will be employed, and the **description of the work** which each will perform if the contract is awarded to this bidder.

Failure to list name of business, address, telephone number, description of work to be performed and dollar amount or percentage of work for each subcontractor may be cause for denial of the non-small business subcontractor preference.

(If further space is required for the List of Proposed Subcontractors, additional sheets showing the required information, as indicated below, shall be attached hereto and made a part of the Bid).

CERTIFIED SMALL BUSINESS SUBCONTRACTOR **(Name of Business)**	CERTIFIED SMALL BUSINESS SUBCONTRACTOR **(Address)**	CERTIFIED SMALL BUSINESS SUBCONTRACTOR **(Telephone Number)**	CERTIFIED SMALL BUSINESS SUBCONTRACTOR **($ or % Amount)**	CERTIFIED SMALL BUSINESS SUBCONTRACTOR **(Description of Work) (Service or Materials)**

SAMPLE

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**

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 General Services, Administrative Division			Office of Business and Acquisition Services, Contract Services Section
MAILING ADDRESS		**FAX**	**TELEPHONE** *(Include area code)*
707 Third Street, MS 508		n/a	n/a
CITY	**STATE**	**ZIP CODE**	**E-MAIL ADDRESS**
West Sacramento	CA	95605	n/a

SAMPLE

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 (Form 1099).
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.

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.

STATE OF CALIFORNIA – DEPARTMENT OF GENERAL SERVICES

STANDARD AGREEMENT

STD 213 (Rev. 03/2019)

AGREEMENT NUMBER	PURCHASING AUTHORITY NUMBER (if applicable)

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

CONTRACTING AGENCY NAME

Department of General Services, Real Estate Services Division, Project Management and Development Branch

CONTRACTOR NAME

2.The Term of this Agreement is:

START DATE

As Identified in the Notice to Proceed

THROUGH END DATE

XXX Calendar Days, commencing on the Start Date Identified in the Notice to Proceed

3.The maximum amount of this Agreement is: $X,XXX,XXX.XX

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
Project Title	Project Title Client Address City, County, CA Project Number	
Exhibit A	Performance Bond, Payment Bond, Bid Form, and Invitation to Bid	
Exhibit B	Project Manual (except Bidding Requirements), dated XXX including the following Contract Documents: Introductory Information General Conditions of the Contract for Construction Supplementary Conditions Specifications Addenda No.	
Exhibit C	XXX Drawings, dated XXX, as listed in Document 00 01 15 of the Project Manual	

Items shown with an asterisk (*), are here by 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

STATE OF CALIFORNIA

CONTRACTING AGENCY NAME

CONTRACTING AGENCY ADDRESS	CITY	STATE	ZIP

PRINTED NAME OF PERSON SIGNING	TITLE

CONTRACTOR AUTHORIZED SIGNATURE	DATE SIGNED

CALIFORNIA DEPARTMENT OF GENERAL SERVICES APPROVAL	EXEMPTION, IF APPLICABLE

SAMPLE

PERFORMANCE BOND TO ACCOMPANY CONSTRUCTION CONTRACT

KNOW ALL MEN BY THESE PRESENTS:

THAT WHEREAS, The State of California, acting by and through the Department of General Services has awarded to _____, a _____ existing under and by virtue of the laws of the State of California as Contractor, a contract for the work described as follows:

Project Name
Client Agency
Project Information
Reference Number, Project Number, Contract Number

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 _____ Dollars, ($000,000) 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 and assigns, jointly and severally firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH,

That if the above bounded 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_____

_____

_____
Name of Contractor and Address for Service

By_____
Contractor Signature

_____

_____

_____ (SEAL)
Name of Surety and Address for Service

By _____
Attorney-in-Fact Signature

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

CERTIFICATE OF ACKNOWLEDGMENT

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, _____ proved to me on the basis of satisfactory evidence to be the person whose name is subscribed to the within instrument and proved to me on the basis of satisfactory evidence to be the attorney-in-fact of _____ and acknowledged to me that he/she subscribed the name of the said company thereto as surety, and his/her own name as attorney-in-fact.

(SEAL)

_____
NOTARY PUBLIC

SAMPLE

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.

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 _____ on _____ .

(CITY AND STATE) (DATE)

X _____

(SIGNATURE OF ATTORNEY IN FACT)

STATE OF CALIFORNIA
STD 807 (Rev. 10/2019)

_____

(PRINTED OR TYPED NAME OR ATTORNEY IN FACT)

SAMPLE

Department of General Services

Change Order

Date Issued: (Type Date)

Change Order No: _____

ABMS Contract No: _____
F$ Contract No.: _____
Project ID: **DGS000000XXXXXX**
Activity ID: **CN**
Resource Type: **CONTR**
Category: **10000**

From Division: **Real Estate Services Division**
Branch: **Project Management and Development Branch**
Address: **707 Third Street, 4th Floor**
City, State Zip: **West Sacramento, CA 95605**

Revision No.: _____
Date Revised: _____

Project: _____
Client Agency: _____
Facility Name: _____
Facility Location: _____

To: (Contractor's Name:) _____
(Contractor's Address:) _____
(Contractor's City/State/Zip:) _____

This Change Order is issued pursuant to the provisions of the General Conditions Article 6 of the Contract relating to **Changes in the Work** and shall not be effective until approved by the Department of General Services, REAL ESTATE SERVICES DIVISION. The State will issue the change order after the conditions have been agreed to. The contractor is directed to proceed with construction activities in such manner as to preclude the necessity for later altering the work in order to accomplish this change. This document must be completed in every detail, signed, dated and returned in **DUPLICATE** to the State's representative within **fifteen (15)** calendar days from the date of issue, as provided in the General Conditions of the Contract. Upon approval, a signed copy will be sent to the contractor as authority for proceeding with the changes (or as confirmation of previously issued instructions).

Change Order Description

Item #	Description	Amount

Total this Change Order $100,000.00

The Undersigned Contractor agrees to make this change in accordance with the printed conditions herein for
The Additive sum of $ or deductive sum ($).

This change is approved for the sum stated above and for a time extension of _____ calendar days.

This Agreement constitutes full and final settlement for all aspects of the work described herein. As part of this agreement, Contractor waives any and all rights to claim for any delay or impact costs associated with the work described herein, including, but not limited to, inefficiency, unabsorbed and extended home office overhead and extended field office overhead.

Authorized Contractor's Signature	Title	Date

Authorized State's Representative Signature	Title	Date

Distribution of Change Order:
Originals to: 1) Contractor 2) RESD Contract Unit

SAMPLE

Copies to: 1) Project Manager 2) State Controllers Office 3) DGS Capital Outlay Account 4) State Inspector

SAMPLE

STATE OF CALIFORNIA DEPARTMENT OF GENERAL SERVICES REAL ESTATE SERVICES DIVISION

Document 00 72 00

General Conditions of the Contract for Construction

October 2011 Edition

0000000002765

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DOCUMENT 00 72 00 - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

ARTICLE 1 - GENERAL PROVISIONS

1.1 **DEFINITIONS:** When the following terms appear in the Contract, they shall have the following meaning:

1.1.1 Acceptance of the Work: Written acceptance of the Work by the Director of the Department of General Services, State of California, or the Director's designee.

1.1.2 Act of God: An Act of God shall include only the following occurrences or conditions and effects:

.1 Earthquakes in excess of a magnitude of 3.5 on the Richter Scale; or
.2 Tidal waves.

1.1.3 Addendum (Addenda): A document issued by the State during the bidding period which modifies, supersedes or supplements the Contract Documents.

1.1.4 Alternative: Refer to Approved Equal and Substitution.

1.1.5 Applicable Codes: Include, but are not limited to, applicable laws, statutes, regulations, rules, building and other codes, ordinances, rulings, and lawful orders of all public authorities having jurisdiction over the State, the Contractor, Subcontractors, the Project, the Work, or the execution of the Work.

1.1.6 Approved Equal: Material, equipment, or method approved by the State for use in the Work, as being acceptable as an equivalent in essential attributes to the material, equipment, or method specified in the Contract Documents.

1.1.7 Agreement: The written and executed document known as Document 00 52 00, Agreement.

1.1.8 Architect or Engineer: The State, or the State's consultant listed in the Contract Documents as the designer of record responsible for the preparation and coordination of the Drawings and technical sections of the Project Manual.

1.1.9 Beneficial Occupancy: Occupancy and use by the State of all, or part, or parts, of the Work as selected by the State, prior to Completion.

1.1.10 Bidder: Any individual, partnership, corporation, association, joint venture, or any combination thereof, submitting a Bid Form for the Work.

1.1.11 Change Order: A written order issued by the State used to determine adjustments in the Contract based on:

.1 a change in the Work,
.2 the amount of the adjustment in the Contract Sum, and
.3 the extent of the adjustment in the Contract Time.

1.1.12 Claim: An unresolved Dispute arising under or relating to the performance of the Contract which can only be filed after Acceptance of the Work and the final statement to the Contractor.

1.1.13 Completion: When the entire Work has been performed in accordance with the Contract requirements as delineated in the Contract Documents and Project Manual. Completion of the Work occurs when the State's final inspection has been made and all construction, services and deliverables have been fully executed as determined by the State's Representative, including but not limited to completion of all punch-list items and delivery of as-built drawings, operation & maintenance manuals, guaranties, warranties, spare parts, reports and certifications as noted in the Project Manual, Section 01 77 00.

1.1.14 Contract: The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified by a Change Order. The Contract Documents shall not be construed to create a contractual relationship of any kind between any persons or entities other than the State and the Contractor.

1.1.15 Contract Documents: The Contract Documents consist of the Agreement between the State and Contractor, Payment and Performance Bonds; the Conditions of the Contract, including General, Supplementary and other Conditions; Drawings, Specifications, Addenda and Change Orders.

1.1.16 Contract Sum: The Contract Sum is stated in the Agreement and, including authorized adjustments by Change Order, is the total amount payable by the State to the Contractor for performance of the Work under the Contract Documents.

1.1.17 Contract Time: The Contract Time is the period of time, from the Start Date to the date of Completion of the Work, including authorized adjustments, allotted in the Contract.

1.1.18 Contractor: The individual, partnership, corporation, association, joint venture, or any combination thereof, who has entered into a contract with the State, identified as such in the Agreement, and referred to throughout the Contract as if singular in number. The term "Contractor" means the Contractor or the Contractor's representative.

1.1.19 Day: Calendar day, unless otherwise specifically defined.

1.1.20 Department: The Department of General Services, State of California.

1.1.21 Director: The Director of the Department of General Services, State of California, or the Director's designee.

1.1.22 Dispute: A demand during performance of the Work seeking adjustment or interpretation of Contract terms, payment of money, extension of time or other relief with respect to the terms of the Contract. A Dispute is not a Claim.

1.1.23 Drawings: The graphic and pictorial portions of the Contract Documents, illustrating the design, location and dimensions of the Work, generally including but not limited to, plans, elevations, sections, details, schedules and diagrams.

1.1.24 Emergency: A sudden, unexpected occurrence that poses a clear and imminent danger, requiring immediate action to prevent or mitigate the loss or impairment of life, health, property, or essential public services.

1.1.25 General Notes: The written instructions, provisions, conditions or other requirements appearing on the Drawings, and so identified thereon, which pertain to the performance of the Work.

1.1.26 Guarantee: The Contractor's assurance that the Project complies with the requirements of the Contract Documents.

1.1.27 Official Progress Schedule: The Contractor's baseline schedule and updates accepted by the State.

1.1.28 Or Equal: Refer to Approved Equal.

1.1.29 Owner: The State of California.

1.1.30 Product Data: Illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

1.1.31 Project: The total construction of which the Work performed under the Contract may be the whole or a part.

1.1.32 Project Manual: The volume(s) assembled for the Work which includes the Introductory Information, Bidding Requirements, Contracting Requirements, Specifications, and other information as may be listed in the Project Manual Table of Contents.

1.1.33 Request for Information (RFI): A written request by the Contractor submitted in a State provided format for information regarding Project specific issues.

1.1.34 Retention: A percentage of the Contract Sum held back upon completion of the Work, or any portion of the Work, to cover outstanding liabilities, contingencies, and the like, as specified in the Contract Documents.

1.1.35 Samples: Physical examples which illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

1.1.36 Schedule of Values: A document furnished by the Contractor to the State reflecting the portions of the Contract sum allotted for the various parts of the Work, and used as the basis for reviewing the Contractor's applications for payment request.

1.1.37 Shop Drawings: Drawings, diagrams, schedules, and other data specially issued for the Work by the Contractor or a Subcontractor, Sub-subcontractor, and material suppliers to illustrate some portion of the Work.

1.1.38 Specifications: That portion of the Contract Documents consisting of the written requirements for materials, standards, equipment, construction systems, and standards of workmanship for the Work, and performance of related services.

1.1.39 State: The State of California acting through the Department of General Services.

1.1.40 State Construction Supervisor/Inspector: The person(s) authorized by the State to provide inspection services, field coordination and quality control during construction.

1.1.41 State Contract Act: The act which is set forth in the California Public Contract Code, Section 10100, et seq.

1.1.42 State's Representative: Person(s) authorized by the State to act on behalf of the State for the Project.

1.1.43 Subcontractor: An individual, partnership, corporation, association, joint venture, or any combination thereof, who has a direct contract with the Contractor to perform work or labor or render service in or about the Work. The term "Subcontractor" is referred to as if singular in number and means a Subcontractor or a representative of the Subcontractor. The term "Subcontractor" shall not include those who supply materials only or a separate contractor or subcontractors of a separate contractor.

1.1.44 Sub-subcontractor: A person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the work. The term "Sub-subcontractor" is referred to as if singular in number and means a Sub-subcontractor or a representative of the Sub-subcontractor.

1.1.45 Not Used

1.1.46 Substitution: A material and/or process offered by the Contractor in lieu of the specified material and/or process, and accepted by the State in writing as being equivalent (equal) to the specified material and/or process.

1.1.47 Warranty: A Contractor's, manufacturer's or material supplier's assurance that products and services provided meet the requirements of the Contract Documents.

1.1.48 Work: Construction, services and deliverables required by the Contract Documents and Project Manual, including labor, materials, equipment, services, and documents provided or to be provided by the Contractor to fulfill the Contractor's obligations under the Contract, including but not limited to requirements such as; completion of punch-list items, as-built drawings, operation & maintenance manuals, guaranties, warranties, spare parts, reports, and certifications.

1.2 EXECUTION, CORRELATION AND INTENT

1.2.1 The Contract will not be binding on the State until appropriately endorsed by the State's legal Representative, in accordance with Public Contract Code, Section 10220.

1.2.2 Execution of the Contract by the Contractor is a representation that the Contractor is familiar with the methodology under which the work is to be performed and has correlated personal observations with requirements of the Contract Documents.

1.2.3 The intent of the Contract Documents is to include items necessary for completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all. Performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the intended results.

1.2.4 Organization of the Specifications into Groups, Divisions, subgroups, Sections and Articles, and arrangement of Drawings shall not be the basis that Contractor utilizes in dividing the Work among Subcontractors, nor in establishing the extent of work to be performed by any trade.

1.2.5 When standards of the Federal Government, trade societies, or trade associations are referred to in the Contract Documents by specific date of issue, these shall be considered as part of the Contract Documents. When such references do not bear date of issue, current published edition at the date of the first Invitation to Bid shall be considered as part of the Contract Documents.

1.2.6 Unless otherwise stated in the Contract Documents, words and terms which have well-known or commonly accepted technical or construction industry meanings shall be used in the Contract Documents in accordance with such recognized meanings.

1.2.7 Every part of the Work shall be accomplished in workmanship-like manner by workers, laborers, or mechanics specially skilled in the class of work required. Any person the State may deem incompetent or disorderly shall be promptly removed from the Project by the Contractor upon written notice from the State, and shall not be re-employed on this Project.

1.3 **USE OF THE STATE'S DRAWINGS, PROJECT MANUAL AND OTHER DOCUMENTS:** The Drawings, Project Manual and other documents issued by the State, and copies furnished to the Contractor, are for use solely with respect to this Project. They are not to be used by the Contractor or any Subcontractor, Sub-subcontractor or material or equipment supplier on other projects, nor for additions to this Project outside the scope of the Work without the specific written consent of the State. The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are granted a limited license to use and reproduce applicable portions of the Drawings, Project Manual and other documents issued by the State appropriate to, and for use in, the execution of their work under the requirements of the Contract Documents.

1.4 **CAPITALIZATION**

1.4.1 Terms capitalized in the General Conditions of the Contract for Construction include those which are:

.1 Specifically defined; or
.2 Titles of numbered Articles; or
.3 References to Paragraphs, Subparagraphs and Clauses; or
.4 Titles of other documents.

1.5 **CONFLICTS IN THE CONTRACT DOCUMENTS**

1.5.1 In the event of conflict in the Contract Documents, the following priorities shall govern:

.1 Addenda shall govern over other Sections of the Contract Documents to the extent specifically noted; subsequent Addenda shall govern over prior Addenda only to the extent specified.
.2 The General Conditions of the Contract for Construction shall govern over Drawings and Specifications except for specific modifications stated in the Supplementary Conditions, and except for Addenda.
.3 In case of conflict between the Drawings and the Specifications, the Specifications shall govern unless the requirement(s) in the Drawings is/are more stringent and/or of higher quality and/or of higher quantity.
.4 In the case of conflict within the Drawings, the following shall govern:
    1) Schedules, when identified as such, shall govern over all other portions of the Drawings.
    2) Specific notes shall govern over other notes and all other portions of the Drawings, except schedules described in the preceding Clause.
    3) Larger scale Drawings shall govern over smaller scale Drawings.
    4) Detail Drawings shall govern over standard plates bound within the Project Manual.
    5) Figured or numerical dimensions shall govern over dimensions obtained by scaling.

1.5.2 Omissions: If the Contract Documents are not complete as to any minor detail or required construction system or with regard to the manner of combining or installing of parts, materials, or equipment, but there exists accepted trade standard for good and workmanlike construction, such detail shall be deemed to have been implied by the requirements of the Contract Documents in accordance with such standard.

.1 "Minor Detail" shall include the concept of substantially identical components, where price of each such component is small even though aggregate cost or importance is substantial, and shall include a single component which is incidental, even though its cost or importance may be substantial. Quality and quantity of parts or material so supplied shall conform to trade standards and be compatible with type, composition, strength, size and profile of parts or materials otherwise set forth in the Contract Documents.

1.6 REQUESTS FOR INFORMATION, CLARIFICATION OR ADDITIONAL INSTRUCTIONS

1.6.1 Requests for Information (RFI): Should the Contractor discover conflicts, omissions, or errors in the Contract Documents, or have any questions concerning interpretation or clarification of Contract Documents, the Contractor shall immediately submit to the State in writing an RFI that complies with the following requirements:

.1 All RFIs, whether by the Contractor, a Subcontractor or supplier at any tier, shall be submitted by the Contractor to the State.
.2 RFIs shall be numbered sequentially and be presented in the format provided by the State.
.3 The Contractor shall clearly and concisely set forth the single issue for which interpretation or clarification is sought, indicate Specification Section number, article and subarticle numbers, and Contract Drawing number, and detail, or other item involved, and state why a response is required from the State.
.4 The Contractor shall set forth its own interpretation or understanding of the requirements, along with reasons why it has reached such an understanding in each RFI.
.5 RFIs shall be submitted in a timely manner in order that they may be adequately researched and answered before the response affects any critical activity of the Work.
.6 The State will review all RFIs to determine whether they are truly RFIs within the meaning of the term as defined in Paragraphs 1.1.33 and 1.6.1. RFI's which are determined to be not within the meaning of the term and/or RFIs where answers can readily be found in the Drawings and Project Manuals shall be deemed to be superfluous and the cost for reviewing these RFIs will be back-charged to the Contractor.
.7 Responses to RFIs will be made within 14 days unless the State notifies the Contractor in writing that a response will take longer. The 14 days will begin when the RFI is received and dated by the State. Should the State respond sooner, the Contractor shall not assume that a new timeline has been established. Delays in the progress of the Work due to late submittal of RFIs by the Contractor are solely the responsibility of the Contractor.
.8 Responses from the State will not change any requirement of the Contract unless so noted by the State in the response to the RFI.
.9 Should the Contractor believe that a response to an RFI causes a change to the requirements of the Contract, the Contractor shall, before proceeding, give written notice to the State, indicating that the Contractor considers the State's response to the RFI to be a Change Order. An RFI will not be considered to be automatically a notice for a Change Order. The Contractor shall give separate written notice within 7 days of receipt of the State's response to the RFI. If the Contractor fails to give notice within 7 days or prior to commencement of the change, the Contractor shall forfeit the right to seek additional time or cost under Article 6.

1.6.2 Additional Detailed Instructions: The State may furnish additional detailed written and/or graphic instructions to further explain the work, and such instructions shall be a part of the Contract requirements. Should additional detailed instructions, in the opinion of the Contractor, constitute work in excess of the scope of the Work, the Contractor shall submit written notice to the State within 14 days following receipt of such instructions, and in any event prior to commencement of the work thereon. The State will then consider the notice; and, if in the State's judgment it is justified, the State's instructions will be revised or the extra work authorized in accordance with the provisions of Article 6.

ARTICLE 2 - ADMINISTRATION OF THE CONTRACT

2.1 INFORMATION AND/OR SERVICES REQUIRED OF THE STATE

2.1.1 Information and/or services under the State's control shall be furnished by the State within a mutually agreed upon response time so as to avoid delay in the orderly progress of the Work.

2.1.2 The Contractor will be furnished Drawings and Project Manuals as specified in the Contract Documents.

2.2 ADMINISTRATION OF THE CONTRACT

2.2.1 The State will provide administration of the Contract as described in the Contract Documents during construction, until final payment is due and during the correction period described in Paragraph 12.2 and throughout the guarantee period.

2.2.2 The State will visit the Project site appropriate to the stage of construction to become familiar with the progress and quality of the completed work and to determine if the Work is in accordance with the Contract Documents.

2.2.3 Unless so specified in the Contract Documents, the State will not have control over construction means, methods, techniques, sequences or procedures, or safety precautions and programs in connection with the Work. The State will not be responsible for the Contractor's failure to carry out the Work in accordance with the requirements of the Contract Documents. The State will not be responsible for acts, errors, or omissions of the Contractor, a Subcontractor, or anyone directly or indirectly employed by any of them, or of any other persons performing portions of the Work.

2.2.4 Communications Facilitating Contract Administration: Communications by and with the State's consultants shall be through the State. Communications by and with Subcontractors, Sub-subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the State.

2.2.5 If the State observes work that appears to not comply with the requirements of the Contract Documents, the State will have the authority to reject the Work. Whenever the State considers it necessary or advisable for implementation of the intent of the Contract Documents, the State will require additional inspection or testing of the Work, in accordance with Subparagraphs 3.13.2 and 3.13.3, whether or not such work is fabricated, installed or completed.

2.2.6 The State will review and take action upon the Contractor's submitted Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. Review of submittals is not conducted for the purpose of determining the accuracy and completeness of other details, such as dimensions and quantities, nor for substantiating instructions for installation or performance of equipment or systems, which remain the responsibility of the Contractor.

2.2.7 Substitutions and Approved Equals: Alternative material(s), article(s), or equipment that are of equal quality and of required characteristics for the purpose intended may be proposed by the Contractor. The State will examine proposed alternatives for compliance with the Contract Documents. The proposed material(s), article(s), or equipment, will be reviewed for comparative quality, suitability, and performance against the product(s) specified in the Contract Documents. Refer to Subparagraph 3.12.10, for Substitution procedures. If Contractor’s substitution is accepted, the Contractor shall be responsible for the costs of any changes resulting from the substitution, including, but not limited to redesign costs of the Project.

2.2.8 The State will conduct inspections to determine the Contractor’s compliance with the Contract Documents and the date of Completion; will receive, for review and record, written warranties and related documents required by the Contract Documents and assembled by the Contractor; and will issue a final Payment Authorization upon compliance with the requirements of the Contract Documents and Acceptance of the Work.

2.3 BREACHES, DEFAULTS AND TERMINATION FOR CAUSE

2.3.1 If the Director deems that the Contractor has failed to supply an adequate working force, or material of proper quality, or has failed to comply with Public Contract Code Section 10262, or has failed in any other respect to prosecute the Work with the diligence and force specified by the Contract, the Director may:

.1 after written notice of at least 5 days to the Contractor, specifying the defaults to be remedied, provide any such labor or materials and deduct the cost from any money due or to become due to the Contractor under the Contract; or
.2 if the Director considers that the failure is sufficient ground for such action, the Director may give written notice of at least 5 days to the Contractor and the Contractor's sureties, that if the defaults are not remedied, the Contractor's control over the Work will be terminated.

2.3.2 Should the State exercise its rights to terminate as noted in Subparagraph 2.3.1, the State may, without prejudice to any other rights or remedies of the State and subject to any prior rights of the Surety:

.1 terminate employment of the Contractor;
.2 take possession of the Project site, materials, equipment, tools, appliances, and construction equipment and machinery owned by the Contractor;
.3 accept assignment of Subcontractor Agreements pursuant to Paragraph 4.4; and/or
.4 finish the Work by whatever method(s) the State may deem expeditious and appropriate.

2.3.3 When the State terminates the Contract for reasons provided in Subparagraph 2.3.1, the Contractor shall not be entitled to receive any further payment until Completion of the Work. If the costs incurred by the State because of termination under Subparagraph 2.3.1 exceed the unpaid balance, the Contractor shall pay the difference to the State.

2.4 TERMINATION FOR THE STATE'S CONVENIENCE

2.4.1 The State reserves the right to terminate this Contract or any part thereof, due to an Act of God or for its sole convenience. In the event of such termination, the Contractor shall immediately stop hereunder and shall immediately cause its Subcontractors, Sub-subcontractors and material suppliers at any tier, to immediately stop work, leaving the site in a safe and secured condition. The Contractor shall not be paid for any work performed or costs incurred after the termination date that could have been avoided.

2.4.2 The Contractor shall be paid in accordance with the provisions of Article 8; except that the amount due the Contractor shall be based upon the State's final estimate of the Work completed, or acceptable materials furnished but not used, to the date of suspension of the Work, less any amounts required to be withheld pursuant to Article 8, and less any prior payment(s) made to, or on the account of the Contractor.

2.5 SUSPENSION BY THE STATE FOR CONVENIENCE

2.5.1 The State may, by written notice, order the Contractor to suspend, delay or interrupt the Work, in whole or in part, for such period of time as the State may determine.

2.5.2 An adjustment may be claimed by the Contractor in accordance with Article 6 and Article 7 for changes in the Work, caused by a suspension, delay or interruption. No adjustment will be made to the extent:

.1 that Contractor's performance of the Work, is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible; or
.2 that an equitable adjustment is made or denied under another provision of the Contract.

ARTICLE 3 - CONTRACTOR

3.1 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY THE CONTRACTOR

3.1.1 The Contractor shall carefully study and compare the Contract Documents with each other and shall report to the State, in writing, any errors, inconsistencies or omissions discovered. If the Contractor performs any work knowing it involves a recognized error, inconsistency or omission in the Contract Documents, without such notice to the State the Contractor shall assume responsibility for such performance and shall bear the cost for correction.

3.1.2 The Contractor shall take field measurements and verify field conditions and shall compare such field measurements, conditions and other related information known to the Contractor with the Contract Documents before proceeding.

3.1.3 The Contractor shall promptly, and before such conditions are disturbed, notify the State in writing of:

.1 subsurface or latent physical conditions at the site differing materially from those indicated, or
.2 unknown physical conditions at the site of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in this Contract.
.3 Hazardous materials.

3.1.4 The State will promptly investigate the conditions, and if the State finds that such conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performance of any part of the Work, whether or not changed as a result of such conditions, a Change Order will be issued in accordance with Article 6.

3.2 SUPERVISION AND CONSTRUCTION PROCEDURES

3.2.1 The Contractor shall supervise and direct the Work. The Contractor shall be responsible for, and have control over, construction means, methods, techniques, sequences, procedures, safety precautions and programs in connection with the Work, and for coordinating the Work under the Contract; unless otherwise noted or specified in the Contract Documents.

3.2.2 The Contractor shall be responsible to the State for acts and omissions of the Contractor's employees, Subcontractors, Sub-subcontractors or material suppliers and their agents and employees, and other persons performing portions of the Work under a contract with the Contractor.

.1 Subcontractor Responsibility: The Contractor shall be responsible for the actions or inaction of Subcontractors, Sub-subcontractors or material suppliers, at all tiers, regardless of whether they are a Disabled Veterans Business Enterprise (DVBE) firm or are stipulated suppliers or sole sourced. No claim, request for equitable adjustment or Change Order request shall be submitted to the State for any action of any Subcontractor, Sub-subcontractor or material supplier, at any tier, unless the Contractor can demonstrate that the State is the proximate cause of the change or delay alleged in such request. The State will not accept any responsibility or liability for any action or inaction of any Subcontractor, Sub-subcontractor or material supplier, at any tier, except to the extent that the State is the proximate cause of the change or delay.

3.2.3 The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents, either by activities or duties of the State, the State's administration of the Contract, or by tests, inspections or approvals required or performed by persons other than the Contractor.

3.2.4 The Contractor shall be responsible for inspections of portions of the Work already completed under the Contract to determine that such portions are in proper condition to receive subsequent work. If the Contractor determines that some work performed on the Project does not comply with the requirements of the Contract Documents, the Contractor shall repair or replace such defective work at the Contractor's sole expense.

3.2.5 Until Acceptance of the Work, the Contractor shall have the charge and care thereof, and shall bear risk of injury or damage to any part of the Work by action of the elements (except for an Act of God, or natural disaster as proclaimed by the State or Federal Government), or from any other reason except for such damages as are directly caused by acts of the Federal or State Government and the public enemy, except as provided in Paragraph 8.5.

3.3 LABOR AND MATERIALS

3.3.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work. Materials, articles and equipment furnished by the Contractor for incorporation into the Work shall be new unless otherwise specified in the Contract Documents.

3.3.2 Hours of Labor: Workers are limited and restricted to 8 hours during any one calendar day, and 40 hours during any one calendar week except that pursuant to Labor Code Section 1815, any work performed in excess of 8 hours per day and 40 hours during any one week, shall be permitted upon compensation for hours worked in excess of 8 hours per day at not less than 1-1/2 times the basic rate of pay. The Contractor shall pay the State $25 as a penalty for each worker for each calendar day worked in violation of the above limitations and restrictions.

3.3.3 Prevailing Wage: The Contractor shall comply with Labor Code, Section 1774 and 1775. Pursuant to Section 1774, the Contractor and any subcontractors, regardless of tier, shall pay not less than the specified prevailing wage rates to all workers employed in the execution of the Contract. In accordance with Section 1775, the Contractor and any subcontractor under the Contractor shall forfeit to the State not more than $50 for each calendar day, or portion thereof, for each worker paid less than the prevailing wage rates for the work or craft, in which the worker is employed for any work executed under the Contract by the Contractor or by any subcontractor in violation of the provisions of the Labor Code; and, in particular, Labor Code, Sections 1770 to 1780, inclusive. In addition to such forfeiture, the difference between such stipulated prevailing wage rates and the amount paid to each worker for each day, or portion thereof, shall be paid to each underpaid worker by the Contractor or subcontractor. This provision shall not apply to properly registered apprentices.

.1 Pursuant to Labor Code, Section 1770, the Director of the Department of Industrial Relations has ascertained the general prevailing rate of per diem wages and a general prevailing rate for legal holiday and overtime work for each craft required for execution of the Contract. The Contractor shall obtain copies of the prevailing rate of per diem wages from the Department of Industrial Relations, Division of Labor Statistics & Research, PO Box 420603, San Francisco, CA 94142-0603, (415) 703-4780; or wage rates may be accessed on the internet at http://www.dir.ca.gov/DLSR/statistics_research.html.The Contractor is responsible to read, understand and comply with all the guidelines, including the fine print in the prevailing wage determinations; and shall post a copy of the prevailing wage rates, specific to the Project, at the Project site.

.2 Wage rates set forth are the minimum that may be paid by the Contractor. Nothing herein shall be construed as preventing the Contractor from paying more than the minimum rates set. No extra compensation will be allowed by the State due to the inability of the Contractor to hire labor at minimum rates, nor for necessity for payment by the Contractor of subsistence, travel time, overtime, or other added compensations, all of which possibilities are elements to be considered and ascertained to the Contractor's own satisfaction in preparing the Bid Form.

.3 If it becomes necessary to employ crafts other than those listed in the General Prevailing Wage Rate booklet, the Contractor shall contact the Division of Labor Statistics and Research as noted above. The rates thus determined shall be applicable as minimum for the contract and incorporated in the bid. When the wage determination shows an expiration date (noted by a double asterisk**), to expire during the term of the contract, the Contractor must call or write the DIR to obtain the new rates and incorporate them in the bid to be applicable for the term of the contract.

.4 The Contractor and each subcontractor, regardless of tier, shall keep an accurate payroll record showing the names, addresses, social security numbers, work classifications, straight time and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker, or other employee employed by the Contractor and/or subcontractor in connection with the Work. Payroll records shall be certified and shall be on forms provided by the Division of Labor Standards Enforcement, or shall contain the same information as those forms. The Contractor's and subcontractor's certified payroll records for each employee shall be submitted with each payment request, covering the period of the payment request.

3.3.4 Travel and Subsistence Payments: The Contractor shall pay travel and subsistence payments to persons required to execute the Work as such travel and subsistence payments are defined in applicable collective bargaining agreements filed with the Department of Industrial Relations, pursuant to Labor Code, Sections 1773.1 and 1773.9.

3.3.5 Apprentices: Properly registered apprentices may be employed in the execution of the Work. Every apprentice shall be paid the standard wage paid to apprentices under the regulations of the craft or trade at which the apprentice is employed, and shall be employed only at the work of the craft or trade to which the apprentice is registered. The Contractor and each Subcontractor shall comply with the requirements of Labor Code, Section 1777.5, and any related regulations regarding the employment of registered apprentices.

3.4 NONDISCRIMINATION CLAUSE

3.4.1 Definitions: As they pertain to the Standard California Nondiscrimination Construction Contract Specifications:

.1 Administrator: The Administrator, Office of Compliance Programs (OCP), California Department of Fair Employment and Housing (DFEH), or any person to whom the Administrator delegates authority.

.2 Minority includes:

1) Black (all persons having primary origins in any of the Black racial groups of Africa, but not of Hispanic origin); or
2) Hispanic (all persons of primary culture or origin in Mexico, Puerto Rico, Cuba, Central or South America, or other Spanish derived culture or origin regardless of race); or
3) Asian/Pacific Islander (all persons having primary origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent or the Pacific Islands); or
4) American Indian/Alaskan Native (all persons having primary origins in any of the original peoples of North America and who maintain culture identification through tribal affiliation or community recognition).

3.4.2 Whenever the Contractor or any Subcontractor subcontracts a portion of the Work, it shall physically include in each subcontract of $5,000 or more, the Nondiscrimination Clause in the Contract directly or through incorporation by reference. Any subcontract for work involving a construction trade shall also include the Standard California Construction Contract Specifications, either directly or through incorporation by reference.

3.4.3 The Contractor shall implement the specific nondiscrimination standards provided in Clauses 3.4.6.1 through 3.4.6.5.

3.4.4 Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities and/or women shall excuse the Contractor's obligations under these specifications, Government Code, Section 12990, or the regulations promulgated pursuant thereto.

3.4.5 In order for the nonworking training hours of apprentices and trainees to be counted, such apprentices and trainees shall be employed by the Contractor during the training period, and the Contractor shall have made a commitment to employ the apprentices and trainees upon the completion of their training, subject to the availability of employment opportunities. Trainees shall be trained pursuant to training programs approved by the U.S. Department of Labor or the California Department of Industrial Relations.

3.4.6 The Contractor shall take specific actions to implement the Contractor's nondiscrimination program. The evaluation of the Contractor's compliance with these specifications shall be based upon the Contractor's effort to achieve maximum results from the Contractor's actions. The Contractor shall be able to demonstrate fully the Contractor's efforts under Steps .1 through .5 below:

.1 Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites and at all facilities at which the Contractor's employees are assigned to work. The Contractor, whenever possible, shall assign two or more women to each construction project. The Contractor shall specifically ensure that all leadpersons, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligations to maintain such a working environment, with specific attention to minority and/or female individuals working at such sites or in such facilities.

.2 Provide written notification within 7 days to the Director of DFEH when the union(s) with which the Contractor has a collective bargaining agreement(s) has not referred to the Contractor a minority person and/or woman sent by the Contractor, or when the Contractor has other information that the union(s) referral process has impeded the Contractor's efforts to meet the Contractor's obligations.

.3 Disseminate the Contractor's equal employment opportunity policy by providing notice of the policy to unions and training, recruitment and outreach programs and requesting their cooperation in assisting the Contractor to meet the Contractor's obligations; and by posting the company policy on bulletin boards accessible to all employees at each location where construction work is performed.

.4 Ensure all personnel making management and employment decisions regarding hiring, assignment, layoff, termination, conditions of work, training, rates of pay or other employment decisions, including all supervisory personnel, superintendents, general leadpersons, on-site leadpersons, etc., are aware of the Contractor's equal employment opportunity policy and obligations, and discharge their responsibilities accordingly.

.5 Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the equal employment opportunity policy and the Contractor's obligations under these specifications are being carried out.

3.4.7 Contractors are encouraged to participate in voluntary associations which assist in fulfilling their equal employment opportunity obligations. The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the Contractor is a member and participant, may be asserted as fulfilling any one or more of the Contractor's obligations under these specifications provided that the Contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female work-force participation, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. It is the Contractor's obligation to comply.

3.4.8 The Contractor is required to provide equal employment opportunity for all minority groups, both male and female, and all women, both minority and nonminority. Consequently, the Contractor may be in violation of the Fair Employment and Housing Act (Government Code, Section 12990 et seq.) if a particular group is employed in a substantially disparate manner.

3.4.9 Establishment and implementation of a bona fide affirmative action plan pursuant to Section 8104(b) of Title 2, California Code of Regulations (CCR), shall create a rebuttable presumption that the Contractor is in compliance with the requirements of Government Code, Section 12990, and its implementing regulations.

3.4.10 The Contractor shall not use the nondiscrimination standards to discriminate, harass or allow harassment against any person because of race, color, religion, sex, national origin, ancestry, physical disability (including HIV and AIDS), mental disability, medical condition (cancer), marital status, or age over 40, denial of family and denial of family care leave.

3.4.11 The Contractor shall not enter into any subcontract with any person or firm decertified from State contracts pursuant to Government Code, Section 12990.

3.4.12 The Contractor shall carry out such sanctions and penalties for violation of these specifications and the Nondiscrimination Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Government Code, Section 12990 and its implementing regulations by the awarding agency. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Government Code, Section 12990.

3.4.13 The Contractor shall designate a responsible official to monitor all employment-related activity to ensure that the company's equal employment opportunity policy is being carried out, to submit reports relating to the provisions herein as may be required by OCP, and to keep records. Records shall at least include for each employee the name, address, telephone number, construction trade, union affiliation, if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice

trainee, helper or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work is performed. Records shall be maintained in any easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, the Contractor shall not be required to maintain separate records.

3.5 GUARANTEE

3.5.1 The Contractor unconditionally guarantees the Work will be completed in accordance with the requirements of the Contract Documents, and will remain free of defects in workmanship and materials for a period of 1 year from the date of Completion of the Work of the Project, unless a longer guarantee period is specifically called for in the Contract Documents. The Contractor shall repair or replace work, or adjacent work, or both, that may have been damaged or displaced, which was not in accordance with the requirements of the Contract Documents, or that may be defective in its workmanship or material within the guarantee period specified in the Contract Documents, without any expense whatsoever to the State; ordinary wear and tear and abuse excepted.

3.5.2 The Contractor further agrees, within 14 days after being notified in writing by the State, of work not in accordance with the requirements of the Contract Documents or defects in the Work, that the Contractor shall commence and execute, with due diligence, work necessary to fulfill the terms of the guarantee. If the State finds that the Contractor fails to perform the work under the guarantee, the State will proceed to have the work completed at the Contractor's expense and the Contractor will pay costs of the work upon demand. The State will be entitled to all costs, including attorney's fees necessarily incurred upon the Contractor's refusal to pay the above costs.

3.5.3 Notwithstanding the foregoing Subparagraph, in the event of an emergency constituting an immediate hazard to health or safety of State employees, property, or licensees, the State may undertake, at the Contractor's expense and without prior notice, work necessary to correct such hazardous condition(s) when it is caused by work of the Contractor not being in accordance with the requirements of the Contract Documents.

3.6 **TAXES:** The Contractor shall pay all applicable taxes for the Work, or portions thereof provided by the Contractor, which were legally enacted as of the bid date, whether or not yet effective or merely scheduled to go into effect.

3.7 PERMITS, FEES AND NOTICES

3.7.1 The Contractor shall secure and pay for required permits, governmental fees, licenses and inspections necessary to complete the Work, unless otherwise provided in the Contract Documents.

3.7.2 The Contractor shall comply with and give notices required by laws, ordinances, rules, regulations and lawful orders of public authorities bearing on the performance of the Work.

3.7.3 If the Contractor observes that portions of the Contract Documents are at variance with applicable laws, statutes, ordinances, building codes, and rules and regulations, the Contractor shall promptly notify the State in writing. If the Contractor performs work known to be contrary, or should have known to be contrary to laws, statutes, ordinances, building codes, and rules and regulations without prior notice to the State, the Contractor shall assume full responsibility for the Work and shall bear the attributable costs.

3.7.4 The Contractor is not subject to municipal, county, or district laws, rules, or regulations pertaining to building permits or regulating the design or construction of buildings upon State property, except as specified in the Contract Documents.

3.7.5 The Contractor may be subject to federal, state, municipal, county, local or district laws, rules, or regulations pertaining to off-site work, such as utility connections, fire protection systems and encroachment upon federal, state, private, city or county property, including, but not limited to storm water pollution prevention plans.

3.7.6 All construction work shall comply with the California Code of Regulations, Title 24, California Building Standards Code (CBSC), and other Applicable Codes, current edition, as of the bid date or as specified in the Specifications.

3.8 **ALLOWANCES:** The Contractor shall include in the Contract Sum, Allowances in accordance with the requirements of the Specifications, Division 01.

3.9 SUPERINTENDENT

3.9.1 The Contractor shall employ a competent Superintendent and assistants who shall be in attendance at theProject site during performance of the Work. The Superintendent, or the Contractor’s duly appointed representative, shall be the person in charge of

the construction of the Work and shall represent the Contractor. Communications given to the Superintendent shall be as binding as if given directly to the Contractor. All communications shall be confirmed in writing by the Contractor. Should the State deem the Superintendent to be incompetent, the State has the authority to request the Contractor to replace this person.

3.9.2 Should the Contractor decide to replace the Superintendent, the Contractor shall notify the State in writing, no fewer than 14 calendar days prior to the replacement. The Contractor shall submit the name and resume of the new Superintendent with the letter.

3.9.3 At any other time when the Superintendent is absent from the Project site because no Work is being performed, the Superintendent shall nevertheless keep the State advised of the Superintendent's whereabouts so that the Superintendent may readily be reached and available for consultation at the Project site at any time.

3.10 CONTRACTOR'S PROGRESS SCHEDULE

3.10.1 Within the time frame specified in the specifications and prior to the first payment request, the Contractor shall submit to the State a Progress Schedule, including submittal schedules, prepared in accordance with the Specifications, Division 01. The Progress Schedule shall show the order in which the Contractor proposes to execute the Work, dates on which the Contractor will start each major subdivision of the Work, and projected dates of completion of each such subdivision in accordance with the requirements of the Contract Documents. The Contractor shall submit adjusted Progress Schedules, including submittal schedules, to reflect changed conditions in accordance with the requirements of the Contract Documents with each payment request.

3.10.2 The Contractor shall, unless otherwise specified in the Contract Documents, or directed by the State in writing, show in the schedule that physical construction of the Work will start within 10 calendar days of the start date stipulated in the Notice to Proceed, and show execution to Completion, in accordance with the specified schedule, subject to adjustment in accordance with the requirements of the Contract Documents.

3.10.3 The Contractor shall provide an adequate work force, materials of proper quality, and equipment to properly execute the Work and to ensure completion of each part in accordance with the Progress Schedule and within the Contract Time specified.

3.10.4 The Contractor shall submit to the State a Schedule of Values consistent with the Progress Schedule and Article 8. The Schedule of Values will be used as a basis for payment in accordance with Article 8.

3.10.5 The State's review and acceptance of the Progress Schedule is for compliance with the requirements of the Contract Documents only. Review and acceptance by the State of the Progress Schedule does not mean approval and does not relieve the Contractor of any of the Contractor's responsibility for the accuracy or feasibility of the Progress Schedule, or of the Contractor's ability to meet the interim Project milestone dates and the date of Completion. The State's review and acceptance does not expressly or impliedly warrant, acknowledge or admit the reasonableness of the logic, durations, manpower or equipment loading of the Progress Schedule.

3.11 DOCUMENTS AND SAMPLES AT THE PROJECT SITE

3.11.1 The Contractor shall maintain at the Project site one record copy of the Drawings, Project Manual, Addenda, Change Orders and other modifications, in good order and marked currently to record changes and selections made during construction; and in addition, Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the State and shall be delivered to the State upon completion of the Work.

3.11.2 Daily Records Clause: The Contractor shall prepare and maintain daily inspection records to document the progress of the Work on a daily basis. Daily Records shall include a daily accounting of labor and equipment on the site for the Contractor and Subcontractors, at any tier. Daily Records shall make a clear distinction between work being performed under Change Order, base scope work, and/or disputed work. Daily Records shall be copied and provided to the State at the end of every week, unless otherwise agreed to in writing.

3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES (SUBMITTALS)

3.12.1 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. Their purpose is to demonstrate those portions of the work for which submittals are required and the way the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents. Review by the State is subject to the limitations of Subparagraph 2.2.6.

3.12.2 The Contractor shall review, approve and submit to the State Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents within the number of days set forth in the Specifications, Division 01; except finishes which shall be submitted in a sequence so as to cause no delay in the progress of the Work or in the activities of the State or separate

contractors. Submittals that are not required by the Contract Documents may be returned to the Contractor without action.

3.12.3 The Contractor shall perform no portion of the Work requiring submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been reviewed by the State. Such work shall be in accordance with reviewed submittals.

3.12.4 By submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents that the Contractor has determined and verified materials, field measurements and related field construction criteria, and has checked and coordinated the information contained within the submittal(s) with the requirements of the Contract Documents.

3.12.5 The Contractor shall not be relieved of the responsibility for any deviation from the requirements of the Contract Documents by the State's review of submittals unless the Contractor has specifically informed the State, in writing, or as directed by the State, of such deviation at the time of submittal, and the State has given written consent to the specific deviation. The State's review shall not relieve the Contractor of responsibility for errors or omissions in submittals. Any resulting cost increase due to such a deviation shall be the sole responsibility of the Contractor.

3.12.6 The Contractor shall respond per requirements of the Contract Documents, in writing or on resubmitted submittals, to revisions other than those requested by the State on previous submittals. After the second resubmittal of a specific item, that is still not accepted, the Contractor will be charged all costs of submittal review. The charges will be deducted from the Contract Sum.

3.12.7 Informational submittals on which the State is not expected to take action, may be identified in the Contract Documents.

3.12.8 When professional certification of performance criteria of materials, systems or equipment is required by the Contract Documents, the State will be entitled to rely upon the accuracy and completeness of such calculations and certifications.

3.12.9 When descriptive catalog designations, including manufacturer's name, product brand name, or model number(s) are referred to in the Contract Documents, such designations shall be considered as being those found in industry publications of current issue at date of first Invitation to Bid.

3.12.10 Substitutions and Approved Equals: Alternative material(s), article(s), or equipment that are of equal quality and of required characteristics for the purpose intended may be proposed by the Contractor for use in the Work, provided the Contractor complies with the Specifications, Division 01, and the following requirements:

.1 The Contractor shall submit a proposal for the alternative material(s), article(s), or equipment, in writing, within 35 days after Contract start date stated in the Notice to Proceed. In exceptional cases where the best interests of the State so require, the State may give written consent to a submittal or resubmittal received after expiration of the time limit designated.

.2 The proposal will not be considered unless the submittal is accompanied by complete information and descriptive data necessary to determine equality of offered material(s), article(s), or equipment. Samples shall be provided when requested by the State. Burden of proof as to comparative quality, suitability, and performance of offered material(s), article(s), or equipment shall be upon the Contractor. The State will be the sole judge as to such matters. In the event the State rejects the use of such alternative(s) submitted, then one of the particular products originally specified in the Contract Documents shall be furnished.

.3 If mechanical, electrical, structural, or other changes are required for installation, fit of alternative materials, articles, or equipment, or because of deviations from Contract Drawings and Specifications, such changes shall not be made without consent of the State, and shall be made without additional cost to the State.

3.13 TESTS AND INSPECTIONS

3.13.1 The Contractor shall at all times permit the State, its agents, officers, and employees to visit the Project site and inspect the Work, including shops where work is in preparation. This obligation shall include maintaining proper facilities and safe access for such inspection. Including, but not limited to providing lifts, ladders, scaffolds, platforms and paths of travel. When the Contract Documents require a portion of the Work to be tested, such portion of work shall not be covered up until inspected and approved by the State. The Contractor shall be solely responsible for notifying the State where and when the work is ready for inspection and testing. Should any work be covered without the required testing and approval, such work shall be uncovered and recovered at the Contractor's expense. Whenever the Contractor intends to perform work on Saturday, Sunday, or a legal holiday, the Contractor shall give written notice to the State of such intention at least 48 hours prior to performing the Work, so that the State may make necessary arrangements.

3.13.2 If the State determines that portions of the Work require additional testing, inspection or approval not included in the Contract Documents, the State will instruct the Contractor, in writing, to make arrangements for additional testing, inspection or

approval by an entity acceptable to the State, and the Contractor shall give 48 hours written notice to the State of where and when tests and inspections will be conducted so that the State may observe the procedures. The State will bear the costs except as provided in Subparagraph 3.13.3.

3.13.3 If procedures for testing, inspection or approval under Subparagraphs 3.13.1 and 3.13.2 reveal failure of a portion(s) of the Work to comply with the Contract Documents, the Contractor shall bear all costs made necessary by such failure(s) including those of repeated procedures and compensation for the State's services and expenses.

3.13.4 Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and delivered to the State within 14 days after each test.

3.14 USE OF PROJECT SITE

3.14.1 The Contractor shall confine operations at the Project site to areas permitted by law, ordinances, permits and the Contract Documents.

3.14.2 The Contractor shall perform no operations of any nature on or beyond the limits of Work or premises, except as such operations are authorized in the Contract Documents, or authorized by the State.

3.14.3 The Contractor shall ensure the limits of Work to be free of graffiti or other similar defacements during the time of the Contract; if such defacement occurs, then the Contractor shall properly remove, repair, or correct the affected area(s), or as otherwise directed by the State. The Contractor shall protect exposed surfaces within the limits of Work, with anti-graffiti coatings, and maintain such protection continuously effective during the time of the Contract.

3.14.4 Prohibitions: Pursuant to Subparagraph 3.2.2., the use of alcohol and tobacco products, and the use or possession of weapons, or illegal controlled substances by the Contractor, or others under the Contractor's control, on State property is not allowed. Residing on site in temporary facilities by the Contractor, or others under the Contractor's control, is not allowed unless otherwise specified in the Specifications, Division 01.

3.15 CUTTING AND PATCHING

3.15.1 The Contractor shall be responsible for cutting, fitting or patching as required to complete the Work.

3.15.2 The Contractor shall not damage nor endanger the Work by cutting, patching or otherwise altering the construction, and shall not cut nor otherwise alter the construction without prior written consent of the State.

3.16 CLEANING UP

3.16.1 The Contractor shall keep the Project site and surrounding areas free from waste materials and/or rubbish caused by operations under the Contract and at other times when directed by the State. At all times while finish work is being accomplished, floors shall be kept clean, free of dust, construction debris and trash. Upon completion of the Work, the Contractor shall remove from the Project site the Contractor's tools, construction equipment, machinery, and any waste materials not previously disposed of, leaving the Project site thoroughly clean, and ready for the State's final inspection.

3.16.2 If the Contractor fails to clean up as provided in the Contract Documents, the State may do so and charge the cost thereof to the Contractor.

3.17 **ACCESS TO WORK:** The Contractor shall provide the State continuous and safe access to the Work. Including, but not limited to providing lifts, ladders, scaffolds, platforms and paths of travel.

3.18 **ROYALTIES AND PATENTS:** The Contractor shall pay royalties and license fees. The Contractor shall defend suits or claims for infringement of patent rights and hold the State harmless.

3.19 INDEMNIFICATION

3.19.1 Duty To Defend: To the fullest extent permitted by law, the Contractor shall defend the State and any officer or employee of the State from and against suits filed against the State alleging claims, (including costs of attorneys fees) by reason of liability imposed by law and claims, including but not limited to, claims of personal injury, death, damage to property and loss of use thereof, or any claims arising out of the Contractor's performance of the Contract, or damages of other relief based on allegations of the failure of the Contractor, or the Contractor's Subcontractors to properly perform their obligations under the Contract, of the Contractor's violations of any legal duties, even if the allegations of any suit are groundless, false or fraudulent, and the Contractor

may make such investigation and settlement of any suit as the Contractor deems expedient. This duty to defend is separate and independent from the Contractor's duty to indemnify and hold harmless the State from such claims. Any failure to fulfill this obligation shall be a default of the Contractor's performance obligations under the Contract.

3.19.2 Duty to Indemnify: To the fullest extent permitted by the law, the Contractor shall hold harmless and indemnify the State and any officer or employee of the State from and against claims, losses and expenses (including costs of attorneys fees) by reason of liability imposed by law for claims, including but not limited to, claims of personal injury, death, damage to property and loss of use thereof, or any claims arising out of the Contractor's performance of the Contract, or damages or other relief based on allegations of the failure of the Contractor, or the Contractor's Subcontractors to properly perform their obligations under the Contract, or the Contractor's violations of any legal duties. Any failure to fulfill this obligation shall be a default of the Contractor's performance obligations under the Contract.

3.20 **AIR POLLUTION:** The Contractor and Subcontractors shall comply with State and/or local air pollution control rules, regulations, ordinances, and statutes that apply to work performed under the Contract. If there is a conflict between the State and local air pollution control rules, regulations, ordinances and statutes, the most stringent shall govern.

3.21 **CERTIFICATION BY CONTRACTOR OF RECYCLED CONTENT:** The Contractor shall certify in writing, under penalty of perjury, to the State, the minimum, if not exact, percentage of recycled content, both postconsumer material and secondary material, as defined in Public Contract Code Sections 12153 and 12200 and 12209, in materials, goods, or supplies offered or products used in the performance of the Contract, regardless of whether the product meets the required recycled percentage as defined in Sections 12153 and 12200 and 12209. The Contractor may certify that the product contains zero recycled content.

3.22 **UNFAIR BUSINESS PRACTICES:** The Contractor agrees and will require the Subcontractors and suppliers to agree to assign to the State all rights, title, and interest in and to all causes of action they may have under Section 4 of the Clayton Act (15 U.S.C. Section 15), or under the Cartwright Act (commencing with Section 16700 of the Business and Professions Code), arising from the purchase of goods, services or materials, pursuant to the Contract Documents or subcontract thereunder. An assignment made by the Contractor, and additional assignments made by Subcontractors and suppliers, shall be deemed to have been made and will become effective at the time the State tenders final payment to the Contractor, without further acknowledgment of the parties.

3.23 **CHILD SUPPORT COMPLIANCE ACT:** For any contract in excess of $100,000, the Contractor acknowledges in accordance with Public Contract Code Section 7110, that: (a) the Contractor recognizes the importance of child and family support obligations and shall fully comply with all applicable state and federal laws relating to child and family support enforcement, including, but not limited to, disclosure of information and compliance with earnings assignment orders, as provided in Chapter 8 (commencing with Section 5200) of Part 5 of Division 9 of the Family Code; and (b) the Contractor, to the best of its knowledge is fully complying with the earnings assignment orders of all employees and is providing the names of all new employees to the New Hire Registry maintained by the California Employment Development Department.

3.24 **NOT USED**

3.25 **CONTRACTOR REQUIRED NOTIFICATION OF CHANGES:** The Contractor shall notify the State's Representative in writing of any change to Contractor's name, status, or information including but not limited to:

1. Name
    a. An amendment is required to change the Contractor's name as listed on this Agreement. Upon receipt of Contractor's notification and 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.
    b. The State shall not be liable for penalties or interest on payments which are delayed due to Contractor's change of name and subsequent amendment processing.
2. Address/Location
3. Federal Employer Identification Number (FEIN)
4. Type of Organization or Legal Status – including:
    a. Corporate
    b. Partnership
    c. Individual/Sole-Ownership
    d. Joint Venture
    e. Limited Liability Company
    f. DBA
5. Ownership
6. Officers or Key Personnel
7. License
8. Other (Bankruptcy, Etc.)

Contractor shall immediately provide an updated Standard Form 204 (IRS/FTB form) to the Contracts Management & Procurement Services Section within five (5) calendar days of any such relevant change.

The State shall not be liable for penalties or interest on payments which are delayed do to Contractor's lack of proper or timely notice and documentation of a relevant change in status which impacts the State's ability to pay.

Contractor shall submit the firm's status change in writing including the Contract Number, Project Title and all necessary backup and legal documentation to support the status change to:

The State Department of General Services
Real Estate Services Division
Contracts Management & Procurement Services Section
707 Third Street, Suite 2-350
West Sacramento, CA 95605

ARTICLE 4 - SUBCONTRACTORS

4.1 SUBLETTING AND SUBCONTRACTING

4.1.1 The Contractor shall adhere to the rules governing subcontracting as set forth in the Subletting and Subcontracting Fair Practices Act, commencing with Public Contract Code, Section 4100. Subcontractor substitutions shall be in accordance with provisions of the Subletting and Subcontracting Fair Practices Act, beginning with Public Contract Code, Section 4100. Violations of this Act by the Contractor may subject the Contractor to penalties and disciplinary action as provided by the Subletting and Subcontracting Fair Practices Act.

4.1.2 The Contractor shall be responsible for the Work. Persons engaged in the Work of the Project are the responsibility and under the control of the Contractor. The Contractor shall give personal attention to fulfillment of the Contract and shall keep the Work under the Contractor's control. When any Subcontractor fails to execute a portion of the Work in a manner satisfactory to the State, the Contractor shall remove such Subcontractor immediately upon written request notice from the State, and the Subcontractor shall not again be employed on the Project. Although Specification Sections of the Contract Documents may be arranged according to various trades or general grouping of work, the Contractor is not obligated to sublet work in any manner. The State will not entertain requests to arbitrate disputes among Subcontractors or between the Contractor and Subcontractor(s) concerning responsibility for performing any part of the Work.

4.1.3 The State may not permit a contractor or subcontractor who is ineligible to bid or work on, or be awarded, a public works project pursuant to Sections 1777.1 or 1777.7 of the Labor Code to bid on, be awarded, or perform work as a subcontractor on a public works project.

.1 Any contract on a public works project entered into between a contractor and a debarred subcontractor is void as a matter of law. A debarred subcontractor may not receive any public money for performing work as a subcontractor on a public works contract, and any public money that may have been paid to a debarred subcontractor by a contractor on the project shall be returned to the awarding body. The Contractor shall be responsible for the payment of wages to workers of a debarred subcontractor who has been allowed to work on the Project.

4.2 SUBCONTRACTUAL RELATIONS

4.2.1 The Contractor shall make available to each proposed Subcontractor, prior to the execution of a Subcontractor Agreement, copies of the Contract Documents to which the Subcontractor will be bound. Upon written request of the Subcontractor, the Contractor shall identify to the Subcontractor the terms and conditions of the proposed Subcontractor Agreement which may or may not be at variance with the Contract. Subcontractors shall similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors. The Contractor shall, by Subcontractor Agreement, require each Subcontractor, to the extent of the work to be performed by the Subcontractor:

.1 To be bound to the Contractor by terms of the Contract.
.2 To assume toward the Contractor the obligations and responsibilities which the Contractor, by the Contract, assumes toward the State.
.3 To preserve and protect the rights of the State under the Contract Documents with respect to the work to be performed by the Subcontractor.
.4 To be allowed, unless specifically provided otherwise in the Subcontractor Agreement, the benefits of rights, remedies and redress against the Contractor that the Contractor, by the Contract, has against the State.
.5 To enter into similar agreements with Sub-subcontractors.

4.2.2 Subcontractor Payments: The Contractor shall pay the Contractor's Subcontractors for work performed no later than 10 days after receipt of each progress payment. If there is a good faith dispute over all or any portion of the amount due a Subcontractor on a progress payment, the Contractor may withhold no more than 150 percent of the disputed amount. This provision shall apply to Sub-subcontractors also. A violation of these requirements invokes the payment and penalty provisions of Public Contract Code, Section 10262 and Section 10262.5.

4.3 **DISABLED VETERAN BUSINESS ENTERPRISE PROGRAM:** Pursuant to Public Contract Code (PCC) Section 10115 et. seq., the Contractor shall use, employ and utilize Disabled Veteran Business Enterprise (DVBE) subcontractors, sub-subcontractors or material suppliers who were listed in their bid documents for DVBE Program participation, to the full extent of the amount of money and/or percentage of commitment manifested in the bid documents. If the Contractor wishes to substitute any listed DVBE subcontractors, sub-subcontractors or material suppliers for just and legal cause, the Contractor shall follow the dictates of PCC Sections 4107 and 10115.12b, as well as Military and Veterans Code (M&VC) Section 999.5(e) and California Code of Regulations, Title 2, Section 1896.64. The DVBE may only be replaced by another DVBE and shall obtain the written authorization of the State prior to any such substitutions. The Contractor shall not unilaterally substitute a listed DVBE subcontractor, sub-subcontractor or material supplier. Failure of Contractor to seek substitution and adhere to the DVBE participation requirement identified in the bid may be cause for contract termination, recovery of damages under rights and remedies due to the State, and penalties as outlined in M&VC Section 999.9; PCC Sections 4110 and PCC Section 10115.10.

4.4 **CONTRACT ASSIGNMENTS:** Performance of the Contract may not be assigned except upon written consent of the State. Consent will not be given to an assignment which would relieve the Contractor or the Contractor's Surety of their responsibilities under the Contract.

ARTICLE 5 - CONSTRUCTION BY THE STATE OR BY SEPARATE CONTRACTORS

5.1 STATE'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

5.1.1 The State reserves the right to perform work or operations related to the Project with the State's own work force, and to award separate contracts in connection with other portions of the Project, and other construction or operations on the Project site or adjacent to the Project. The Contractor shall at all times conduct the Work so as to impose no hardship on the State or others engaged in work on the Project, nor to cause any unreasonable delay or hindrance to the Project.

5.1.2 When separate contracts are awarded for different portions of the Project, "the Contractor" in the Contract Documents in each case shall mean the contractor who executes each separate contract. Each contractor is the intended third part beneficiary of other contracts for the Project.

5.1.3 The Contractor shall not cause unnecessary hindrance or delay to another contractor working on or near the Project. If the performance of any contract for the Project is likely to be interfered with by the simultaneous execution of some other separate contract or contracts, the State will decide which contractor may proceed.

5.1.4 Costs caused by defective or ill-timed work shall be borne solely by the responsible contractor.

5.2 MUTUAL RESPONSIBILITY

5.2.1 The Contractor shall cooperate fully with the State and separate contractors with regard to the execution of their work as follows:

.1 The Contractor shall cooperate fully with the State and all separate contractors with regard to introduction and storage of their materials and equipment.

.2 The Contractor shall coordinate with the State and separate contractors with regard to construction scheduling and sequence of operations, subject to approval of the State.

.3 Each contractor shall monitor the schedule and progress of each other contractor whose work affects its work, and shall provide timely notice to the State of potential problems of interface so that the State can mitigate the problem.

.4 The Contractor shall properly connect the Work to the work of the State or the separate contractors.

.5 The Contractor shall inspect the work of the State or other contractors affecting the Work and promptly report to the State in writing irregularities or defects in the separate work, which renders it unsuitable for reception or connection of the Work.

.6 Failure of the Contractor to inspect and report shall constitute acceptance of the other work as fit and proper to receive the Work, except as to defects which may develop in the other work after execution of the Contractor's Work.

5.2.2 Claims Between Separate Contractors:

.1 Should the Contractor cause damage to the work or property of any separate contractor on the Project, the Contractor shall, upon due notice, settle with such other contractor by agreement, mediation or arbitration, if they will so settle.

.2 If such separate contractor sues the State or initiates an arbitration proceeding on account of any damage alleged to have been so sustained, the State will notify the Contractor who shall defend such proceedings at the Contractor's sole expense.

.3 The Contractor shall pay or satisfy any judgement or award against the State, arising therefrom. In addition, the Contractor shall pay the State for attorney's fees, court, arbitration or mediation costs and additional administrative, professional, consultant, inspection, testing and other service costs which the State has incurred.

5.2.3 The Contractor shall promptly remedy damage wrongfully caused by the Contractor to any completed or partially completed construction or to any property of the State or separate contractors as provided in Subparagraph 10.1.6.

5.2.4 Cutting and Patching Under Separate Contracts: The Contractor shall be responsible for any cutting, fitting and patching that may be required to complete the Work, except as otherwise specifically provided for in the Contract Documents. The Contractor shall not endanger any work of the State or of any other contractor by cutting, excavating, or otherwise altering any work, except with the written consent of the State.

5.3 **STATE'S RIGHT TO CLEAN UP:** If a dispute arises among the Contractor, separate contractors and/or the State as to the responsibility under their respective contracts for maintaining the Project site and surrounding areas free from waste materials and rubbish as described in Paragraph 3.16, the State may clean up and allocate the costs among those responsible.

ARTICLE 6 - CHANGES IN THE WORK

6.1 GENERAL

6.1.1 The State may order changes, including but not limited to, revisions to the Contract Documents, performance of extra work, and the elimination of work, without invalidating the Contract. Orders for such changes will be in writing. Changes shall not affect the obligations of the sureties on the contract bonds nor require their consent. Contract Time and Contract Sum will be adjusted, by written Change Order for changes which materially increase or decrease the time or cost or performance.

.1 Proposed Change Order: The Contractor will be issued a written proposed Change Order by the State describing the intended changes to the Work.

.2 Timeline: Within 14 days the Contractor shall submit to the State the Contractor's proposed cost estimate to be added or deducted from the Contract Sum due to the change, authenticated in full by completely detailed estimates and other authenticators of the cost by the Contractor, Subcontractors, Sub-subcontractors, vendors or material suppliers, and any adjustments of time of Completion of the entire Work that is directly attributable to the State's proposed Change Order.

.3 Agreement: If an agreement is reached as to the adjustment in compensation for performance of changed Work, but an agreement is not reached as to the adjustment of Time for such Work, then the Contractor shall proceed with the Work at the agreed cost, reserving to the Contractor the right to further pursue the Contractor's claim for adjustment of time in accordance with Paragraphs 7.4 and 9.1.

.4 Failure to Submit Cost Estimate: If the Contractor fails to submit the cost estimate within the 14 days timeline, or there is failure to agree to the Cost, then the State shall have the right to issue an order in writing to the Contractor to commence Work immediately, and the Contract Sum shall be changed in accordance with the State's estimate of cost, unless, within 14 days following completion of the added Work or with written notice to delete the Work, the Contractor submits to the State written proof that the State's estimate is in error.

6.1.2 The Contractor, when ordered by the State, shall proceed with changes before agreement is reached on adjustment, if any, in compensation or time for performance, and shall furnish to the State records as specified in Clause 6.2.1.3. If the Contractor fails to provide such records, the State's records will be used for the purpose of adjustment, if any, in Contract Time and Contract Sum.

.1 Contractor may make payment requests for such work.

6.1.3 The Contractor will forfeit compensation for cost and /or time for proceeding with changes to the Work without written authorization from the State. The Contractor shall notify the State, in writing, and request an evaluation whenever it appears a change is necessary. This written notice shall be made within 24 hours of such discovery. If the State concurs with the Contractor's request for a change to the Work, the State will follow the procedures under Article 6. Delays as a result of these requests will be the

responsibility of the Contractor.

6.2 CHANGE ORDER

6.2.1 Methods used in determining adjustments to the Contract Sum shall be based on one of the following methods:

.1 By mutual acceptance of a lump sum increase or decrease in costs. Upon the State's written request, the Contractor shall furnish a detailed estimate of increase or decrease in costs, together with cost breakdowns and other support data within the time specified in such request. The Contractor shall be responsible for any additional costs caused by the Contractor's failure to provide the estimate within the time specified.

.2 By the State, on the basis of the State's estimate of increase or decrease in the costs.

.3 By the State, whether or not negotiations are initiated as provided in Clause 6.2.1.1, by actual and necessary costs, as determined by the State, on the basis of records. Beginning with the first day and at the end of each day, the Contractor shall furnish to the State detailed hourly records for labor, construction equipment, and services; and itemized records of materials and equipment used that day in performance of the changes. Such records shall be on a form acceptable to the State. Such records shall be signed by the Contractor and, when agreed to by the State, will become the basis for compensation for the changed work. Such agreement shall not preclude subsequent adjustment based upon later audit by the State.

.4 By unit prices stated in the Contract Documents, or subsequently agreed upon.

.5 By a manner agreed upon by the State and the Contractor.

6.2.2 Allowable Costs: The only costs which will be allowed due to changes in the Work shall be computed in the following manner:

.1 Labor: Compensation for labor shall include the applicable payroll cost for labor, including first level supervision providing physical construction labor directly engaged in performance of the changes. Others, who may be involved in the preparation of the change order, including, but not limited to supervisors, superintendent, engineers, or estimators, shall be considered as overhead costs under Clause 6.2.2.4. Payroll cost for labor shall be the General Prevailing Wage Rates applicable for this project and in the locality for performance of the changes. In addition to the published rates, only social security, worker compensation, state and federal taxes shall be included in the total payroll cost. Other costs shall be considered as mark-ups under Clause 6.2.2.4. Use of a classification which would increase labor costs will not be permitted.

.2 Materials and Equipment: Compensation for materials and equipment shall include the necessary costs for materials and equipment directly required for performance of the changes. Cost of materials and equipment may include costs of transportation and delivery. If discounts by suppliers are available to the Contractor, they shall be credited to the State. If materials and equipment are obtained from a supply or source owned by, or in part, by the Contractor, payment therefore will not exceed current wholesale prices for such materials and equipment. If, in the opinion of the State, the cost of materials and equipment is excessive, or if the Contractor fails to furnish satisfactory evidence of costs from supplier, the cost of materials and equipment shall be the lowest current wholesale price at which similar materials and equipment are available in quantities required. The State reserves the right to furnish materials and equipment required for performance of the changes, and the Contractor shall have no claim for costs or mark-ups on such materials and equipment.

.3 Construction Equipment:

.1 Compensation for construction equipment shall include the necessary costs for use of construction equipment directly required for performance of the changes. Any use for less than 30 minutes shall be considered one-half hour. No costs will be allowed for time while construction equipment is inoperative, idle, or on stand-by, for any reason, unless such times have been approved in advance by the State. Rental time for construction equipment moved by its own power shall include the time required to move construction equipment to the Work site from the nearest available source for rental of such equipment, and time required to return such equipment to the source. If construction equipment is not moved by its own power, loading and transportation costs will be paid in lieu of such rental time. Neither moving time nor loading and transportation costs will be allowed if the construction equipment is used for any work other than the changes. No allowance will be made for individual pieces of construction equipment and tools having a replacement value of $500 or less. No construction equipment costs will be recognized in excess of rental rates established by distributors or equipment rental agencies in the locality for performance of the changes.

.2 Unless otherwise approved by the State, the allowable rate for use of construction equipment shall constitute full compensation to the Contractor for cost of fuel, power, oil, lubrication, supplies, necessary attachments, repairs and maintenance of any kind, depreciation, storage, insurance, labor except for construction equipment operators and any and all costs to the Contractor incidental to the use

of such construction equipment.

.4 Mark-Ups for Added Work:

.1 General: The following allowance for mark-ups for performance of the changes shall constitute full compensation for additional field and home office overhead, profit, insurance, taxes (excluding sales taxes for materials incorporated into the project), and bonds, and other costs not covered under Clauses 6.2.2.1 through 6.2.2.3.

.2 Contractor: When work is added, the Contractor may claim mark-up in addition to authorized allowable costs, a reasonable sum as compensation for the items identified in 6.2.2.4.1 above, subject to proof of entitlement based on actual job costs, actual job experience, the Contractor's bidding data, and industry custom and practice. Under no circumstance can this sum exceed the following percentages:

.1 Contractor Labor : 21 percent, includes bond cost.

.2 Contractor Materials and Equipment : 16 percent, includes bond cost.

.3 Subcontractor Work : 6 percent of Subcontractor's costs, includes bond cost.

.1 Calculations of the Contractor's allowable 6 percent mark-up of the Subcontractor's Work shall not include the Subcontractor's allowable mark-up. Compounding of mark-up is not allowed.

.3 Subcontractors: When work is added, the Subcontractor may claim mark-up in addition to authorized allowable costs, a reasonable sum as compensation for the items identified in 6.2.2.4.1 above, subject to proof of entitlement based on actual job costs, actual job experience, the Subcontractor's bidding data, and industry custom and practice. Under no circumstance can this sum exceed the following percentages:

.1 Subcontractor Labor : 20 percent

.2 Subcontractor Materials and Equipment : 15 percent

.3 The aggregate mark-ups for all Subcontract tiers shall not exceed 20 percent for labor and 15 percent for materials and equipment. Compounding of mark-up is not allowed.

.5 For Deleted Work: When the State is entitled to a credit for deleted work, the credit shall include direct labor, materials, and supervision plus overhead of the Contractor or Subcontractor, as applicable for the deleted work. Deleted overhead shall be computed as no less than 5 percent of the direct labor, materials, and supervision, and should reflect the actual savings to the Contractor resulting from the deletion based upon actual job prices for the work at issue, actual job experience, the Contractor's bidding data for the project and industry custom and practice. For example, if a $10,000 item of work is deleted, the credit to the State would be no less than $10,500.

.6 For Combination of Added and Deleted Work: For Change Orders that involve both added and deleted work, the Contract Sum will be adjusted based on the following computation: Cost before mark-ups of added and deleted work shall each be separately estimated. If a difference between costs results in an increase to the Contract Sum, a mark-up for added work shall be applied to the difference. If a difference in costs results in a decrease, then the 5 percent credit to the State for deleted overhead set forth above shall be applied to the difference.

.7 General Limitations: Costs to the Contractor for changes which exceed market values prevailing at the time of the change will not be allowed unless the Contractor establishes that all reasonable means for performance of the changes at prevailing market values have been investigated and the excess cost could not be avoided. Notwithstanding actual charges to the Contractor on work performed or furnished by others, no mark-ups will be allowed in excess of those specified in Clause 6.2.2.4 above.

6.2.3 Cost Disallowance: Costs which will not be allowed or paid in Change Orders or Claim settlements under this Contract include, but are not limited to, interest cost of any type other than those mandated by statute; Claim preparation or filing costs; legal expenses; the costs of preparing or reviewing proposed Change Orders or Change Order proposals concerning Change Orders which are not issued by the State; lost revenues; lost profits; lost income or earnings; rescheduling costs; costs of idled equipment when such equipment is not yet at the site or has not yet been employed on the Work; lost earnings or interest on unpaid retainage; claims consulting costs; the costs of corporate officers or staff visiting the site or participating in meetings with the State; any compensation due to the fluctuation of foreign currency conversions or exchange rates; or loss of other business.

6.3 **ACCEPTANCE OF CHANGE ORDERS:** The Contractor's written acceptance of a Change Order shall constitute final and binding agreement to the provisions thereof and a waiver of Claims in connection therewith, whether direct, indirect, or consequential in nature.

6.4 **EFFECT ON SURETIES:** Alterations, extensions of time, extra and additional work, and other changes authorized by the Contract Documents may be made without securing consent of Surety(s) on Contract Bonds.

ARTICLE 7 - TIME

7.1 NOTICE TO PROCEED

7.1.1 The Contractor will be notified of the Contract start date as stated in the Notice to Proceed. Notwithstanding other provisions of the Contract, the State will not be obligated to accept or to pay for work furnished by the Contractor prior to the start date stated in the Notice to Proceed whether or not the State has knowledge of the furnishing of such work. The Contractor shall not be allowed on the site of the Work until the Contractor's Contract bonds and certificates of insurance comply with requirements of the Contract.

7.1.2 Work under the Contract shall be conducted in accordance with Paragraph 3.10. The Contractor shall not begin any Work until authorized in writing by the State.

7.2 **CONTRACT TIME:** The Contract Time is the period set forth in Document 00 73 00, Supplementary Conditions. The start and completion dates will be stated in a Notice to Proceed. It is essential that the Project be completed within the time fixed for Completion in Document 00 73 00 or liquidated damages will be assessed for delay. All portions of the Work shall be completed and shall be ready for full use by the State on, or prior to, the date of Completion.

7.2.1 Time is of the essence in this Contract.

7.3 **LIQUIDATED DAMAGES:** For every day that the Work remains unfinished after the time fixed for Completion in the Contract Documents, as modified by any approved extension of time, damage will be sustained by the State. Because of the difficulty in computing actual material loss and disadvantages to the State, it is determined in advance that the Contractor will pay the State the amount of damages set forth in the Agreement, as representing a reasonable forecast of actual damages which the State will suffer by failure of Contractor to complete the Work within the time fixed for Completion in the Contract. Execution of the Agreement shall constitute acknowledgment by the Contractor that the Contractor agrees that the State will actually suffer damages in the amount fixed for every Day during which Completion of the Work is avoidably delayed beyond the time fixed for Completion in the Contract.

7.4 TIME EXTENSIONS

7.4.1 Request for Time Extension: In the event the Contractor requests an extension of Contract Time for unavoidable delay, the Contractor shall furnish such justification and supporting evidence as the State may deem necessary for the determination as to whether the Contractor is entitled to an extension of Contract Time. The Contractor shall submit justification in writing no later than 7 days after the initial occurrence of any delay. The justification shall be based on the Official Progress Schedule as updated at the time of occurrence of the delay or execution of work related to any changes to the scope of the Work. The justification shall include, but is not limited to the following information:

.1 Duration to perform activity(ies) relating to changes in the Work and resources (manpower, equipment, material, etc.) required to perform these activities within the stated duration.

.2 Logical ties to the Official Progress Schedule for proposed changes or delay showing activity(ies) in the schedule start or completion dates are affected by the change or delay.

7.4.2 The State, upon receipt of such justification and supporting evidence, shall make its finding of fact. The State's decision shall be final and conclusive and the State will advise the Contractor in writing of such decision. If the State finds that the Contractor is entitled to an extension of Contract Time, the State's determination as to the total number of extension days shall be based upon the latest updated version of the Official Progress Schedule. Such data will be included in the next monthly updating of the schedule.

7.4.3 Time Extensions: For delays that the State agrees are unavoidable, and are Justified in accordance with Subparagraph 7.5.2, the Contractor shall, pursuant to the Contractor's application, be allowed an extension of time beyond the Contract Time. During such extension of time, neither extra compensation for engineering and inspection nor liquidated damages will be charged to the Contractor. Time extensions shall be granted only for delays or changes that extend the Completion date, based on the latest accepted updated version of the Official Progress Schedule. Time extensions for delays and changes shall not exceed one day for each day that the Contract Completion date of the Official Progress Schedule is extended by this change or delay.

7.5 DELAYS IN COMPLETION OF THE WORK

7.5.1 Notice of Delays: Whenever the Contractor foresees delay in the continuance and Completion of the Work, or immediately upon the occurrence of any delay which the Contractor regards as unavoidable, the Contractor shall notify the State in writing, in a separate notice of the delay. The Contractor's notice shall include the probability of the occurrences of such delay and its cause in

order that the State may take immediate steps to prevent the occurrence or continuance of the delay. If the delay cannot be prevented, the State will determine whether the delay is unavoidable and to what extent continuance and Completion of the Work is anticipated to be delayed.

.1 The Contractor shall make no claim for delay not called to the attention of the State in writing, at the time of its occurrence.

.2 Delay in the continuance of parts of the Work that does not prevent or delay the continuance of other parts of the Work or the Completion of the whole Work within the Contract Time shall be deemed to constitute neither avoidable delays nor unavoidable delays, within the meaning of the Contract. Such delay will be considered Unjustified and no extension to the Contract Time and/or additional compensation will be granted.

7.5.2 Justified Delay: Justified Delay in the continuance or Completion of the Work shall include delays which result from causes beyond the control of the Contractor and which could not have been avoided by the exercise of due care and diligence on the part of the Contractor or the Contractor's Subcontractors. Delay in Completion of the Work due to Contract modifications ordered by the State and unforeseeable delays in continuance or completion of the work of other contractors employed by the State may be considered Justified Delays insofar as they interfere with the Contractor's Completion of the Work within the Contract Time. Delays due to normal weather conditions which prevent the Contractor from proceeding with the controlling item on the Official Progress Schedule will not be regarded as a Justified Delay.

.1 Justified Delay will result in an extension beyond the Contract Time in accordance with Paragraph 7.4.

.2 Justified Delay that includes Contract modifications ordered by the State may entitle the Contractor to extra compensation in accordance with the provisions of Article 6.

.3 Delay that results from causes beyond the control of the State and is determined by the State to be the Contractor's responsibility shall be considered Unjustified and will result in no extension in the Contract Time or extra compensation. The State's decision shall be final and conclusive.

.4 The State will determine the net difference between overlapping or concurrent Justified Delays and Unjustified Delays and whether the Contractor is entitled to any extension in the Contract Time and/or extra compensation. The State's decision shall be final and conclusive.

7.5.3 Weather Delays: If weather conditions are the basis for delays in the continuance or completion of the Work, such delay shall be documented by 5 year climatological data obtained by the Contractor, from the nearest nationally recognized reporting station to the Work site, substantiating that weather conditions were abnormal for the period of time and could not have been reasonably anticipated, and that weather conditions had an adverse effect on the scheduled construction. The State will not be responsible for additional costs of the Contractor caused by weather delays, including, but not limited to, costs of extended overhead.

7.6 ACCELERATION

7.6.1 The State reserves the right to accelerate the Work of the Contract. In the event that the State directs acceleration, such directive will be only in written form. The Contractor shall keep cost and other Project records related to the acceleration directive separately from normal Project costs and records, and shall provide a written record of acceleration cost to the State on a daily basis.

7.6.2 In the event that the Contractor believes that some action or inaction on the part of the State constitutes an acceleration directive, the Contractor shall immediately notify the State in writing that the Contractor considers the actions an acceleration directive. This written notification shall detail the circumstances of the acceleration directive. The Contractor shall not accelerate work efforts until the State responds to the written notification. If acceleration is then directed or required by the State, cost records referred to above shall be maintained by the Contractor and provided to the State on a daily basis.

7.6.3 In order to recover additional costs due to acceleration, the Contractor shall document that additional expenses were incurred and paid by the Contractor. Labor costs recoverable will be only overtime or shift premium costs or the cost of additional laborers brought to the site to accomplish the accelerated work effort. Equipment costs recoverable will be only the cost of added equipment mobilized to the site to accomplish the accelerated work effort.

ARTICLE 8 - PAYMENTS AND COMPLETION

8.1 **SCHEDULE OF VALUES**: Before the first payment request, the Contractor shall submit to the State a Schedule of Values allocated to portions of the Work, included with the Contractor's Progress Schedule, and supported by such data to substantiate the accuracy as the State may require. This Schedule of Values, unless objected to by the State, shall be used as a basis for progress payments.

8.2 **TIMELINESS OF PAYMENTS**

8.2.1 Upon receipt of a payment request by the designated State's Representative with updated Progress Schedule from the Contractor, the State will review same to determine if it is a proper payment request based on the approved Schedule of Values. Any payment request determined by the State not to be suitable for payment shall be modified and processed in accordance with the State's assessment or returned to the Contractor for resubmittal. The reason(s) the payment request was deemed unsuitable shall be stated in writing.

8.2.2 Actual payment request submittal date shall be established by the State. Thereafter, the payment request submittal date will be monthly on the same date.

8.2.3 The State will make progress payments pursuant to Public Contract Code, Section 10261.5.

8.3 **RETENTIONS**

8.3.1 Upon submittal and receipt of a monthly payment request in accordance with Paragraph 8.2 above, the following shall apply:

.1 The Contractor's payment request shall include the total amount of Work completed to date, including materials as verified by the State, furnished and delivered on the Project site, not used, or in a secure off-site facility, pursuant to Public Contract Code, Section 10261. All materials included in the Contractor's payment requests furnished and delivered on the Project site, not used, and /or in a secure off-site facility shall be used exclusively for the Project. It shall be the sole responsibility of the Contractor to maintain, protect and secure such materials.

.2 The State shall retain not less than 5 percent of the estimated value of Work completed.

8.3.2 Securities in Lieu of Retention: At the request and expense of the Contractor, and in accordance with Public Contract Code, Section 10263, the Contractor may provide securities in lieu of retention.

8.4 **ASSIGNMENT OF CONTRACT FUNDS:** The Contractor may assign moneys due or to become due under the Contract, through an amendment to the Contract. Any assignment of moneys earned by the Contractor shall be subject to proper retention in favor of the State and to deductions provided for in the Contract. Moneys withheld, whether assigned or not, are subject to being used by the State to the extent permitted by law, for the Completion of the Work in the event that the Contractor is in default of the Contract.

8.5 **OCCUPANCY BY THE STATE PRIOR TO COMPLETION OF THE WORK**

8.5.1 The State reserves the right to occupy all or any part of the Project prior to Completion of the Work, upon written notice. Such occupancy or use is herein referred to as Beneficial Occupancy. In this event, the Contractor shall be relieved of responsibility to the State for liability arising out of such occupancy by the State. Nevertheless, the Builder's Risk Coverage must remain in effect, with either a "consent to occupy" endorsement or a waiver of occupancy endorsement, with no right of recovery against the State.

8.5.2 The State's Beneficial Occupancy does not constitute Completion of the Work or Acceptance of the Work by the State, or any portion of the Work, nor will it relieve the Contractor of responsibility for correcting defective Work or materials found at any time before Acceptance of the Work, as set forth in Article 12 or during the Guarantee period as set forth in Paragraph 3.5, or after the State's acceptance, as set forth in Subparagraph 8.6.1. However, when the Project includes separate buildings, and one or more of the buildings is entirely occupied by the State, then upon written request by the Contractor and by written consent from the State, the Guarantee period will commence to run from the date of the State's occupancy of such building or buildings.

8.6 **ACCEPTANCE OF THE WORK AND FINAL PAYMENT**

8.6.1 When the Contractor considers the Work complete, the Contractor shall request a final inspection in writing to be conducted by the State.

.1 The Contractor shall request this final inspection only when all Work, including deficient items identified on previous inspections, have been completed and deliverables delivered as noted in the Project Manual, Section 01 77 00.

.2 The State Representative shall conduct a final inspection within 14 days of receipt of a written request from the Contractor for final inspection.

.3 If, after the inspection, the State Representative determines that the Work is complete, the State Representative will establish a date for Completion of the Work. The State Representative will then recommend to the Director of the Department of General Services, or the Director's designee, to accept the Work within 60 days from the

date of Completion of the Work.

.4 Upon Acceptance of the Work by the Director:
   a) The Retention held by the State will be released, and
   b) The Contractor will be relieved of the duty of maintaining and protecting the Work.

.5 If the State determines that the Work is not complete, the Contractor will be notified in writing of deficiencies. After correcting all deficiencies the Contractor shall again initiate the procedures for final inspection as set forth above. If the process of re-inspection and correction of deficiencies goes beyond the Contract Time, the Contractor shall be assessed liquidated damages.

.6 Determination by the State that the Work is complete or Acceptance of the Work will not bar any Claim against the Contractor pursuant to Paragraph 3.5.

8.6.2 Upon Acceptance of the Work, the State will submit a final statement to the Contractor:

.1 The final statement shall take into account the Contract Sum as adjusted by any Change Orders, amounts already paid to the Contractor, sums to be withheld for incomplete Work, liquidated damages, stop notices, and for any other cause under the Contract.

.2 A warrant in the amount of the sum due the Contractor, if any, will be issued.

.3 If the Contractor owes any amount to the State, the final statement shall serve as an invoice to the Contractor.

8.6.3 The Contractor is required to pay Subcontractors from which a Retention has been withheld within 7 days of receipt from the State of Retention proceeds.

8.6.4 The Contractor has 30 days after receipt of the final statement to file a Claim with the State.

.1 All Claims shall comply with the requirements of Subparagraph 9.1.2.

.2 Failure to file a Claim within the 30 day period constitutes a failure to diligently pursue and exhaust the required administrative procedures set forth in the Contract. Such failure shall constitute waiver of additional rights to compensation under the Contract or the right to request Equitable Adjustment.

.3 If the Contractor does not file a Claim within the 30 day period, the final warrant made by the State will become a complete and final settlement between the State and the Contractor.

8.7 **INTEREST:** Payments due and unpaid under the Contract shall earn interest pursuant to Public Contract Code, Sections 7107 and 10261.5.

ARTICLE 9 - DISPUTES AND CLAIMS

9.1 DISPUTE AND CLAIM PROCEDURES

9.1.1 Dispute as to Contract Requirements: When the Contractor and the State fail to agree whether or not any work is within the scope of Contract requirements, the Contractor shall immediately perform such work upon receipt of a written notice to do so by the State. Within 14 days after receipt of such notice to perform disputed work, the Contractor may submit a written protest to the State, specifying in detail the Contract requirements that were exceeded, and approximate change in cost resulting so that the State will have notice of a potential Claim. Failure to submit a protest within the specified period shall constitute a waiver of any and all rights to an adjustment in Contract Sum and Contract Time due to such work, and the Contractor thereafter shall not be entitled to adjustment of Contract Sum or Contract Time. For any such work that is found to exceed Contract requirements, there shall be an adjustment in Contract Sum and Contract Time on same basis as any other change in the Work.

.1 The Contractor shall provide supporting data and shall provide and maintain records of costs attributable to Disputes in similar manner as for Change Orders in Article 6.

.2 The State's Representative and the Contractor's Superintendent will make every reasonable effort to resolve the Dispute prior to proceeding to the next step.

.3 Either the State or the Contractor may call a special meeting for the purpose of resolving the Dispute. Such a meeting will be held within 7 days of written request thereof.

.4 If the Dispute as to the Contract Documents has not been resolved, the Contractor shall, within 14 days after the special meeting, take one or more of the following actions:
   .1 submit additional supporting data requested by the State;
   .2 modify the initial Dispute; or
   .3 notify the State that the initial Dispute stands as is.

.5 If the Dispute has not been resolved within 7 days after the Contractor's action in response to Clause 9.1.1.4, another meeting may be scheduled, at the State's option, with senior management personnel of the State and the Contractor. The purpose of this meeting is to resolve the Dispute prior to proceeding to the action under

Subparagraph 9.1.2.

9.1.2 Claim Submission and Documentation: If a Dispute has not been resolved at the time of the State's final statement, the Contractor shall submit within 30 days a Claim along with detailed documentation required by Subparagraph 9.1.1 for the State's consideration.

.1 The Contractor shall furnish 3 certified copies of the required Claim documentation. The Claim documentation shall be complete when furnished. The evaluation of the Contractor's Claim will be based upon State records and the Claim documents furnished by the Contractor.

.2 Claim documentation shall conform to generally accepted accounting principles and shall be in the following format:

- .1 General Introduction
- .2 General Background Discussion
- .3 Issues
  - .1 Index of Issues (listed numerically)
  - .2 For each issue
    - .1 Background
    - .2 Chronology
    - .3 Contractor's position (reason for State's potential liability)
    - .4 Supporting documentation of merit or entitlement
    - .5 Supporting documentation of damages
    - .6 Begin each issue on a new page
- .4 All critical path method (CPM) schedules, both as-planned, monthly updates, schedule revisions, and as-built along with the computer disks of all schedules related to the Claim.
- .5 Productivity exhibits (if appropriate)
- .6 Summary of Issues and Damages

.3 Supporting documentation of merit for each issue shall be cited by reference, photocopies, or explanation. Supporting documentation may include, but shall not be limited to, General Conditions; General Requirements; technical Specifications; Drawings; correspondence; conference notes; Shop Drawings and submittals; Shop Drawing logs; survey books; inspection reports; delivery schedules; test reports; daily reports; subcontracts; fragmentary critical path method (CPM) schedules or time impact analyses; photographs; technical reports; requests for information; field instructions; and all other related records necessary to support the Contractor's Claim.

.4 Supporting documentation of damages for each issue shall be cited, photocopied, or explained. Supporting documentation may include, but shall not be limited to, documents related to the preparation and submission of the bid; certified, detailed labor records, including labor distribution reports; material and equipment procurement records; construction equipment ownership costs records or rental records; Subcontractor or vendor files and cost records; service cost records; purchase orders; invoices; Project as-planned and as-built cost records; general ledger records; variance reports; accounting adjustment records; and any other accounting materials necessary to support the Contractor's Claim.

.5 Each copy of the Claim documentation shall be certified by a responsible officer of the Contractor in accordance with the requirements of the Contract Documents.

.6 Should the Contractor be unable to support any part of the Claim, and it is determined that such inability is attributable to falsity of such certification or misrepresentation of fact or fraud on the part of the Contractor, the Contractor shall be liable to the State as provided for under California Government Code, Section 12650 et seq., known as the False Claims Act.

.7 The State will render a written decision to the Contractor relative to the Claim. The State's written decision shall be final and binding on the party(ies) but subject to arbitration. The State may withhold from the final payment an amount not to exceed 150 percent of the disputed amount. If there is a Surety and there appears to be a possibility of a Contractor's default, the State may, but is not obligated to, notify the Surety and request the Surety's assistance in resolving the controversy.

.8 All issue items to be included in the Complaint in Arbitration shall be a part of the Claim submitted with the required documentation under this Subparagraph 9.1.2. Issues not included in the Claim under Subparagraph 9.1.2 shall not be considered.

9.1.3 Arbitration: Any Claim filed in compliance with Subparagraph 9.1.2 not resolved by the above procedures shall be resolved by arbitration in accordance with the provisions of Public Contract Code Section 10240 et seq., and Title 1, California Code of Regulations, Section 1300 et seq., unless the State and the Contractor agree in writing to waive arbitration and proceed to litigation. Either party may initiate arbitration by filing a Complaint in Arbitration with the Office of Administrative Hearings in

Sacramento, California, in compliance with the requirements of Public Contract Code Section 10240, et seq., and Title 1, California Code of Regulations, Section 1300 et seq. Arbitration shall be conducted in Sacramento, California.

9.2 AUDIT AND ACCESS TO RECORDS

9.2.1 The Contractor shall maintain books, records, documents, and other evidence directly pertinent to the performance of the Work under this Contract, in accordance with generally accepted accounting principles and practices consistently applied. The Contractor shall also maintain all financial information and data used by the Contractor in the preparation or support of any cost submission, including the Contractor's original bid required for this Contract, or any Change Order, Claim, or other request for equitable adjustment, and a copy of the cost summary or information submitted to the State. The State's Representative shall have access upon 24 hours advance written notice, at all times during normal business hours, to such books, records, documents, financial information, and all other evidence for the purpose of inspection, audit, and copying. The Contractor shall, at no cost to the State, provide proper facilities for such access, inspection and copying purposes.

9.2.2 The Contractor agrees to make the provisions of Paragraph 9.2 applicable to this Contract, and Change Orders, Claims, or other requests for Equitable Adjustment affecting the Contract Time or Contract Sum. The Contractor agrees to include the provisions of Paragraph 9.2 in subcontracts and sub-subcontracts or purchase orders, at any tier, and make Paragraph 9.2 applicable to subcontracts, at any tier, in excess of $10,000, and to make the provisions of Paragraph 9.2 applicable to Change Orders, Claims, and other requests for Equitable Adjustment related to Project performance.

9.2.3 Audits conducted under Paragraph 9.2 shall be in accordance with general accepted auditing standards and established procedures and guidelines of the reviewing or audit agency.

9.2.4 The Contractor agrees to the disclosure of all information and reports resulting from access to records under the provisions of Paragraph 9.2, to the State, and other affected agencies.

9.2.5 Records under the provisions of Paragraph 9.2 shall be maintained and made available during the performance of the Work under this Contract until 3 years past final payment, and until final settlement of all Disputes, Claims, or litigation, whichever occurs later. In addition, those records which relate to any portion of this Contract, to any Change Order, to any Dispute, to any litigation, to the settlement of any Claim arising out of such performance, or to the cost or items to which an audit exception has been taken, shall be maintained and made available until final payment or final resolution of such Dispute, litigation, Claim, or exception, whichever occurs later.

9.2.6 The right of access provisions of Paragraph 9.2 applies to financial records pertaining to this Contract and Change Orders and Claims. In addition, this right of access applies to records pertaining to all contracts, Change Orders, and Contract Amendments:

.1 To the extent the records pertain directly to Contract performance;
.2 If there is any indication that fraud, gross abuse, or corrupt practices may be involved;
.3 If the Contract is terminated for default or convenience.

9.2.7 Access to records is not limited to the required retention periods. The authorized State Representatives shall have access to records at any reasonable time for as long as the records are maintained.

9.2.8 Further, the Contractor agrees to include a similar right of the State to audit records and interview staff in any subcontract related to performance of this Agreement, in regards to the Disabled Veterans Business Enterprise (DVBE) Program.

ARTICLE 10 - PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY OF PERSONS AND PROPERTY

10.1.1 The Contractor shall initiate, maintain and supervise safety precautions and programs in connection with the performance of the Work.

10.1.2 The Contractor shall take precautions for safety and provide protection to prevent damage, injury or loss to:

.1 Employees working under the Contract and other persons who may be affected thereby;
.2 The Work and materials and equipment to be incorporated therein, whether in storage on or off the Project site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and
.3 Other property at the Project site, or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities, except as otherwise noted or specified.

10.1.3 The Contractor shall comply with applicable laws, ordinances, rules, regulations and lawful orders of public authorities bearing on the safety of persons or property, or their protection from damage, injury or loss.

10.1.4 The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying the State, other Owners (other than the State) and users of adjacent sites and utilities.

10.1.5 The Contractor shall comply with applicable laws, ordinances, rules, regulations and lawful orders of public authorities regarding the storage and/or use of explosives or other hazardous materials or equipment necessary for execution of Work. The Contractor shall employ properly qualified personnel for supervision of same.

10.1.6 The Contractor shall remedy damage and loss to property referred to in Clauses 10.1.2.2 and 10.1.2.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Clauses 10.1.2.2 and 10.1.2.3. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Paragraph 3.19.

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

10.1.8 When conditions of the Work, in the judgment of the State, present risk of injury or death to persons or property damage, the State, may direct the Contractor, at the Contractor's sole expense, to close down the Work and not commence work again until dangerous conditions are eliminated.

10.1.9 The Contractor, at the Contractor's own cost, shall rebuild, repair, restore and make good-damages to any portion of the Work affected by such causes before Acceptance of the Work.

10.2 **EMERGENCIES:** In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's sole discretion, to prevent any threatened damage, injury or loss. Additional compensation or extension of Contract Time claimed by the Contractor because of an emergency will be reviewed as provided in Article 6.

10.3 **DRUG-FREE WORKPLACE**

10.3.1 By signing the Agreement, the Contractor certifies, under penalty of perjury under the laws of the State of California, that the Contractor will comply with the requirements of the Drug-Free Workplace Act of 1990 (Government Code, Section 8350 et seq.), and will provide a drug-free workplace by taking the following actions:

.1 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.

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

.1 The dangers of drug abuse in the workplace;

.2 The person's or company'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.

.3 Provide, as required by Government Code, Section 8355(c), that every employee who works under the Contract 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.

ARTICLE 11 - INSURANCE AND BONDS

11.1 CONTRACTOR'S INSURANCE

11.1.1 General Insurance Requirements:

.1 Contractor shall procure and maintain insurance against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the work hereunder and the results of that work by the Contractor, its agents, representatives, employees or subcontractors.

.1 Contractor shall furnish the State with original certificates and endorsements effecting coverage required by this clause. All certificates and endorsements are to be received and approved by the State before work commences.

.2 The State reserves the right to require complete, certified copies of all required insurance policies, including endorsements affecting the coverage required by these specifications at any time.

.2 Insurance Companies shall be acceptable to Department of General Services (DGS) and Office of Risk and Insurance Management (ORIM). Insurance is to be placed with insurers with a current A.M. Best's rating of no less than A-VI. Exception may be made for the State Compensation Insurance Fund. If self-insured, review of financial information may be required.

.3 Except as otherwise provided for Builders Risk/Installation Floater under Clause 11.1.2.4, all coverage shall be in force until the Acceptance of the Work by the Director of DGS. If the insurance expires, the Contractor shall immediately provide a new current certificate or be declared in breach of Contract. The State reserves the right to withhold all progress and retention payments until the breach is cured to the satisfaction of the State. Renewal insurance certificates must be tendered to the State prior to or exactly at the expiration of the previous insurance certificate. There shall be no gap in insurance coverage. This renewed insurance shall be in accordance with the terms of the Contract.

.4 Insurance policies shall contain a provision that coverage will not be cancelled without 30 days prior written notice to the State.

.5 The Contractor shall be responsible for any deductible or self-insured retention contained within the insurance.

.6 In the event the Contractor fails to keep in effect at all times the specified insurance coverage, the State may, in addition to the remedies noted in Article 11.1.1.3 above and any other remedies it may have, remove the Contractor from the work site and/or may terminate this Contract upon the occurrence of such event, subject to the provisions of this Contract. In the event, the State elects to remove the Contractor from the work site, the Contractor will not be entitled to additional days or compensation.

.7 Any insurance required to be carried shall be primary.

.8 Minimum Scope of Insurance - Coverage shall be at least as broad as:

.1 Insurance Services Office Commercial General Liability coverage (occurrence Form CG 0001). The insurance Certificate shall show the GL form number.

.2 Insurance Services Office Form Number CA 0001 covering Automobile Liability, "any auto", or "scheduled, hired and nonowned".

.9 The State reserves the right to require the Contractor to provide the subcontractors' insurance certificates and policies, when so directed by the State.

11.1.2 Insurance Requirements: The Contractor shall furnish to the State evidence of the required insurance as follows:

.1 Commercial General Liability: The Contractor shall maintain commercial general liability with limits of not less than $5,000,000 per occurrence for bodily injury and property damage liability combined. If Commercial General Liability insurance or other form with a general aggregate limit is used, either the general aggregate limit shall apply separately to this project/location or the general aggregate limit shall be twice the required occurrence limit. If the aggregate applies "per project or location", it shall so state on the certificate. The policy shall include coverage for liabilities arising out of premises, operations, independent contractors, products, completed operations, personal and advertising injury, and liability assumed under an insured contract. This insurance shall apply separately to each insured against whom claim is made or suit is brought subject to the Contractor's limit of liability. The policy shall include the Department of General Services and the State of California, its officers, agents, and employees, as additional insureds, but only insofar as the operations under the Contract are concerned.

.1 Additional Insured coverage shall be provided in the form of an insured endorsement (CG 20 10 11 85 r equivalent) to the contractor's insurance policy. The endorsement must be attached to the certificate.

.2 Deductibles and Self-Insured Retentions (for Commercial General Liability): Any deductibles or self-insured retentions must be declared to and approved by the State. At the option of the State, either: the insurer shall reduce or eliminate such deductibles or self-insured retentions as respects the State of California and the Department of General Services, its officers, agents, employees and servants or the Contractor shall provide a financial guarantee satisfactory to the State guaranteeing payment of losses and related investigations, claim administration, and defense expenses.

.2 Automobile Liability: The Contractor shall maintain motor vehicle liability with limits of not less than $1,000,000 per accident for bodily injury and property damage. The State is to be covered as additional insured with respect to liability arising out of automobiles owned, leased, hired or borrowed by or on behalf of the contractor.

.3 Workers' Compensation: The Contractor shall maintain statutory workers' compensation and employer's liability coverage for all its employees who will be engaged in the performance of the Contract, including special coverage extensions where applicable as required by the State of California. The Workers' Compensation policy shall be endorsed with a waiver of subrogation in favor of the State for all work performed by the contractor, its employees, agents and subcontractors. Except for State Fund, all subrogation waiver endorsements shall be on a separate form attached to the certificate. The Contractor shall maintain Employer's Liability coverage of $1,000,000 per accident for bodily injury or disease.

.4 Builders Risk/Installation Floater: The Contractor shall maintain in force, at its own expense, Builders Risk/Installation Floater covering the Contractor's labor, materials, and equipment to be used for completion of the Work performed under this Contract against all risks of direct physical loss, excluding earthquake and flood, for an amount equal to the full amount of the Contract Sum.

.1 The Contractor agrees as a provision of the contract to waive all rights of recovery against the State.

.2 The State of California, Department of General Services shall be a named insured or additional insured under the policy.

.3 The policy shall have a loss payable clause in favor of the State of California, Department of General Services.

.4 The requirement for maintaining the Builders Risk/Installation Floater shall be in full force at all times during the entire duration of the Contract Time without any gaps, delays or breaks in coverage. This includes Beneficial Occupancy and authorized adjustment for time extensions. Coverage shall be maintained until Completion of the Work, except for delivery of as-built drawings, operation and maintenance manuals, guarantees, warranties, spare parts, reports and certifications as noted in the Closeout Procedures section of the Project Manual and as determined by the State's Representative in writing.

11.1.3 Neither the State, nor any officer or employee of the State, shall be liable for any loss or damage that may happen to the Work, or any part thereof; nor to any of the materials or other items used or employed in performing the Work; nor for injury to any person or persons, either workers or the public, for damage to property from any cause which might have been prevented by the Contractor, or the Contractor's employees or agents, against all of which injuries or damages the Contractor shall properly guard. The Contractor shall indemnify and hold harmless the State, and all officers and employees of the State, from all suits, actions or claims brought for, or on account of injuries or damages received or sustained by any person or persons, by or from the Contractor, the Contractor's employees or agents, in construction of the Work, or by or in consequence of the Contractor's failure to properly guard the same, or by or as a result of any act or omission of the Contractor, the Contractor's employees or agents. In addition to any remedy authorized by law, moneys due the Contractor under the Contract, as considered necessary by the State, may be retained until disposition has been made of such suits, actions, or claims for damages; however, this provision shall not be construed as precluding the State from enforcing any right of offset the State may have to any such moneys.

11.2 **NO PERSONAL LIABILITY:** Neither the State, nor any other officer or employee of the State will be personally responsible for liabilities arising under the Contract.

11.3 **PERFORMANCE BOND AND PAYMENT BOND**

11.3.1 The Contractor shall furnish bonds, each in the amount of 100 percent of the Contract Sum, covering faithful performance of the Contract and payment of obligations arising thereunder, as stipulated in the bidding requirements or as specifically required in the Contract Documents.

11.3.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bond(s) or permit a copy to be made.

ARTICLE 12 - UNCOVERING AND CORRECTION OF WORK

12.1 UNCOVERING AND CORRECTION OF WORK

12.1.1 If a portion of the Work is covered prior to the State's review, it shall, if requested in writing by the State, be uncovered for the State's observation and replaced at the Contractor's expense without change in the Contract Time.

12.1.2 The Contractor shall notify the State 2 working days prior to covering any work.

12.2 CORRECTION OF WORK

12.2.1 The Contractor shall promptly correct work rejected by the State or Work failing to conform to the requirements of the Contract Documents, whether or not fabricated, installed or completed. The Contractor shall bear the costs of correcting such rejected work, including additional testing and inspections required and compensation for the State's services and expenses made necessary thereby.

12.2.2 Notwithstanding Paragraph 3.5, in the event of an emergency constituting an immediate hazard to the health or safety of any persons or property, the State may undertake, at the Contractor's expense and without prior notice, work necessary to correct such hazardous condition(s) arising from work performed by the Contractor that is not in conformance with the requirements of the Contract Documents.

12.2.3 The Contractor shall remove from the Project site portions of the Work that are not in accordance with the requirements of the Contract Documents, and are neither corrected by the Contractor nor accepted by the State.

12.2.4 If the Contractor fails to correct nonconforming work, as per Paragraph 3.5, the State may correct the nonconforming work in accordance with Paragraph 2.3. If the Contractor does not proceed with correction of such nonconforming work, within such time fixed by written notice from the State, the State may remove and store the salvable materials articles and/or equipment at the Contractor's expense. If the Contractor does not pay all costs of such removal and storage within 14 days after written notice, the State may, upon 14 additional calendar days written notice, sell such materials articles and/or equipment at an auction or private sale, and shall account for the proceeds thereof, after deducting costs and damages that would have been borne by the Contractor, including compensation for the State's services and expenses made necessary thereby. If the proceeds of a sale do not cover all costs that the Contractor would have borne, the Contract Sum shall be reduced by the deficiency. If payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the State.

12.2.5 The Contractor shall bear the cost of correcting destroyed or damaged Work executed by the State or separate contractors, whether fully completed or partially completed, which is caused by the Contractor's correction or removal of Work that is not in accordance with requirements of the Contract Documents.

12.2.6 Nothing contained in this Paragraph 12.2 shall be construed to establish a period of limitation with respect to other obligations that the Contractor might have in the Contract Documents. Establishment of the time period of 1 year, as described in Subparagraph 3.5.1, relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with requirements of the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

12.3 **ACCEPTANCE OF NONCONFORMING WORK:** If the State prefers to accept any or all of the Work that is not in accordance with requirements of the Contract Documents, the State may do so instead of requiring its correction and/or removal, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment to the Contractor has been made.

ARTICLE 13 - MISCELLANEOUS PROVISIONS

13.1 **GOVERNING LAW:** The Contract shall be governed by the law of the State of California.

13.2 **SUCCESSORS AND ASSIGNS:** The Contract binds the Contractor, the Contractor's partners, successors, assigns and legal representatives to the State in respect to covenants, agreements and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations in the Contract Documents.

13.3 **WRITTEN NOTICE:** Written notice shall be deemed to have been duly served if delivered in person to the individual; or a member of the firm or entity; or to an officer of the corporation for which it was intended; or if delivered to or sent by US mail to the last business address known to the party giving notice.

13.4 **CONTRACTOR'S USE OF COMPUTER SOFTWARE:** The Contractor, by signing the Agreement, certifies that it has appropriate systems and controls in place to ensure that State funds will not be used in the performance of the Contract for the acquisition, operation or maintenance of computer software in violation of copyright laws.

13.5 **INDEPENDENT CONTRACTOR:** Contractor, and the agents, subcontractors, and employees of the Contractor, in the performance of this Contract, shall act in an independent capacity and not as officers or employees or agents of the State.

13.6 **UNENFORCEABLE PROVISIONS:** In the event that any provision of this Contract is unenforceable or held to be unenforceable, then the parties agree that all other provisions of this Contract have force and effect and shall not be affected thereby.

13.7 **EXPATRIATE CORPORATIONS:** Contractor herby 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.

13.8 **DOMESTIC PARTNERS:** For Contracts executed or amended after July 1, 2004, the Contractor may elect to offer domestic partner benefits to the Contractor's employees in accordance with Public Contract Code Section 10295.3. However, the Contractor cannot require an employee to cover the costs of providing any benefits which have otherwise been provided to all employees regardless of marital or domestic partner status.

13.9 **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.

13.10 **CERTIFICATION BY CONTRACTOR OF DISABLED VETERAN BUSINESS ENTERPRISE/SMALL BUSINESS PARTICIPATION**

13.10.1 If, for this agreement, the Contractor made a commitment to achieve disabled veteran business enterprise (DVBE) participation, the Contractor must certify in writing to the State, the total amount the Contractor received under the contract, the name and address of the DVBE firms that participated in the performance of the contract, the amount each DVBE received from the Contractor, that all payments have been made to the DVBE and the actual percentage of DVBE participation achieved. Additionally, if for this agreement, the Contractor made a commitment to achieve 25% Small Business participation, the Contractor must certify in writing to the State, the actual percentage of Small Business participation that was achieved. The Contractor is instructed to comply with the procedures stated in CLOSEOUT PROCEDURES, Section 01 77 00. This certification shall be completed pursuant to Section 999.5 of the Military and Veterans Code (M&VC) and Section 14841 of the Government Code. A person or entity that knowingly provides false information shall be subject to a civil penalty for each violation.

END OF DOCUMENT

DOCUMENT 00 73 00
SUPPLEMENTARY CONDITIONS

Requirements included herein supplement DOCUMENT 00 72 00 - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION.

1. ARTICLE 1 – GENERAL PROVISIONS

Paragraph 1.1, DEFINITIONS

Add the following definition:

Hazardous Materials: These materials include but are not limited to products and materials containing: Asbestos, Lead, PCB's, Petroleum fuels and lubricants (including chemical additives), oxidizers, corrosives, solvents, acids and carcinogens.

2. ARTICLE 2 – ADMINISTRATION OF THE CONTRACT

Paragraph 2.6, RUSSIAN SANCTION ORDERS

Add the following Subparagraph 2.6

2.6 On March 4, 2022, Governor Gavin Newsom issued Executive Order (EO) N-6-22 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.

Paragraph 2.7. GENERATIVE ARTIFICIAL INTELLIGENCE (GenAI) REPORTING

Add the following Subparagraph 2.7

2.7.1 Definitions: The following terms are in addition to the defined terms and shall apply to the Contract:

.1 "Generative AI (GenAI)" means 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. (Gov. Code § 11549.64.)

2.7.2 Contractor shall immediately 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.

2.7.3 Notification shall be provided to the State's Representative identified in this Contract.

2.7.4 At the direction of the State, Contractor shall discontinue the provision to the State of any previously unreported GenAI that results in a material impact to the functionality of the System, risk to

the State, or Contract performance, as determined by the State.

2.7.5 If the use of previously undisclosed GenAI is approved by the State, then Contractor will update the Deliverable description, and the Parties will amend the Contract accordingly, which may include incorporating the GenAI Special Provisions into the Contract, at no additional cost to the State.

2.7.6 The State, at its sole discretion, may consider Contractor's failure to disclose or discontinue the provision or use of GenAI as described above, to constitute a material breach of Contract when such failure results in a material impact to the functionality of the System, risk to the State, or Contract performance. The State is entitled to seek any and all remedies available to it under law as a result of such breach, including but not limited to termination of the contract.

Paragraph 2.8, NEWS RELEASES

Add the following Subparagraph 2.8

2.8 News releases pertaining to award of, or work performed as a result of, contract may not be made without prior written approval from:

The Public Information Officer
707 Third Street, MS 101
West Sacramento, CA 95605
Phone: (916) 376-5037
Email: DGSPublicAffairs@dgs.ca.gov

3. ARTICLE 3 – CONTRACTOR

Paragraph 3.2, SUPERVISION AND CONSTRUCTION PROCEDURES

Delete Subparagraph 3.2.5 in its entirety and replace it with new Subparagraph 3.2.5 as follows:

3.2.5 Until Acceptance of the Work, the Contractor shall have the charge and care thereof, and shall bear risk of injury or damage to any part of the Work by action on the elements (except for an Act of God, or natural disaster as proclaimed by the State or Federal Government provided that the loss does not involve Contractor negligence and if the Work damaged is built in accordance with the Contract and applicable building standards), or from any other reason except for such damages as are directly caused by acts of the Federal or State Government and the public enemy, except as provided in Paragraph 8.5.

Paragraph 3.3, LABOR AND MATERIALS

Delete Subparagraph 3.3.3 in its entirety and replace it with new Subparagraph 3.3.3 as follows:

3.3.3. Prevailing Wage: The Contractor shall comply with Labor Code Sections 1774 and 1775. Pursuant to Section 1774, the Contractor and every subcontractor, regardless of tier, shall pay not less than the specified prevailing wage rates to all workers employed in the execution of the Contract. In accordance with Section 1775, the Contractor shall forfeit to the State up to $200 for each day, or portion thereof, for each worker paid less than the prevailing wage rates for the work or craft in which the worker is employed for any work executed under the Contract by the Contractor or by any subcontractor, regardless of tier, in violation of the provisions of the Labor Code; and, in particular,

Labor Code Sections 1770 to 1780, inclusive. In addition to such forfeiture, the difference between such stipulated prevailing wage rates and the amount paid to each worker for each day, or portion thereof, shall be paid to each underpaid worker by the Contractor. This provision shall not apply to properly registered apprentices.

.1 Pursuant to Labor Code, Section 1770, the Director of the Department of Industrial Relations has ascertained the general prevailing rate of per diem wages and a general prevailing rate for legal holiday and overtime work for each craft required for execution of the Contract. The Contractor shall obtain copies of the prevailing rate of per diem wages from the Department of Industrial Relations, Division of Labor Statistics & Research, PO Box 420603, San Francisco, CA 94142-0603, (415) 703-4780; or wage rates may be accessed on the internet at Prevailing Wage Requirements. The Contractor is responsible to read, understand and comply with all the guidelines, including the fine print in the prevailing wage determinations; and shall post a copy of the prevailing wage rates, specific to the Project, at the Project site.

.2 Wage rates set forth are the minimum that may be paid by the Contractor. Nothing herein shall be construed as preventing the Contractor from paying more than the minimum rates set. No extra compensation will be allowed by the State due to the inability of the Contractor to hire labor at minimum rates, nor for necessity for payment by the Contractor of subsistence, travel time, overtime, or other added compensations, all of which possibilities are elements to be considered and ascertained to the Contractor's own satisfaction in preparing the Bid Form

.3 If it becomes necessary to employ crafts other than those listed in the General Prevailing Wage Rate booklet, the Contractor shall contact the Division of Labor Statistics and Research as noted above. The rates thus determined shall be applicable as minimum for the contract and incorporated in the bid. When the wage determination shows an expiration date (noted by a double asterisk**), to expire during the term of the contract, the Contractor must call or write the DIR to obtain the new rates and incorporate them in the bid to be applicable for the term of the contract.

.4 The Contractor and each subcontractor, regardless of tier, shall keep an accurate payroll record showing the names, addresses, social security numbers, work classifications, straight time and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker, or other employee employed by the Contractor and/or subcontractor in connection with the Work. Payroll records shall be certified and shall be on forms provided by the Division of Labor Standards Enforcement, or shall contain the same information as those forms. The Contractor's and subcontractor's certified payroll records for each employee shall be submitted with each payment request, covering the period of the payment request unless requested otherwise by the Labor Commissioner of the Department of Industrial Relations pursuant to Labor Code Section 1771.4(c)(2)(b) monthly payrolls should be sent directly to the Department of Industrial Relations in the current prescribed electronic format. Refer to Certified Payroll Reporting for access to the electronic Certified Payroll (eCRP) Application.

.5 Labor Compliance Monitoring and Enforcement: This project is subject to monitoring and enforcement by the Department of Industrial Relations (DIR), Compliance Monitoring Unit. All Contractors and subcontractors, regardless of tier, shall be required to comply with the Monitoring and Enforcement Program, including, but not limited to, contractor registration, submittal of electronic certified payroll reports directly to the DIR and cooperation with on-site monitoring by DIR personnel.

Paragraph 3.13, TESTS AND INSPECTIONS

Delete Subparagraph 3.13.1 in its entirety and replace with the following Subparagraph 3.13.1.

3.13.1 The Contractor shall at all times permit the State, its agents, officers, and employees to visit the Project site and inspect the Work, including shops where the work is in

preparation. This obligation shall include maintaining proper facilities and safe access for such inspection. Including, but not limited to providing lifts, ladders, scaffolds, platforms and paths of travel. When the Contract Documents require a portion of the Work to be tested, such portion of the work shall not be covered up until inspected and approved by the State. The Contractor shall be solely responsible for notifying the State where and when the work is ready for inspection and testing and shall give written notice no fewer than two business days prior to the time of inspection. For inspections that require the State Fire Marshal's (SFM) presence, the Contractor shall provide the State's Inspector of Record (IOR) written notice where and when the work is ready for inspection no fewer than three business days prior to the time of inspection.

Should any work be covered without the required testing and approval, such work shall be uncovered and recovered at the Contractor's expense.

Delete Subparagraph 3.13.2 in its entirety and replace with the following Subparagraph 3.13.2.

3.13.2 If the State determines that portions of the Work require additional testing, inspection or approval not included in the Contract Documents, the State will instruct the Contractor, in writing, to make arrangements for additional testing, inspection or approval by an entity acceptable to the State, and the Contractor shall give written notice to the State of where and when tests and inspections will be conducted no fewer than two business days prior to the time of the additional testing, inspection or approval so that the State may observe the procedures. For inspections that require the State Fire Marshal's (SFM) presence, the State's Inspector of Record (IOR) will make the necessary arrangements with the SFM. The Contractor shall provide ~~a~~ written notice no fewer than three business days prior to the time of inspection.

The State will bear the costs except as provided in Subparagraph 3.13.3.

Paragraph 3.25, CONTRACTOR REQUIRED NOTIFICATION OF CHANGES

Delete Paragraph 3.25 in its entirety and replace with the following Paragraph 3.25

3.25 CONTRACTOR REQUIRED NOTIFICATION OF CHANGES: The Contractor shall notify the State's Representative in writing of any change to Contractor's name, status, or information including but not limited to:

1. Name
   a. An amendment is required to change the Contractor's name as listed on this Agreement. Upon receipt of Contractor's notification and 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.
   b. The State shall not be liable for penalties or interest on payments which are delayed due to Contractor's change of name and subsequent amendment processing.
2. Address/Location
3. Federal Employer Identification Number (FEIN)
4. Type of Organization or Legal Status – including:
   a. Corporate
   b. Partnership
   c. Individual/Sole-Ownership
   d. Joint Venture
   e. Limited Liability Company
   f. DBA
5. Ownership

6. Officers or Key Personnel
7. License
8. Other (Bankruptcy, Etc.)

Contractor shall immediately provide an updated Standard Form 204 (IRS/FTB form) to the Architectural, Construction and Engineering Contracts Section within five (5) calendar days of any such relevant change.

The State shall not be liable for penalties or interest on payments which are delayed due to Contractor's lack of proper or timely notice and documentation of a relevant change in status which impacts the State's ability to pay.

Contractor shall submit the firm's status change in writing including the Contract Number, Project Title and all necessary backup and legal documentation to support the status change to:

The State Department of General Services, Administration Division
Office of Business and Acquisition Services, Contracts Services Section
707 Third Street, Suite 2-300
West Sacramento, CA 95605-2811

Paragraph 3.4, NONDISCRIMINATION CLAUSE

Delete Paragraph 3.4 in its entirety and replace with the following:

3.4.1. During the performance of this contract, the recipient, contractor, and its subcontractors shall not deny the contract's benefits to any person on the basis of race, religious creed, color, national origin, ancestry, physical disability, mental disability, medical condition, genetic information, marital status, sex, gender, gender identity, gender expression, age, sexual orientation, or military and veteran status, nor shall they discriminate unlawfully against any employee or applicant for employment because of race, religious creed, color, national origin, ancestry, physical disability, mental disability, medical condition, genetic information, marital status, sex, gender, gender identity, gender expression, age, sexual orientation, or military and veteran status. Contractor shall insure that the evaluation and treatment of employees and applicants for employment are free of such discrimination.

3.4.2. Contractor shall comply with the provisions of the Fair Employment and Housing Act (Gov. Code, § 12900 et seq.), the regulations promulgated thereunder (Cal. Code Regs., tit. 2, § 11000 et seq.), the provisions of Article 9.5, Chapter 1, Part 1, Division 3, Title 2 of the Government Code (Gov. Code, §§ 11135-11139.5), and the regulations or standards adopted by the awarding state agency to implement such article.

3.4.3. Contractor or recipient shall permit access by representatives of the Department of Fair Employment and Housing (DEFH) and the awarding state agency upon reasonable notice at any time during the normal business hours, but in no case less than 24 hours' notice, to such of its books, records, accounts, and all other sources of information and its facilities as said Department or Agency shall require to ascertain compliance with this clause.

3.4.4. Recipient, contractor and its subcontractors shall give written notice of their obligations under this clause to labor organizations with which they have a collective bargaining or other agreement.

3.4.5. The contractor shall include the nondiscrimination and compliance provisions of this clause in all subcontracts to perform work under the contract.

3.4.6 STANDARD CALIFORNIA NONDISCRIMINATION CONSTRUCTION CONTRACT SPECIFICATIONS (GOV. CODE SECTION 12990)

These specifications are applicable to all state contractors and subcontractors having a construction contract or subcontract of $5,000 or more.

.1 As used in the specifications:

a. “Act” means the Fair Employment and Housing Act.

b. “Administrator” means Administrator, Office of Compliance Programs, California Department of Fair Employment and Housing, or any person to whom the Administrator delegates authority.

.2 Whenever the contractor or any subcontractor subcontracts a portion of the work, it shall include in each subcontract of $5,000 or more the nondiscrimination clause in this contract directly or through incorporation by reference. Any subcontract for work involving a construction trade shall also include the Standard California Construction Contract Specifications, either directly or through incorporation by reference.

.3 The contractor shall implement the specific nondiscrimination standards provided in paragraphs 6(a) through (e) of these specifications.

.4 Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the contractor has a collective bargaining agreement, to refer members of any group protected by the Act shall excuse the contractor's obligations under these specifications, Government Code section 12990, or the regulations promulgated pursuant thereto .5. In order for the nonworking training hours of apprentices and trainees to be counted, such apprentices and trainees must be employed by the contractor during the training period, and the contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor or the California Department of Industrial Relations.

.5 In order for the nonworking training hours of apprentices and trainees to be counted, such apprentices and trainees must be employed by the contractor during the training period, and the contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor or the California Department of Industrial Relations.

.6 The contractor shall take specific actions to implement its nondiscrimination program. The evaluation of the contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The contractor must be able to demonstrate fully its efforts under steps a. through e. below:

a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and at all facilities at which the contractor's employees are assigned to work. The contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the contractor's obligations to maintain such a working environment.

b. Provide written notification within (7) seven days to the director of the DFEH when the referral process of the union or unions with which the contractor has a collective bargaining agreement has impeded the contractor's efforts to meet its obligations.

c. Disseminate the contractor's equal employment opportunity policy by providing notice of the policy to unions and training, recruitment and outreach programs and requesting their cooperation in assisting the contractor to meet its obligations; and by posting the company policy on bulletin boards accessible to all employees at each location where construction work is performed.

d. Ensure all personnel making management and employment decisions regarding hiring, assignment, layoff, termination, conditions of work, training, rates of pay or other employment decisions, including all supervisory personnel, superintendents, general foremen, on-site foremen, etc., are aware of the contractor's equal employment opportunity policy and obligations, and discharge their responsibilities accordingly.

e. Ensure that seniority practices, job classifications, work assignments, and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the equal employment opportunity policy and the contractor's obligations under these specifications are being carried out.

.7 Contractors are encouraged to participate in voluntary associations that assist in fulfilling their equal employment opportunity obligations. The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under these specifications provided that the contractor actively participates in the group, makes every effort to assure that the group has a positive impact on equal employment opportunity in the industry, ensures that the concrete benefits of the program are reflected in the contractor's workforce participation, and can provide access to documentation that demonstrates the effectiveness of actions taken on behalf of the contractor. The obligation to comply, however, is the contractor's.

.8 The contractor is required to provide equal employment opportunity for all persons. Consequently, the contractor may be in violation of the Fair Employment and Housing Act (Government Code section 12990 et seq.) if a particular group is employed in a substantially disparate manner.

.9 The contractor shall not use the nondiscrimination standards to discriminate against any person because race, religious creed, color, national origin, ancestry, physical disability, mental disability, medical condition, genetic information, marital status, sex, gender, gender identity, gender expression, age, sexual orientation, or military and veteran status.

.10 The contractor shall not enter into any subcontract with any person or firm decertified from state contracts pursuant to Government Code section 12990.

.11 The contractor shall carry out such sanctions and penalties for violation of these specifications and the nondiscrimination clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Government Code section 12990 and its implementing regulations by the awarding agency. Any contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Government Code section 12990.

.12 The contractor shall designate a responsible official to monitor all employment related activity to ensure that the company equal employment opportunity policy is being carried out, to submit reports relating to the provisions hereof as may be required by OCP and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, status, (e.g., mechanic, apprentice trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in any easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

4. ARTICLE 4 – SUBCONTRACTORS

Paragraph 4.2, SUBCONTRACTUAL RELATIONS

Delete Paragraph 4.2.2 and replace it with the following Paragraph 4.2.2:

4.2.2 Subcontractor Payments: Subcontractors and Sub-subcontractors shall be paid for work performed in accordance with Public Contract Code Sections 10262 and 10262.5.

Delete Paragraph 4.3 and replace it with the following Paragraph 4.3

4.3 DISABLED VETERAN BUSINESS ENTERPRISE PROGRAM: Pursuant to Public Contract Code (PCC) Section 10115 et. seq., the Contractor shall use, employ and utilize Disabled Veteran Business Enterprise (DVBE) subcontractors, sub-subcontractors or material suppliers who were listed in their bid documents for DVBE Program participation, to the full extent of the amount of money and/or percentage of commitment manifested in the bid documents. If the Contractor wishes to substitute any listed DVBE subcontractors, sub-subcontractors or material suppliers for just and legal cause, the Contractor shall follow the dictates of PCC Sections 4107 and 10115.12b, as well as Military and Veterans Code (M&VC) Section 999.5(e) and California Code of Regulations, Title 2, Section 1896.64. The DVBE may only be replaced by another DVBE and shall obtain the written authorization of the State prior to any such substitutions. The Contractor shall not unilaterally substitute a listed DVBE subcontractor, sub-subcontractor or material supplier. Failure of Contractor to seek substitution and adhere to the DVBE participation requirement identified in the bid may be cause for contract termination, recovery of damages under rights and remedies due to the State, and penalties as outlined in M&VC Section 999.9; PCC Sections 4110 and PCC Section 10115.10.

5. ARTICLE 7 – TIME

Paragraph 7.2, CONTRACT TIME

Delete Subparagraph 7.2.1 and replace it with the following Subparagraph 7.2.1:

7.2.1 Time is of the Essence in this Contract. The Contractor shall complete all the Work of the Contract within the Contract Time of:

FOUR HUNDRED AND FIFTY (450)

calendar days, starting on the Start Date stipulated in the Notice to Proceed, which the Contractor will receive not less than 5 days in advance.

Add the following Subparagraph 7.2.2:

7.2.2 Hazardous Materials Removal Work: Within the Contract Time specified in Subparagraph 7.2.1, Contractor shall complete the Hazardous Materials removal work in accordance with the following schedule, commencing on same date as the entire Contract:

.1 Complete Hazardous Materials removal submittals within the following number of calendar days: FOURTEEN (14)

.2 Allow the following number of calendar days for the State's review and acceptance of Hazardous Materials removal submittals: FOURTEEN (14)

.3 Allow the following number of calendar days from date of written notification to start of on-site Hazardous Materials removal work: FOURTEEN (14)

.4 Complete on-site Hazardous Materials removal work within the following number of working days *: THIRTY (30)

(* not to exceed one 8-hour shift per working day. Working days shall be as specified in Section 01 11 00, Article 1.10.)

.5 Allow the following number of calendar days for the State's review and certification of Hazardous Materials removal: SEVEN (7)

Paragraph 7.3, LIQUIDATED DAMAGES

Add the following Subparagraphs 7.3.1 and 7.3.2:

7.3.1 The Contractor shall pay to the State the sum of $3,200.00 per day for each and every calendar day delay in finishing of Work under this Contract beyond the Contract time.

7.3.2 If the Contractor is more than 14 calendar days behind schedule at any point during the Contract Time, based on the latest updated Official Progress Schedule, the State will withhold $3,200.00 per day for each and every day that the Contractor is behind schedule from the monthly payment for that month. If the Contractor recoups all or a portion of the delay during the next pay period, the amount withheld will be reduced accordingly.

Add the following Subparagraphs 7.3.3 and 7.3.4:

7.3.3 Hazardous Materials Removal Work: Contractor shall pay to the State the sum of $1,000 per day for air monitoring by State's Observation Service and other costs for each and every working day's delay in finishing the on-site Hazardous Materials removal work under this Contract beyond the scheduled Contract time set forth in Clause 7.2.3.1.

7.3.4 Should Contractor have no work force present for Hazardous Materials removal work on any scheduled work day, Contractor will be required to pay the State the sum of $1,000 for air monitoring by State's Observation Service and other costs for each such missed work day, unless the Contractor notifies the State Inspector at least 48 hours in advance, for each particular work day which the Contractor expects no work force to be present.

6. ARTICLE 8 – PAYMENTS AND COMPLETION

Paragraph 8.2, TIMELINESS OF PAYMENTS

Delete Paragraph 8.2.3 and replace it with following Paragraph 8.2.3:

8.2.3 The State will make progress payments pursuant to Public Contract Code, Sections 10261 and 10261.5.

Paragraph 8.3, RETENTIONS

Delete Subparagraph 8.3.1.2 and replace it with the following Subparagraph 8.3.1.2:

.2 The State shall retain 5 percent of the estimated value of Work completed.

Paragraph 8.5, OCCUPANCY BY THE STATE PRIOR TO COMPLETION OF THE WORK

Delete Paragraph 8.5.1 and replace it with the following:

8.5.1 The State reserves the right to occupy all or any part of the Project prior to Completion of the Work, upon written notice. Such occupancy or use is herein referred to as Beneficial Occupancy. In this event, the Contractor shall be relieved of responsibility to the State for liability arising out of such occupancy by the State.

7. ARTICLE 11 – INSURANCE AND BONDS

Paragraph 11.1, CONTRACTOR'S INSURANCE

Delete Paragraph 11.1 and replace it with the following 11.1:

11.1 CONTRACTOR'S INSURANCE

11.1.1 General Insurance Requirements:

.1 Contractor shall procure and maintain insurance against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the work hereunder and the results of that work by the Contractor, its agents, representatives, employees or subcontractors.

.1 Contractor shall furnish the State with certificates and endorsements effecting coverage required by this clause. All certificates and endorsements are to be received and approved by the State before work commences.

.2 The State reserves the right to require complete, certified copies of all required insurance policies, including endorsements affecting the coverage required by these specifications at any time.

.2 Insurance Companies shall be acceptable to Department of General Services (DGS) and Office of Risk and Insurance Management (ORIM). Insurance is to be placed with insurers with a current A.M. Best's rating of no less than A-VII, unless otherwise acceptable to DGS, Office of Risk and Insurance Management. Exception may be made for the State Compensation Insurance Fund. If self-insured, review of financial information may be

required.

.3 Except as otherwise provided for Builders Risk/Installation Floater under Clause 11.1.2.4, all coverage shall be in force until the Acceptance of the Work by the Director of DGS. If the insurance expires, the Contractor shall immediately provide a new current certificate or be declared in breach of Contract. The State reserves the right to withhold all progress and retention payments until the breach is cured to the satisfaction of the State. Renewal insurance certificates must be tendered to the State prior to or exactly at the expiration of the previous insurance certificate. There shall be no gap in insurance coverage. This renewed insurance shall be in accordance with the terms of the Contract.

.4 Contractor is responsible to notify the State a minimum of five (5) business days before the effective date of any cancellation, non-renewal or material change that affects required insurance coverage.

.5 Unless otherwise stated in the contract, the Contractor shall be responsible for any premium deductible or self-insured retention contained within the insurance.

.6 All insurance policies required by this contract must allow the State to pay and/or act as the contractor's agent in satisfying any self-insured retention (SIR). The choice to pay and/or act as the contractor's agent in satisfying any SIR is at the State's discretion.

.7 In the event the Contractor fails to keep in effect at all times the specified insurance coverage, the State may, in addition to the remedies noted in Article 11.1.1.3 above and any other remedies it may have, remove the Contractor from the work site and/or may terminate this Contract upon the occurrence of such event, subject to the provisions of this Contract.

In the event, the State elects to remove the Contractor from the work site, the Contractor will not be entitled to additional days or compensation.

.8 Any insurance required to be carried shall be primary and not excess or contributory, to any other insurance carried by the State.

.9 Any required endorsement requested by the State must be submitted with all requested certificates of insurance and not substituted by referring to such coverage on the certificate of insurance.

.10 Minimum Scope of Insurance - Coverage shall be at least as broad as:

.1 Insurance Services Office Commercial General Liability coverage (occurrence Form CG 0001). .2 Insurance Services Office Form Number CA 0001 covering Automobile Liability, "any auto", or "all owned, hired and non-owned".

.11 All coverage and limits available to the contractor shall also be available and applicable to the State.

.12 Contractor shall procure and maintain insurance against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the work hereunder by the Contractor, his agents, representatives, employees, or subcontractors.

.13 With the exception of Builders Risk/Installation Floater, Contractor shall require and verify that all subcontractors maintain insurance coverage and limits meeting or exceeding all the requirements stated herein. Contractor shall ensure that the Department of General Services and the State of California, its officers, agents, and employees, as additional insured on insurance required from subcontractors but only insofar as the operations under the Contract are concerned. For Commercial General Liability coverage subcontractors shall provide coverage with a form at least as broad as CG 20 38 04 13. The State reserves the right to require the Contractor to provide the subcontractors' insurance certificates and policies, when so directed by the State.

11.1.2 Insurance Requirements: The Contractor shall furnish to the State evidence of the required insurance as follows:

.1 Commercial General Liability: The Contractor shall maintain commercial general liability with limits of not less than $5,000,000 per occurrence for bodily injury and property damage

liability combined. If Commercial General Liability insurance or other form with a general aggregate limit is used, either the general aggregate limit shall apply separately to this project/location or the general aggregate limit shall be twice the required occurrence limit. If the aggregate applies “per project or location”, it shall so state on the certificate. The policy shall include coverage for liabilities arising out of premises, operations, independent contractors, products, completed operations, personal and advertising injury, and liability assumed under an insured contract. This insurance shall apply separately to each insured against whom claim is made or suit is brought subject to the Contractor’s limit of liability. The policy shall include the Department of General Services and the State of California, its officers, agents, and employees, as additional insureds, but only insofar as the operations under the Contract are concerned.

.1 Additional Insured coverage shall be provided in the form of an insured endorsement as broad as the (CG 20 10 11 85) to the contractor’s insurance policy. All coverage and limits available to the named insured shall be available and applicable to the additional insured. The endorsement must be attached to the certificate.

.2 Deductibles and Self-Insured Retentions (for Commercial General Liability): Any deductibles or self-insured retentions must be declared to and approved by the State. At the option of the State, either: the insurer shall reduce or eliminate such deductibles or self-insured retentions as respects the State of California and the Department of General Services, its officers, agents, employees and servants or the Contractor shall provide a financial guarantee satisfactory to the State guaranteeing payment of losses and related investigations, claim administration, and defense expenses.

.2 Automobile Liability: The Contractor shall maintain motor vehicle liability with limits of not less than $1,000,000 per accident for bodily injury and property damage. The State is to be covered as additional insured with respect to liability arising out of automobiles owned, leased, hired or borrowed by or on behalf of the contractor. The policy shall include the Department of General Services and The State of California, its officers, agents, and employees, as additional insureds, but only insofar as the operations under the Contract are concerned. All coverage and limits available to the named insured shall also be available and applicable to the additional insured.

.3 Workers' Compensation: The Contractor shall maintain statutory workers' compensation and employer's liability coverage for all its employees who will be engaged in the performance of the Contract, including special coverage extensions where applicable as required by the State of California. The Workers' Compensation policy shall be endorsed with a waiver of subrogation in favor of the State for all work performed by the contractor, its employees, agents and subcontractors. Except for State Fund certificates, all subrogation waiver endorsements shall be submitted on a separate form. The Contractor shall maintain Employer’s Liability coverage of $1,000,000 per accident for bodily injury or disease.

.4 Builders Risk/Installation Floater: The State shall insure all Work while in the course of construction, reconstruction, remodeling or alteration, including materials incorporated in the Work, against physical loss or damage resulting from the perils normally insured under an All Risk Builders Risk/Installation Floater policy, including, but not limited to theft, fire and vandalism. The State will self-insure against Acts of God and natural disasters proclaimed by the State or Federal Government. The State will issue to the Contractor a “Summary of Coverage” provided under this Clause 11.1.2.4 Summary of Coverage and Certificate of Insurance will be provided to contractor as part of the executed contract.

.1 Contractor shall be responsible for paying a deductible not to exceed (to be determined on the certificate of insurance following project enrollment) per occurrence in the event of loss.

.2 The proceeds under the Builder’s Risk/Installation Floater Insurance procured by the State will be payable to the State and Contractor as their respective interests,

from time to time, may appear.

.3 State's Builders Risk/Installation Floater Insurance shall provide limited coverage for materials in transit and materials stored off-site, and full coverage for materials at the Project site; however, the Contractor is responsible for reviewing the "Summary of Coverage" and reporting values that exceed the limits provided within the Summary of Coverage. Notification to the State does not provide coverage. Value increases must be approved by the insurance carrier and contractor must have a Certificate of Insurance issued by the insurance carrier showing the increased values. Lacking confirmation from the State's insurance carrier that additional coverage was procured, Contractor will be responsible for damages in excess of the coverage limits provided within the Summary of Coverage.

.4 Nothing in this Clause 11.1.2.4 shall be construed to relieve the Contractor of Contractor's responsibilities referred to under Clause 11.1.1 and Clause 11.1.2.

.5 Insurance policies referred to in this Clause 11.1.2.4 shall provide the following:

.1 That the policies are primary and do not participate with nor are excess over any other valid collectible insurance carried by the Contractor.

.2 That the Insurer waives the right of subrogation against the Contractor.

Add Clause 11.1.2.7 as follows:

.7 Pollution Liability: The Contractor shall maintain, or shall cause the hazardous materials subcontractor(s) to maintain, Pollution Liability coverage for Contractor's liability for bodily injury, property damage and environmental damage resulting from pollution and related cleanup costs directly or indirectly caused by the hazardous material mitigation work, or related services to be performed.

.1 Coverage shall be provided for work performed on site as well as during handling and transport of hazardous materials.

.2 Limit of not less than $2,000,000 per occurrence and shall be required.

.3 The Contractor, or the hazardous materials mitigation subcontractor(s), shall maintain this required Pollution Liability coverage during each single period, or multiple periods, of hazardous material mitigation work. This coverage may be effected in conjunction with the Contractor's General Liability coverage as long as coverage is provided for the Contractor's liability for bodily injury, property damage and environmental damage resulting from pollution and related cleanup costs directly or indirectly caused by the scope of work or related services within this contract; a separate pollution limit of insurance is required. In cases where the Pollution Liability coverage is not required for the complete term of the Contract, the length of time, and periods of time, that this insurance coverage is required may be determined by the State in accordance with the commencement and cessation dates in the Contractor's Progress Schedule, as accepted by the State in writing. When timing, conditions, and/or the needs of the State warrant, the State reserves the right to set the term of the Pollution Insurance prior to execution of the contract.

.1 The Transporter of hazardous materials, whether the Contractor or a subcontractor shall produce to the State a Certificate of Liability Insurance for Pollution Liability Coverage mandated by law with a copy of the MCS-90.

.2 The MCS-90 Form is effected through the Transporters Automobile liability insurance carrier.

.4 The policy, whether obtained by the Contractor, or by the hazardous materials mitigation

subcontractor(s), shall include the Department of General Services and the State of California, its officers, agents, and employees as additional insureds, but only insofar as the operations under the Contract are concerned. All coverage and limits available to the named insured shall also be available and applicable to the additional insured.

.5 The insurance certificate shall name the State of California, Department of General Services, as certificate holder.

.6 If there is change in the hazardous materials mitigation work, then the Pollution Insurance requirements affected by such change must be effected by an Amendment to the Contract.

END OF DOCUMENT

STATE OF CALIFORNIA DEPARTMENT OF GENERAL SERVICES

REAL ESTATE SERVICES DIVISION
PROJECT MANAGEMENT AND DEVELOPMENT BRANCH

EXAMPLE

Date: July 15, 1999 **DOCUMENT 00 91 13**

ADDENDUM No. 1 TO THE CONTRACT DOCUMENTS

Bid Due Date - August 14, 1999

BUILDING ALTERATIONS
DEPARTMENT OF DEVELOPMENTAL SERVICES
SONOMA DEVELOPMENTAL CENTER
ELDRIDGE, SONOMA COUNTY, CALIFORNIA

PROJECT NO. [ ]

ACKNOWLEDGE RECEIPT OF THIS ADDENDUM ON BID FORM AND
REVISE THE CONTRACT DOCUMENTS AS FOLLOWS:

PROJECT MANUAL

INTRODUCTORY INFORMATION

1. DOCUMENT 00 01 10 - TABLE OF CONTENTS

   SPECIFICATIONS

   A. DIVISION 01 - GENERAL REQUIREMENTS

      DELETE Section 01 45 33 - Asbestos Abatement Observation in its entirety. Asbestos is not anticipated to be encountered in this Project.

   B. DIVISION 02 – EXISTING CONDITIONS

      ADD the attached Section 02 40 00, Demolition, pages 1 through 3.

   C. DIVISION 13 - SPECIAL CONSTRUCTION

      DELETE Section 13 11 00 – Swimming Pools in its entirety.

SECTION 01 10 00

SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Work required to be performed by the Contractor comprises:

1. Oxnard Field Office Renovation in conformity with the Drawings and Specifications hereinafter identified; including furnishing all material, labor, plant, tools, equipment, and services necessary therefore and incidental thereto, complete and ready for use, except as hereinafter otherwise provided.

1.2 WORK NOT INCLUDED

A. Except for such auxiliary work as is shown or specified or is necessary as a part of the construction, the following work is NOT included in this Contract.

1. Work shown but marked "NIC" (Not in Contract). "BUA" (By Using Agency), or otherwise designated to be done by others.

1.3 PROJECT INFORMATION

A. Project Location: 4050 Saviers Road, Oxnard, Ventura County, California

B. Project Identification: 0000000002765

1.4 SPECIFICATIONS

A. The Specifications are those bound in the Project Manual in Book I , and enumerated in the Table of Contents. The General Conditions of the Contract for Construction, Supplementary Conditions, and Division 01 of the Specifications apply to all Work of this Contract.

1.5 DRAWINGS

A. The Drawings consist of Drawing Sheets as listed in Document 00 01 15 of Project Manual.

1.6 CONTRACTOR'S SET OF DRAWINGS AND PROJECT MANUAL

A. State Furnished Drawings and Project Manual: Upon award of Contract, the State will provide Drawings and Project Manual upon Contractor’s request as follows:

1. Electronic Files in PDF format.

B. Contractor Furnished Drawings and Project Manuals: Within 10 days of date established for the Notice to Proceed, provide full-size paper copies of Drawings and Project Manual as follows:

1. Drawings: 2 minimum sets.
2. Project Manual: 2 minimum sets.
3. Distribute as follows:

a. One full-size paper copy set of Contractor furnished Drawings and Project Manual for use as field set by construction personnel and State's Representative.
b. One full-size paper copy set of Contractor furnished Drawings and Project Manual for use as record prints.

C. Keep paper copy sets current with all approved revisions and change orders.

D. Additional Sets shall be the responsibility of the Contractor.

1.7 INTERRUPTION OF SERVICES

A. Make provisions to accomplish the work of this Contract without undue interference with facility operations. Interruptions to services for the purpose of making or breaking connection shall be made only after consultation with the State, minimum of one week in advance of connection break, and shall be at such time and of such duration as may be directed.

B. Coordinate erection of wall framing, wall panels, windows, partitions or other space enclosure with requirements of others for moving large pieces of equipment into building or into room to be enclosed. Consult with others as to the necessity for deferring erection of such enclosures and deliver to the State a schedule of such deferments and reasons, therefore. Cost of deferring construction shall be borne by Contractor.

1.8 WORK RESTRICTIONS

A. Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work to between 7:**30**a.m. to **4:30**p.m., Monday through Friday, unless otherwise indicated. Work hours may be modified to meet Project requirements if approved by State and authorities having jurisdiction.

1. Weekend Hours and State Holidays: Work may be permitted if approval is received from the State at least 3 working days in advance.

C. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet of entrances, operable windows, or outdoor-air intakes.

1.9 CONTRACTOR'S USE OF SITE AND PREMISES

A. 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. Contractor's use of Project site is limited by State's right to perform work or to retain other contractors on portions of Project.

1.10 HAZARDOUS MATERIALS ANTICIPATED ON-SITE

A. It is anticipated that lead paint, asbestos, and polychlorinated Biphenyls (PCB)] exist[s] in the work area and may be encountered during execution of the work.

B. If existing construction materials are identified as containing hazardous materials and/or are disturbed while performing work under this Contract cease work around the suspect area immediately and notify the State. Site conditions and extent of hazardous materials removal related work will be assessed by the State. Affected work activities under this Contract shall not resume until determination is made by the State.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 21 00

ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.

B. Types of allowances include the following:

1. Lump-sum allowances.
2. Unit-cost allowances.
3. Quantity allowances.
4. Contingency allowances.
5. Testing and inspecting allowances.

1.2 DEFINITIONS

A. Allowance: A quantity of work or dollar amount included in the Contract, established in lieu of additional requirements, used to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

1.3 SUBMITTALS

A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.4 ALLOWANCE(S)

A. Allowance shall include cost to Contractor of specific products and materials ordered by or selected by the State under allowance and shall include taxes, freight, delivery to, labor, and installation at Project site.

B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, protection from damage, overhead and profit, other expenses required to complete the Work, and similar costs related to products and materials ordered by or selected by the State under allowance shall be included as part of the Contract Sum and not part of the allowance.

C. The State will review and delineate allowance work with Contractor.

1.5 CONTRACTOR RESPONSIBILITY FOR ALLOWANCE ITEMS

A. Make all arrangements for performance of allowance work.

B. Submit to State certified copies of invoices, bills of sale or other documents authenticating costs incurred by Contractor for allowance items.

1.6 ADJUSTMENT OF COSTS

A. Should net cost be more or less than specified amount of allowance, the Contract Sum will be adjusted accordingly by a Change Order in compliance with requirements of the Document 00 72 00 “General Conditions of the Contract for Construction”.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. Allowance No. 1: Lump-Sum Allowance: Include the sum of $25,000 for removal and disposal of unforeseen hazardous materials, currently concealed by existing conditions.

B. Allowance No. 2: Lump-Sum Allowance: Include $50,000 for alterations to unsupported and incomplete structural components and walls currently concealed by existing conditions.

C. Allowance No. 3: Lump-Sum Allowance: Include $30,000 for modifications to non-compliant existing electrical equipment, machinery, circuitry, raceways, and systems currently concealed by existing conditions.

D. Allowance No. 4: Lump-Sum Allowance: Include $15,000 for modifications to existing entry ways, thresholds, jambs, sills, trim, vestibules, doors and hardware, currently concealed by existing conditions.

E. Allowance No. 5: Lump-Sum Allowance: Include $5,000 for printing services required by the State

F. Allowance No. 6: Lump-Sum Allowance: Include the sum of $25,000 for the removal and proper disposal of unforeseen underground conditions, including hazardous materials.

G. Allowance No. 7: Lump-Sum Allowance: Include the sum of $50,000 to pay for City Permits, City Inspections, and City Connection Fees.

H. Allowance No. 8: Lump-Sum Allowance: Include the sum of $250,000 to pay for Utility Companies Permits, Inspections, Connection Fees.

END OF SECTION

SECTION 01 25 00

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

1.2 DEFINITIONS

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

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 documentation identifying 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.
2. Documentation: Show compliance with requirements for substitutions per Article 3.12.10, Document 00 72 00 “General Conditions of the Contract for Construction”, 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 Owner 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. 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.

h. 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.

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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 29 00

PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's construction schedule.

1. Coordinate line items in the Schedule of Values with items required to be indicated as separate activities in Contractor's construction schedule.
2. Submit the Schedule of Values to State at earliest possible date, but no later than 14 days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use 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. Identification: Include the following Project identification on the Schedule of Values:

a. Project name and location.
b. State’s Project number.
c. Contractor's name and address.
d. Date of submittal.

2. Arrange the Schedule of Values in tabular form, with separate columns to indicate the following for each item listed:

a. Related Specification Section or division.
b. Description of the Work.
c. Change Orders (numbers) that affect value.
d. Dollar value, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent. Round dollar amounts to whole dollars, with total equal to Contract Sum.

3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports.
4. Allowances: Provide a separate line item in the schedule of values for each allowance.
5. Overhead Costs, Proportional Distribution: Include total cost and proportionate share of general overhead and profit for each line item.
6. Schedule of Values Revisions: Revise the Schedule of Values when Change Orders result in a change in the Contract Sum. Include at least one separate line item for each Change Order.

1.3 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments.

B. Payment Application Times: The date for each progress payment shall be established by the State. The period covered by each Application for Payment is one month.

1. Submit draft copy of Application for Payment three days prior to due date for review by State Construction Supervisor/Inspector.
2. State Construction Supervisor/Inspector will review the draft with the Contractor to verify requested payment percentages.
3. Submit Application for Payment upon approval by the State Construction Supervisor/Inspector.

C. Application for Payment Forms: Submit forms for approval with initial submittal of schedule of values.

D. Application Preparation: Complete every entry on form. State will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3. Include amounts of Change Orders issued before last day of construction period covered by application.

E. Partial payment for "mobilization" shall be made in percentages as follows (less retainage):

Contract Amount Completed	Payment for Mobilization
5 %	50% of amount bid for mobilization, or 5% of original Contract amount, whichever is lesser.
10%	75% of amount bid for mobilization, or 7.5% of original Contract amount, whichever is lesser.
20%	95% of amount bid for mobilization, or 9.5% of original Contract amount, whichever is lesser.
50%	100% of amount bid for mobilization, or 10% of original Contract amount, whichever is lesser.

1. Upon completion of all Work on the Project, payment of any amount bid for mobilization in excess of 10% of the original Contract amount will be paid.

F. Project Record Drawings: Prior to each Application for Payment review, update Project Record Documents as required by Section 01 77 00 “Closeout Procedures” and submit for the State’s review and approval. Monthly Applications for Payment will not be processed without review and approval of Project Record Drawings by the State.

G. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored subject to or under the control of the State, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1. Provide certificate of insurance, evidence of transfer of title to State, and consent of surety to payment for stored materials.

2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
3. Provide summary documentation for stored materials indicating the following:

    a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
    b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
    c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

H. Transmittal: Submit Application for Payment signed by the Contractor and State Construction Supervisor/Inspector to the State.

1. Submit with each Application for Payment such evidence as may be necessary to demonstrate costs incurred or estimated to be incurred in accordance with the Schedule of Values during such month and the percentage of completion of each category of Work.
2. Submit with each Application for Payment certified payroll records for each Contractor's and Subcontractor's employee per Document 00 72 00 "General Conditions of the Contract for Construction." Copies of the monthly payroll shall be sent directly to the Department of Industrial Relations in the current prescribed electronic format with evidence of such submission provided with each Application for Payment to the State.

I. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. Schedule of values.
2. Contractor's construction schedule (preliminary if not final).
3. Key Personnel Names List.

J. Final Payment Application: After completing Project closeout requirements, 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 in accordance with Section 01 77 00 "Closeout Procedures."
2. Certification of completion of final punch list items.
3. Warranty certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
4. Evidence that disputes have been settled.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 31 00

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. Requests for Information (RFIs).
3. Digital project management procedures.
4. Project meetings.

1.2 SUBMITTALS

A. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals, and their duties and responsibilities, list telephone numbers, and e-mail addresses. Provide names, e-mail addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project. Keep list current at all times.

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. Subletting and Subcontracting Responsibilities: Refer to Document 00 72 00 “General Conditions of the Contract for Construction”, Article 4.
2. 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.
3. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
4. Coordinate the Work with related work being done by the State and other contractors operating in the area. This coordination shall include reasonable adjustments of schedule in order to allow other contractors or State to do their work. Make provisions for accommodating items installed by the State or under separate contracts.
5. Make adequate provisions to accommodate items scheduled for later installation.
6. Carefully examine Drawings relating to entire work with actual conditions so that Work will be accommodated in spaces provided. General arrangement and location of elements of various systems is shown on the Drawings or specified. Final locations, levels, etc., shall be governed by actual material size used, by building conditions encountered, and by work of all trades. Space conflicts and interferences shall be resolved before work is installed.

B. Site Examination: Visit the site prior to commencement of the Work and get familiar with existing conditions. Be prepared to carry out the Work within existing limitations.

1. Inspect and take responsibility for previously prepared or installed work of other contractors before applying subsequent materials or finishes. If work is in unsatisfactory condition, notify the State. Do not proceed until defective work has been corrected.

C. Work Layout

1. Property lines, location ties, and elevations of components of the Project to be built under this Contract are shown on the Drawings. Grade elevations shown for various parts of the Work are taken from a benchmark shown on the Drawings, or if not shown, will be designated by the State. In case of conflict therein, notify the State in writing before starting work.
2. Layout the Work and furnish surveys required for alignment and elevations of the Work. Furnish necessary lines, levels, locations, measurements and markers for all the Work and be responsible for their accuracy.
3. On building structures, layout on forms, walls, floors, and columns, the exact location of partitions as guide to all trades.

D. Allowable Entrance: Contractor, subcontractors, their employees, suppliers and delivery persons shall enter and exit property via designated entrance.

E. 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 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 will return without response those RFIs submitted to State by other entities controlled by Contractor.
2. Coordinate and submit RFIs in a prompt manner 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. Project name.
2. State’s Representative name.
3. State’s Project number.
4. Date.

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

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Form bound in Project Manual or software-generated form with substantially the same content as indicated above, acceptable to the State.

1. Attachments shall be electronic files in PDF format.

D. State’s Action: State will review each RFI, determine action required, and respond.

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 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 Document 00 72 00 “General Conditions of the Contract for Construction”.

1.5 DIGITAL PROJECT MANAGEMENT PROCEDURES

A. State’s Data Files Not Available: State will not provide State’s [digital data files for Contractor's use during construction.

1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project Record Drawings.
2. State makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
3. Contractor shall execute a data release agreement in the form provided by the State upon request.

B. Web-Based Project Management Software Package: Use State's web-based Project management software package for purposes of hosting and managing Project communication and documentation until Acceptance of the Work.

1. Web-based project management software includes, at a minimum, the following features:
   a. Inspection Requests.

2. The web-based project management system is Procore (www.procore.com) and is updated monthly.

1.6 PROJECT MEETINGS

A. General: State will schedule and conduct, unless otherwise indicated, meetings and conferences at Project site and via web based conferencing.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify State of scheduled meeting dates and times a minimum of 10 working days prior to meeting.
2. Agenda: Entity responsible for conducting meeting will prepare the meeting agenda, and distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, within three days of the meeting.

B. Preconstruction Conference: State will schedule and conduct a preconstruction conference before starting construction, at a time convenient to State, but no later than 15 days after execution of the Agreement.

1. Attendees: Authorized representatives of State**,** Architect or Engineer, and their consultants, State Construction Supervisor/Inspector; Contractor and its superintendent; major subcontractors; 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 but not limited to the following:

   a. Responsibilities and personnel assignments.
   b. Tentative construction schedule.
   c. Phasing.
   d. Critical work sequencing and long lead items.
   e. Lines of communications.
   f. Use of web-based Project software.
   g. Procedures for processing field decisions and Change Orders.
   h. Procedures for RFIs.
   i. Procedures for Quality Assurance / Quality Control (testing and inspecting).
   j. Procedures for processing Applications for Payment.
   k. Distribution of the Contract Documents.
   l. Submittal procedures.
   m. Sustainable design requirements including commissioning.
   n. Preparation of Record Documents.
   o. Allowable entrance.
   p. Work restrictions.
   q. Working hours.

r. State’s occupancy requirements.
s. Installation of temporary facilities and controls.
t. Storm Water Pollution Control.
u. Procedures for disruptions and shutdowns.
v. Construction waste management and recycling.
w. Parking availability.
x. Office, work, and storage areas.
y. Equipment deliveries and priorities.
z. Safety.
aa. Security.
bb. Progress cleaning.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Sustainable Design Requirements Coordination Conference: State will schedule and conduct a sustainable design coordination conference before starting construction, at a time convenient to State**,** Architect or Engineer, and Contractor.

1. Attendees: Authorized representatives of State, State's Commissioning Authority, Architect or Engineer, and their consultants; Contractor and its superintendent and sustainable design coordinator; major subcontractors; 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 meeting sustainable design requirements, including the following:

a. Sustainable design Project checklist.
b. General requirements for sustainable design-related procurement and documentation.
c. Commissioning requirements.
d. Project closeout requirements and sustainable design certification procedures.
e. Role of sustainable design coordinator.
f. Construction waste management.
g. Construction operations and sustainable design requirements and restrictions.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

D. 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 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. Review of mockups.
i. Possible conflicts.
j. Compatibility requirements.
k. Time schedules.
l. Weather limitations.
m. Manufacturer's written instructions.
n. Warranty requirements.
o. Compatibility of materials.
p. Acceptability of substrates.
q. Temporary facilities and controls.
r. Space and access limitations.
s. Regulations of authorities having jurisdiction.
t. Testing and inspecting requirements.
u. Installation procedures.
v. Coordination with other work.
w. Required performance results.
x. Protection of adjacent work.
y. 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.

E. Project Closeout Conference: State will schedule and conduct a project closeout conference no later than 30 days prior to the scheduled date of Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of State, State’s Commissioning Authority, Architect or Engineer, and their consultants; Contractor and its superintendent; major subcontractors; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

a. Preparation of Record Documents.
b. Procedures required prior to inspection for Completion and for final inspection for acceptance.
c. Procedures for completing and archiving web-based Project software site data files.
d. Requirements for preparing operations and maintenance data.
e. Submittal of written warranties.
f. Requirements for completing sustainable design and commissioning documentation.
g. Requirements for delivery of material samples, attic stock, and spare parts.
h. Requirements for demonstration and training.
i. Preparation of Contractor's punch list.
j. Procedures for processing Applications for Payment at Completion and for final payment.
k. Submittal procedures.
l. State's Occupancy requirements.

m. Installation of State's furniture, fixtures, and equipment.
n. Removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

F. Progress Meetings: State will conduct will conduct progress meetings at weekly intervals.

1. Attendees: In addition to representatives of State and Architect or Engineer, each contractor, subcontractor, 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.

1) Review schedule for next period.

b. Review present and future needs, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Safety.
4) Status of submittals.
5) Status of sustainable design documentation and commissioning.
6) Deliveries.
7) Off-site fabrication.
8) Access.
9) Site use.
10) Temporary facilities and controls.
11) Storm Water Pollution Control.
12) Progress cleaning.
13) Quality Assurance / Quality Control (testing and inspection).
14) Status of correction of deficient items.
15) Field observations.
16) Status of RFIs.
17) Status of Changes in the Work.
18) 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: Issue revised Contractor's construction schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 32 00

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. Startup construction schedule.
2. Construction Schedule.
3. Short Interval Schedule.
4. Recovery Schedule.
5. Construction schedule updating reports.
6. Daily construction reports.
7. Unusual event 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 the critical path of Project and when activities can be performed.

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. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

1.3 SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. Working electronic copy of schedule file in computer scheduling software native file format.
2. PDF file.
3. Three paper copies of sufficient size to display entire period or schedule, as required.

B. Startup construction schedule.

1. Submittal of cost-loaded startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.

C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

D. 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.

E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, 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.
4. Projected Monthly Payment Requests Report: List of Contractor’s monthly planned billings from the Notice to Proceed until Completion of the Work.

F. Construction Schedule Updating Reports: Submit with Applications for Payment.

G. Short Interval Schedule: Submit at weekly intervals.

H. Daily Construction Reports: Submit at weekly intervals.

I. Site Condition Reports: Submit at time of discovery of differing conditions.

J. Unusual Event Reports: Submit at time of unusual event.

1.4 QUALITY ASSURANCE

A. Scheduling Conference: State may conduct conference at Project site to review methods and procedures related to the Contractor's Construction Schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.

2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including, but not limited to, phasing work, stages, area separations, interim milestones and beneficial occupancy.
4. Review delivery dates for State-furnished products.
5. Review submittal requirements and procedures.
6. Review time required for review of submittals and resubmittals.
7. Review requirements for tests and inspections by independent testing and inspecting agencies.
8. Review time required for Project closeout and State startup procedures, including commissioning activities.
9. Review list of construction activities to be included in schedule.
10. Review procedures for updating schedule.

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.

1. Use Microsoft Project or Primavera for current Windows operating system.

B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Completion of the Work.

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 21 days.
2. Indicate start and completion dates for the following as applicable:

    a. Securing of approvals and permits required for performance of the Work.
    b. Temporary facilities.
    c. Construction of mock-ups, prototypes and samples.
    d. State interfaces and furnishing of items, if any.
    e. Regulatory agency approvals.
    f. Punch list.

3. Procurement Activities: Include procurement process activities for the long lead-time items and major items as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
4. Submittal Review Time: Include review and resubmittal times indicated in Section 01 33 00 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
5. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
6. Commissioning Time: Include no fewer than 15 days for commissioning.
7. Punch List and Completion: Include not more than 30 days for completion of punch list items and Completion. No activities other than Startup, Testing and/or Commissioning shall be scheduled during this period.

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. Work by State: Include a separate activity for each portion of the Work performed by State.

2. Owner-Furnished Products: Include a separate activity for each product.
3. Work Restrictions: Show the effect of the following items on the schedule:

    a. Coordination with existing construction.
    b. Uninterruptible services.
    c. Beneficial occupancy before Completion.
    d. Use-of-premises restrictions.
    e. Environmental control.

E. 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 Completion percentage for each activity.

F. Distribution of Approved Copies:

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made post in the same locations.

1.6 SHORT INTERVAL SCHEDULE

A. Short Interval Scheduling (SIS) shall be used throughout onsite construction activity. Interval shall be a 3-week projection and shall include week submitted and two weeks thereafter. It shall contain sufficient detail to evaluate daily milestones and manpower/equipment loading and shall identify/tie into monthly updated Schedule.

1.7 RECOVERY SCHEDULE

A. 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.

B. Upon acceptance by the State, incorporate Recovery Schedule into Contractor's Construction Schedule.

1.8 STARTUP CONSTRUCTION SCHEDULE

A. Gantt-Chart Schedule: Submit startup, horizontal, Gantt-chart-type 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. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

1.9 GANTT-CHART SCHEDULE REQUIREMENTS

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's Construction Schedule within 30 days of date established for the Notice to Proceed.

1. Base schedule on the startup construction schedule and additional information received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

C. Contract Modifications:

1. 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.
2. The State shall have no obligation to consider time extension request unless requirements of Contract Documents are complied with; the State shall not be responsible or liable to Contractor for constructive acceleration due to failure of the State to grant time extensions under the Contract Documents, should Contractor fail to comply with submission requirements and justification requirements of this Contract for time extension requests. Contractor's failure to perform in accordance with Schedule shall not be excused because Contractor has submitted time extension requests, until and unless such requests are approved by the State.

D. Initial Issue of Schedule: Prepare network diagram(s) 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. Dollar value of activity (coordinated with the schedule of values).
10. Cash flow report calculated by early start, late start and indicating actual progress.

E. Optional Schedule Reports: In addition to the above reports, the State may request, from month-to-month, any of the following reports:

1. Total float from least to most.
2. Activities by early start.
3. Activities by late start.
4. Activities grouped by subcontractors or selected trades.
5. Activities with scheduled early start dates in a given time frame (i.e. 30- or 60-day outlook).

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.

1.10 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. Approximate count of personnel at Project site.
3. Equipment at Project site.
4. Material deliveries.
5. High and low temperatures and general weather conditions, including presence of rain or snow.
6. Testing and inspection.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events.
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Services connected and disconnected.
15. Equipment or system tests and startups.

B. Unusual Event Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise State in advance when these events are known or predictable.

1. Submit unusual event reports directly to State within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

1.11 PAYMENTS WITHHELD

A. Progress Payments may be withheld in whole or in part should Contractor fail to comply with requirements of this Section.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 32 33

PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Preconstruction photographs.
2. Concealed Work photographs.
3. Periodic construction photographs.
4. Final Completion construction photographs.
5. Preconstruction video recordings.
6. Periodic construction video recordings.
7. Construction webcam.

1.2 SUBMITTALS

A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph and video recording. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.

B. Digital Photographs: Submit image files within seven days of taking photographs.

1. Submit photos by uploading to web-based Project management software site. Include copy of key plan indicating each photograph's location and direction.
2. Identification: Provide the following information with each image description in file in web-based Project management software site:

a. Name and number of Project.
b. Date photograph was taken.
c. Description of location, vantage point, and direction.
d. Unique sequential identifier keyed to accompanying key plan.

C. Video Recordings: Submit video recordings within seven days of recording.

1. Submit video recordings by uploading to web-based Project management software site. Include copy of key plan indicating each video's location and direction.
2. Identification: With each submittal, provide the following information on web-based Project management software site:

a. Name and number of Project.
b. Date video recording was recorded.
c. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
d. Unique sequential identifier keyed to accompanying key plan.

D. Special Publicity Photographs: Submit 2 photographs, taken by professional photographer, professionally mounted and framed suitable for entrance lobby or office display.

1. Frame size: 30” x 48”.

1.3 FORMATS AND MEDIA

A. Digital Photographs: Provide color images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels, and at an image resolution of not less than 3200 by 2400 pixels. Use flash in low light levels or backlit conditions.

B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full high-definition mode. Provide supplemental lighting in low light levels or backlit conditions.

C. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

D. Metadata: Record accurate date and time and GPS location data from camera.

E. File Names: Name media files with date, Project number Project area and sequential numbering suffix.

1.4 CONSTRUCTION PHOTOGRAPHS

A. Preconstruction Photographs: Before commencement of the Work, and in the presence of the State’s Representative, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by State.

1. Take **20** photographs to show existing conditions adjacent to property before starting the Work.
2. Take **20** photographs of existing buildings either on or adjoining property, to accurately record physical conditions at start of construction.
3. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

B. Concealed Work Photographs: Before proceeding with installing work that will conceal other work, take photographs sufficient in number, with annotated descriptions, to record nature and location of concealed Work, including, but not limited to, the following:

1. Underground utilities.
2. Underslab services.
3. Piping.
4. Electrical conduit.
5. Waterproofing and weather-resistant barriers.
6. Structural elements.

1.5 CONSTRUCTION VIDEO RECORDINGS

A. Preconstruction Video Recording: Before starting excavation, demolition and construction, and in the presence of the State's Representative, record video recording of Project site and surrounding properties from different vantage points, as directed by State.
   1. Show existing conditions adjacent to Project site before starting the Work.
   2. Show existing buildings either on or adjoining Project site to accurately record physical conditions at the start of excavation, demolition, and construction.
   3. Show protection efforts by Contractor.

B. PRODUCTS (Not Used)

PART 2 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Submittal schedule requirements.
2. Administrative and procedural requirements for submittals.

1.2 DEFINITIONS

A. Submittals: Written and graphic information and physical samples that require State's responsive action. Submittals are those submittals indicated in individual Specification Sections. Submittals may be rejected for not complying with requirements.

1.3 SUBMITTAL SCHEDULE

A. Submittal Schedule: Submit a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by State and additional time for handling and reviewing submittals required by those corrections.

1. Schedule submissions during the first **90** days after a date established for the Notice to Proceed and at least 21 days before dates reviewed submittals will be needed and within the time periods specified below.

a. Items needed in initial stages of Work or requiring long lead-time for ordering: 30 days.
b. Deferred Approval submittals, for review and approval by Regulatory Agencies such as but not limited to Office of the State Fire Marshal, Department of Health Care Access and Information, and Division of the State Architect, have long review periods. Contact these agencies at the onset of the start of construction to determine the length of time for review, back-checks and approval, and appropriately include this time in Submittal and Construction Schedule to avoid delays: 60 days.
c. Major electrical, mechanical and equipment items other than those covered by Deferred Approval submittals: 60 days.

2. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
3. Initial Submittal Schedule: Submit within 10 days of date established for the Notice to Proceed. Include submittals required during the first 90 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
4. Final Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.

a. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.

5. Format: Arrange the following information in a tabular format:

a. Scheduled date for first submittal.
b. Specification Section number and title.
c. Description of the Work covered.
d. Scheduled date for State's final release or approval.
e. Scheduled dates for purchasing.
f. Scheduled dates for installation.

1.4 SUBMITTAL FORMATS

A. Submittal Information: Include the following information in each submittal:

1. Project name.
2. Date.
3. Name of Contractor.
4. Name of firm or entity that prepared submittal.
5. Unique submittal number, including revision identifier.
6. Submittal purpose and description.
7. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
8. Drawing number and detail references, as appropriate.
9. Indication of full or partial submittal.
10. Location(s) where product is to be installed, as appropriate.
11. Other necessary identification.
12. Remarks.
13. Signature of transmitter.

B. Options: Identify options requiring selection by State.

C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by State on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

D. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

E. Submittals Utilizing Web-Based Project Software: Prepare submittals as PDF files or other format indicated by Project management software.

1.5 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project management software website. Enter required data in web-based software site to fully identify submittal.

B. 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. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. State reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on State's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 21 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. State will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 21 days for review of each resubmittal.

D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block, and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from State's action stamp.

E. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from State's action stamp.

1.6 SUBMITTAL REQUIREMENTS

A. 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 published data are unsuitable 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 catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

    a. Wiring diagrams that show factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before Shop Drawings, and before or concurrently with Samples.

B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.
    e. Notation of dimensions established by field measurement.
    f. Relationship and attachment to adjoining construction clearly indicated.
    g. Seal and signature of professional engineer if specified.

C. Samples: Submit physical samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.

1. Transmit Samples that contain multiple, related components, such as accessories together in one submittal package.
2. Where size of Samples is not specified, Samples should be of sufficient size and quantity to clearly illustrate functional characteristics of product or material, with integrally related parts and attachment devices.
3. Identification: Permanently attach label on unexposed side of Samples that includes the following:

    a. Project name and submittal number.
    b. Generic description of Sample.
    c. Product name and name of manufacturer.
    d. Sample source.
    e. Number and title of applicable Specification Section.
    f. Specification paragraph number and generic name of each item.
4. Web-Based Project Management Software: Prepare submittals to accompany Samples in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
5. Paper Transmittal: Include paper transmittal to accompany Samples, including complete submittal information indicated.
6. 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.
7. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: 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. Number of Samples: Submit three sets of Samples. State will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record Sample.

1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.

E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

G. Certificates:

1. Certificates and Certifications Submittals: Submit 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. Provide a notarized signature where indicated.
2. Installer Certificates: Submit written statements on manufacturer's letterhead, certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead, certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
4. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.
5. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.
6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.

H. Test and Research Reports:

1. 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 substrate preparation and primers required.
2. Field Test Reports: Submit written reports 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 in the Contract Documents.
3. 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 in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. 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.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

    a. Name of evaluation organization.
    b. Date of evaluation.
    c. Time period when report is in effect.
    d. Product and manufacturers' names.
    e. Description of product.
    f. Test procedures and results.
    g. Limitations of use.

1.7 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 insufficient to perform services or certification required, submit a written request for additional information to State.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file and three paper copies of certificate, signed and sealed by the responsible design professional licensed to practice in the State of California, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

1.8 CONTRACTOR'S REVIEW

A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to State.

B. Contractor's Approval: Indicate Contractor's approval for each submittal with. Include 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.

1. State will not review submittals received from Contractor that do not have Contractor's review and approval.

1.9 STATE’S REVIEW

A. Submittals: State will review each submittal, indicate corrections or revisions required, and return.

1. Submittals by Web-Based Project Management Software: State will indicate, on Project management software website, the appropriate action.

a. Actions taken by indication on Project management software website have the following meanings:

1) No Exception Taken: Where the submittal is marked "No Exception Taken," the Work covered by the submittal may proceed, provided it complies with the Contract Documents. Final acceptance will depend on that compliance.
2) Exception, See Comments: Where the submittal is marked "Exception, See Comments," the Work covered by the submittal may proceed, provided it complies both with State’s notations and corrections on the submittal and the Contract Documents. Final acceptance will depend on that compliance.
3) Revise and Resubmit: Where the submittal is marked "Revise and Resubmit," do not proceed with the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity for the product submitted. Revise or prepare a new submittal according to State’s notations and corrections.
4) Rejected: Where the submittal is marked "Rejected," do not proceed with the Work covered by the submittal. Prepare a new submittal for a product that complies with the Contract Documents.

B. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from State.

C. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

D. State will return without review submittals received from sources other than Contractor.

E. Submittals not required by the Contract Documents will be returned by State without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 33 29.08

BUY CLEAN CALIFORNIA ACT REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes general requirements and procedures for compliance with Buy Clean California Act (BCCA) per California Public Contract Code, Sections 3500-3505.

B. Submit current facility-specific environmental product declaration for each eligible material proposed to be used on the Project.

1.02 DEFINITIONS

A. Global Warming Potential (GWP): Equivalent amount of carbon dioxide associated with the warming effect of a given quantity of a greenhouse gas produced when manufacturing a product.

B. Environmental Product Declaration (EPD): Type III environmental impact label, as defined by the International Organization for Standardization (ISO) standard 14025, or similarly robust life cycle assessment methods that have uniform standards in data collection consistent with ISO standard 14025, industry acceptance, and integrity.

C. Facility-specific EPD: Product EPD in which the environmental impacts are disclosed for a single manufacturer and single manufacturing facility. Companywide EPD may also be considered facility-specific if it discloses the GWP for each manufacturing facility separately.

D. Eligible Materials: Any of the following:

1. Carbon steel rebar.

a. Carbon steel bars: ASTM A615.
b. Low-alloy steel bars: ASTM A706.
c. Zinc-coated steel bars: ASTM A767.
d. Epoxy-coated steel bars: ASTM A775.

2. Flat glass: Float or rolled glass that is clear or tinted, either installed by itself or as a part of a window assembly.

3. Insulation: Mineral wool board insulation made of rock or slag in light- and heavy-density types.

a. Light-density: 2.5 to 4.3 lb./cu. ft.
b. Heavy-density: 4.4 to 8 lb./ cu. ft.

4. Structural steel.

a. Hot-rolled sections consisting of wide flange beams (W-shape and HP-shape used in structural applications), standard beams (S-shape), miscellaneous beams (M-shape), channels, angles, and tees.
b. Hollow structural sections with round, square, or rectangular cross-section.
c. Plate material.

1.03 REFERENCES

A. California Department of General Services Buy Clean California Act Website: https://www.dgs.ca.gov/PD/Resources/Page-Content/Procurement-Division-Resources-List-Folder/Buy-Clean-California-Act.

1.04 SUBMITTALS

A. General: Buy Clean California Act submittals are required to be submitted along with other required submittal items for eligible materials as described in the Specifications.

1. Do not incorporate these materials and products into the Work until the State has reviewed and accepted the submittals.

B. Facility-specific Environmental Product Declaration: For each eligible material proposed to be used on the Project.

1. Facility-specific EPDs must comply with ISO 14025 and applicable Product Category Rules (PCR) located on the California Department of General Services Buy Clean California Act website.

2. Global Warming Potential (GWP) of each eligible material or product as evidenced by its environmental product declaration shall not exceed the maximum acceptable global warming potential values established by the California Department of General Services and in effect on the date of the first Invitation to Bid.

a. Maximum acceptable GWP limits for eligible materials are located on the California Department of General Services Buy Clean California Act website: https://www.dgs.ca.gov/PD/Resources/Page-Content/Procurement-Division-Resources-List-Folder/Buy-Clean-California-Act.

C. Eligible Materials Quantity and Cost Data: Prior to project closeout, provide statement indicating total quantity and costs for eligible materials used on the Project. Costs exclude labor, overhead, and profit. Include breakout of quantities and costs for each eligible material.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 35 16

ALTERATION PROJECT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes special procedures for alteration work shown on Drawings and specified in Sections pertaining to crafts or trades involved.

1.2 DEFINITIONS

A. Alteration Work: This term includes remodeling, renovation, repair, and maintenance work performed within existing spaces or on existing surfaces as part of the Project.

B. Consolidate: To strengthen loose or deteriorated materials in place.

C. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

D. Match: To blend with adjacent construction and manifest no apparent difference in material type, species, cut, form, detail, color, grain, texture, or finish; as approved by State.

E. Refinish: To remove existing finishes to base material and apply new finish to match original, or as otherwise indicated.

F. Repair: To correct damage and defects, retaining existing materials, features, and finishes. This includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials.

G. Replace: To remove, duplicate, and reinstall entire item with new material. The original item is the pattern for creating duplicates unless otherwise indicated.

H. Replicate: To reproduce in exact detail, materials, and finish unless otherwise indicated.

I. Reproduce: To fabricate a new item, accurate in detail to the original, and from either the same or a similar material as the original, unless otherwise indicated.

J. Retain: To keep existing items that are not to be removed or dismantled.

K. Strip: To remove existing finish down to base material unless otherwise indicated.

1.3 COORDINATION

A. Alteration Work: Coordinate sequence of alteration work activities to accommodate the following:

1. State’s partial occupancy of completed Work.
2. Other known work in progress.
3. Tests and inspections.

4. Utility Services: Coordinate shutoff, capping, and continuation of utility services.

1.4 MATERIALS OWNERSHIP

A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to State that may be encountered or uncovered during the Work, regardless of whether they were previously documented, remain State's property.

1. Carefully dismantle and salvage each item or object in a manner to prevent damage and protect it from damage, then promptly deliver it to State where directed at Project site.

1.5 SUBMITTALS

A. Preconstruction Documentation: Show preexisting conditions of adjoining construction and site improvements that are to remain, including finish surfaces, that might be misconstrued as damage caused by Contractor's alteration work operations.

1. Submit itemized list of defects or damages, including items such as but not limited to, glass, window screens, drywall, salvage items, paving, walks.

1.6 QUALITY ASSURANCE

A. Specialist Qualifications: An experienced firm regularly engaged in specialty work similar in nature, materials, design, and extent to alteration work as specified in each Section.

1.7 STORAGE AND HANDLING OF SALVAGED MATERIALS

A. Salvaged Materials:

1. Clean loose dirt and debris from salvaged items unless more extensive cleaning is indicated.
2. Pack or crate items after cleaning; cushion against damage during handling. Label contents of containers.
3. Store items in a secure area until delivery to State.
4. Protect items from damage during transport and storage.

B. Salvaged Materials for Reinstallation:

1. Repair and clean items for reuse as indicated.
2. Pack or crate items after cleaning and repairing; cushion against damage during handling. Label contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment unless otherwise indicated. Provide connections, supports, and miscellaneous materials to make items functional for use indicated.

C. Existing Materials to Remain: Protect construction indicated to remain against damage and soiling from construction work. Where permitted by State, items may be dismantled and taken to a

suitable, protected storage location during construction work and reinstalled in their original locations after alteration and other construction work in the vicinity is complete.

D. Salvaged Items: Salvaged items of value to State, and not reused in the Work, shall remain State property. Store on site where directed.

E. Removed Items: Removed items and materials not of value to State and not reused in the Work shall be disposed of off premises at Contractor's expense.

F. Storage: Catalog and store items within a weathertight enclosure where they are protected from moisture, weather, condensation, and freezing temperatures.

1. Identify each item for reinstallation with a nonpermanent mark to document its original location. Indicate original locations on plans, elevations, sections, or photographs by annotating the identifying marks.
2. Secure stored materials to protect from theft.
3. Control humidity so that it does not exceed 85 percent. Maintain temperatures 5 deg F or more above the dew point.

G. Storage Space:

1. Arrange for off-site locations for storage and protection of salvaged material that cannot be stored and protected on-site.

1.8 FIELD CONDITIONS

A. Survey of Existing Conditions: Record existing conditions that affect the Work.

1. Comply with requirements specified in Section 01 32 33 "Photographic Documentation."

B. Work Layout: Comply with requirements specified in Section 01 31 00 “Project Management and Coordination”.

C. Discrepancies: Notify State of discrepancies between existing conditions and Drawings before proceeding with removal and dismantling work.

D. At completion of the Work, defects not noted on the itemized list or not verifiable from the Survey of Existing Conditions shall be corrected or replaced at no cost to the State.

PART 2 - PRODUCTS - (Not Used)

PART 3 - EXECUTION

3.1 PROTECTION

A. Protect persons, motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm resulting from alteration work.

1. Use only proven protection methods, appropriate to each area and surface being protected.
2. Provide temporary barricades, barriers, and directional signage to exclude the public from areas where alteration work is being performed.

3. Erect temporary barriers to form and maintain fire-egress routes.
4. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during alteration work.
5. Contain dust and debris generated by alteration work, and prevent it from reaching the public or adjacent surfaces. If indicated on Drawings, temporary dust-retarding partitions and barricades shall be built around work areas.
6. Provide shoring, bracing, underpinning, and supports as necessary. Do not overload structural elements.
7. Protect floors and other surfaces along hauling routes from damage, wear, and staining.

B. Temporary Protection of Materials to Remain:

1. Protect existing materials with temporary protections and construction. Do not remove existing materials unless otherwise indicated.
2. Do not attach temporary protection to existing surfaces except as indicated as part of the alteration work program.

C. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.

D. Utility and Communications Services:

1. Notify State, authorities having jurisdiction, and entities owning or controlling wires, conduits, pipes, and other services affected by alteration work before commencing operations.
2. Disconnect and cap pipes and services as required by authorities having jurisdiction, as required for alteration work.
3. Maintain existing services unless otherwise indicated; keep in service, and protect against damage during operations. Provide temporary services during interruptions to existing utilities.
4. Provide temporary construction lighting and power, as required, in areas where Work is being performed when normal site power is disrupted.

E. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

F. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

G. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify State immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is functioning properly.

1. Prevent solids such as adhesive or mortar residue or other debris from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from alteration work.
2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.

H. Existing Roofing: Prior to the start of work in an area, install roofing protection to prevent damage to existing roofing system.

3.2 GENERAL ALTERATION WORK

A. Replace, patch and finish in kind, adjacent surfaces or features displaced or disturbed in performance of alteration work. Broken and cut units shall be replaced with whole units.

B. Except as otherwise shown or specified, join new work to existing work to match similar existing adjoining work. Prepare existing surfaces to receive new work.

C. Materials and equipment shall be delivered, and rubbish removed, through passages designated by the State. Deliveries of materials and equipment to jobsite shall be made with a Contractor's representative present.

D. Keep corridors and entrances for use of occupants, and reasonable access thereto, clear of building materials, refuse, and the like.

END OF SECTION

SECTION 01 40 00

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 to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
2. 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.
3. Requirements for Contractor to provide quality-assurance and quality-control services required by State, or authorities having jurisdiction are not limited by provisions of this Section.

1.2 DEFINITIONS

A. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

B. 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).

C. Mockups / Field Samples: Full-size physical assemblies that are constructed 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.

D. 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.

E. 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.

F. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).

G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" shall have the same meaning as the term "testing agency."

H. 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.

I. 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.

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.

B. Delegated-Design Services Statement: Submit a statement signed and sealed by the responsible design professional registered to practice in the State of California, 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 regarding the conflict. Use the requirement(s) that is/are more stringent and/or of higher quality and/or higher quantity.

1.5 SUBMITTALS

A. Reports: Prepare and submit certified written reports, products test reports, and documents as required and/or specified.

B. 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.

1.6 REPORTS AND DOCUMENTS

A. Manufacturer's Technical Representative's or Factory-Authorized Service Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement of whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

1.7 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 the State of California or jurisdiction where Project is located, and who has minimum of five years of experience in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.

F. 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.

G. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, demonstrate, repair, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

H. Mockups / Field Samples: Before installing portions of the Work requiring mockups / field samples, build mockups / field samples for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups / field samples of size indicated.
2. Build mockups / field samples in location indicated or, if not indicated, as directed by State.
3. Notify State seven days in advance of dates and times when mockups / field samples will be constructed.
4. Employ supervisory personnel who will oversee mockup / field sample construction. Employ workers who 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 acceptance of mockups / field samples before starting corresponding Work, fabrication, or construction.

    a. Allow 21 days for initial review and each re-review of each mockup / field sample.

7. Promptly correct unsatisfactory conditions noted by State's preliminary review, to the satisfaction of the State, before completion of final mockup / field sample.
8. Acceptance of mockups / field samples by the State does not constitute approval of deviations from the Contract Documents contained in mockups / field samples unless State specifically accepts such deviations in writing.
9. Maintain mockups / field samples during construction in an undisturbed condition as a standard for judging the completed Work.
10. Demolish and remove mockups / field samples when directed unless otherwise indicated.

1.8 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. 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, and the Contract Sum will be adjusted by Change Order.

2. Tests and inspections shall be performed by State's testing laboratory in conformance with California Code of Regulations, Title 24 as noted in individual specifications sections.

B. Contractor Responsibilities: Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. 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.
    b. Testing, Adjusting, and Balancing of Systems: These services shall be provided by approved testing organization in conformance with requirements for services specified in individual sections pertaining to each system.

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. 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 01 33 00 "Submittal Procedures."

D. 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.

E. 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.

F. 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.

G. The State shall have the right to reject materials and workmanship which are defective or to require their correction. Rejected workmanship shall be satisfactorily corrected and rejected materials shall be removed from the premises without charge to the State. If Contractor does not correct such rejected work within a reasonable time, fixed by a written notice, the State may correct same and charge the expenses to Contractor.

H. Should it be considered necessary or advisable by the State at any time before Acceptance of the Work to make examination of work already completed by removing or tearing out same, Contractor shall, on request, promptly furnish necessary facilities, labor and materials. If such work is found to be defective in any respect due to fault of Contractor or subcontractor, Contractor shall defray all expenses of such examinations and of satisfactory reconstruction. If, however, such work is found to meet requirements of the Contract, additional cost of labor and material necessarily involved in the examination and replacement will be allowed to the Contractor.

1.9 SPECIAL INSPECTIONS AND TESTS

A. Special Inspections and Tests: State will engage a qualified testing agency and/or special inspector to conduct special inspections and tests required by authorities having jurisdiction as the responsibility of State.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 GENERAL

A. Notify State's Inspector 48 hours in advance of operations to allow for laboratory assignment of personnel and scheduling of tests. When tests or inspections cannot be performed after such notice, reimburse the State for laboratory personnel and travel expenses incurred due to Contractor's negligence.

B. When additional testing services are needed for Contractor's convenience, employ and pay for services of separate, equally qualified independent testing laboratory; or arrange with State's laboratory and pay for additional samples and tests required for Contractor's convenience.

C. Prepare each system for testing and balancing. Cooperate with testing agency and provide access to equipment and systems. Operate systems at designated times, and under conditions required for proper testing, adjusting, and balancing.

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 01 73 00 "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

SECTION 01 45 29

TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. The State will employ and pay for services of an independent testing laboratory to perform specified testing for CCR Title 24.

1. Contractor shall cooperate with laboratory to facilitate execution of its required services.

2. Employment of laboratory shall in no way relieve Contractor's obligations to perform work of the Contract.

B. Contractor shall employ and pay for services for testing, adjusting, and balancing of systems specified under Section 01 91 13.

1.02 RELATED REQUIREMENTS

A. Document 00 72 00: General Conditions of the Contract for Construction, Paragraph 3.13, Tests and Inspections: Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities.

B. Section 01 91 13: General Commissioning.

C. Section 02 82 13: Asbestos Abatement

C. Individual Sections: Certification of products, Qualifications of testing, organizations and specific services required.

1.03 REQUIRED TESTS AND INSPECTIONS

A. By the State, CCR Title 24 Tests and Inspections: Except as noted otherwise, these tests and inspections shall be performed by State’s testing laboratory in conformance with State of California Code of Regulations (CCR), Title 24 as noted per structural documents, see S002 and specification requirements.

B. By the Contractor, Testing, Adjusting, and Balancing of Systems: These services shall be provided by approved testing organization in conformance with requirements for services specified in individual sections pertaining to each system.

1.04 CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with laboratory personnel, provide access to work and to manufacturer's operations.

B. Provide to laboratory adequate quantities of representational samples of materials proposed to be used and which require testing.

C. Provide to laboratory preliminary design mix proposed to be used for concrete, and other material mixes which require control by testing laboratory.

D. Furnish copies of products test reports as required.
E. Furnish incidental labor and facilities:

   1. To provide access to work to be tested.

   2. To obtain and handle samples at Project site or at source of product to be tested.

   3. To facilitate inspections and tests.

   4. For storage and curing of test samples.

F. Notify State's Inspector 48 hours in advance of operations to allow for laboratory assignment of personnel and scheduling of tests. When tests or inspections cannot be performed after such notice, reimburse the State for laboratory personnel and travel expenses incurred due to Contractor's negligence.

G. When additional testing services are needed for Contractor's convenience, employ and pay for services of separate, equally qualified independent testing laboratory; or make arrangements with State's laboratory and pay for additional samples and tests required for Contractor's convenience.

H. The State or its representative shall have the right to reject materials and workmanship which are defective or to require their correction. Rejected workmanship shall be satisfactorily corrected and rejected materials shall be removed from the premises without charge to the State. If Contractor does not correct such rejected work within a reasonable time, fixed by written notice, the State may correct same and charge the expense to Contractor.

I. Should it be considered necessary or advisable by the State at any time before Acceptance of the Work to make examination of work already completed by removing or tearing out same, Contractor shall, on request, promptly furnish necessary facilities, labor and materials. If such work is found to be defective in any respect due to fault of Contractor or subcontractor, shall defray all expenses of such examinations and of satisfactory reconstruction. If, however, such work is found to meet requirements of the Contract, additional cost of labor and material necessarily involved in the examination and replacement will be allowed the Contractor.

END OF SECTION

SECTION 01 45 33

ASBESTOS ABATEMENT OBSERVATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. The State will contract with an independent Asbestos removal observation service (Observation Service) to perform services as specified herein.

1.02 RELATED SECTIONS

A. Division 02: Asbestos Abatement.

1.03 SUBMITTALS

A. Records: Observation Service shall maintain a complete and legible file, in chronological order, containing a copy of each of the following: Field Reports, Submittals, Notifications, Manifests, Certificates, Air Monitoring Results and Laboratory Reports.

B. Job Book: Upon completion of Abatement Work, Observation Service shall deliver 3 copies of Job Book to State Inspector and others as agreed at pre-project meeting. Job Book shall include records specified, project specifications, Abatement Work narrative covering activities performed, and Record Report(s).

1.04 QUALITY ASSURANCE

A. Methods and Procedures: Observation Service is required to:

1. Review, and recommend to State for approval, proposed methods for establishing Contained Work Areas Decontamination Enclosure System and Differential Pressure System as well as equipment and personnel to be used. Report the use of proprietary systems.

2. Review, and recommend to State for approval, proposed methods and procedures for Abatement Work.

3. Discuss, and report to State, potential problems arising from use of methods and procedures agreed to or not at pre-project meeting.

4. At least 10 days prior to Site Starting Meeting, propose for approval by State, observation methods to be used and reports to be issued to State.

1.05 COSTS

A. The cost of the Observation Service will be the State’s responsibility. The Contractor however, shall be responsible for any additional services of the Observation Service with respect to:

1. Extended Contractor worker hours (overtime);

2. Additional workdays and hours in excess of those allowed for work completion by the Contractor;

3. Re-inspection and testing as the result of failed clearance inspections and testing's (refer to sub-paragraph 7.3.3 of Section 00 73 00 of the Supplementary Conditions; (4) failure to appear for scheduled abatement work and the Observation Service was present and not able to work (refer to sub-paragraph 7.3.4 of Section 00 73 00 of the Supplementary Conditions;

4. 5. Responses to non- compliance with this specification and Section 02 82 13 or releases to the environment of any "Hazardous Materials" associated with the Contractor Work.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.01 OBSERVATION

A. Site-Starting Meeting and Inspection: Observation Service shall:

1. Visually inspect rooms, areas and cavities where Abatement Work is scheduled.

a. Determine general acceptability of preparation criteria for Abatement Work to begin and determine areas requiring further pre-project preparation by State.

b. Discuss potential problems; such as, details, safety procedures, work procedures or methods.

c. Determine acceptable remedies for unacceptable areas and determine remedies for potential problems.

2. Discuss and agree to proposed schedule for Asbestos Abatement Work.

B. Observation Service shall verify that materials delivered to job site are those approved or specified for use on Work.

C. Observation Service shall visually observe the progress of Work, including but not necessarily limited to:

1. Verifying Contained Work Area and Decontamination Enclosure System design and installation.

2. Verifying abatement methods and procedures agreed upon in the pre-project meeting are being followed.

3. Report to State and notify Contractor of unacceptable methods and procedures or unacceptable results of Contractor.

4. Report to State if Contractor fails to correct unacceptable methods and procedures or unacceptable results.

5. Take air tests, core samples and bulk samples in accordance with other sections of this Specification.

6. Conduct periodic reviews of isolation and protective barriers to determine if they are complying with general direction of Project Specifications.

7. Report to State if Contractor varies from agreed upon schedule.

8. Report to State if Contractor varies from agreed upon scope.

D. Observation Service shall make final visual observation of entire Abatement Project and is required to:

1. Compile list of items required to be revised or replaced.

2. Deliver copy of list to Contractor, State, and others as appropriate.

3. Verify proper revision or replacement of items on list.

3.02 AIR MONITORING

A. Observation Service will perform the following air monitoring throughout Project to ensure Work is done in conformance with fiber concentration limits of local Air Pollution Control District Regulations. Fiber counting conducted by PCM methods shall be performed as described in NIOSH Method 7400 or P&CAM 239. Analysis by TEM methods shall be conducted as described in EPA Yamate Level II.

1. Provide Area Monitoring (benchmarking) prior to isolation and plasticizing operations for each Work Area.

2. Provide Area Monitoring and establish fiber level and TWA during first possible exposure to airborne concentrations of asbestos at start of work. Thereafter, provided same type of Work is being performed, provide Area Monitoring inside Work Area, within breathing zone of selected Contractor's employees (personnel monitoring) and at critical locations adjacent to Work Area, including differential pressure equipment's exhaust for the duration of the Work Shift. At discretion of State, more frequent monitoring of Work Area may be required. Perform the following minimum sampling requirements:

Areas to be Sampled	Minimum No. of Samples	Volume
Per Work Area	3 per day	480 liters
Outside Work Area	3 per day	1200 - 2000 liters
Personnel	4 per day	480 liters

3. Observation Service, upon receipt of clearance certification from Contractor, will take one (1,200-2,800 liters) air sample "Clearance Test" upon completion of each Work Area. Except where debris has been removed from a soil surface, samples shall be collected using aggressive air sampling techniques. For the purpose of this work, decontamination shall be defined as an air sample PCM method or TEM analysis. TEM analysis shall be performed if two consecutive PCM tests fail to provide work area clearance.

Observation Service will Report area air monitoring results collected inside this work area to Contractor and State Inspector prior to start of work on the following day.

B. State's Observation Service is not for the protection of the Contractor's workers. Contractor shall be fully and solely responsible to take necessary precautions to protect workers and others against exposure. The Contractor shall all take air and material sampling as required by Code and their Work Plan.

3.04 FIELD QUALITY CONTROL

A. During progress of Project, Observation Service shall:

1. Make visual observations and compile daily written Field Reports described in this Section and deliver one copy to State Inspector on a daily basis and/or to Project Director as requested.

2. Advise Contractor on the job as to unacceptable methods and procedures and unacceptable results when so observed or monitored by Observation Service.

3. Ensure daily all workers meet training requirements; disallow entry for workers who do not meet or cannot prove qualifications.

4. Ensure warning signs and warning barriers are in appropriate locations.

B. In connection with this Project, "unacceptable methods and procedures, and unacceptable results" shall mean methods and results other than the following:

1. Those recommended by manufacturer of approved products and materials.

2. Those required by pertinent regulations of governmental agencies having jurisdiction.

3. Those required by these Specifications.

4. Those agreed upon at pre-project meeting.

C. Observation Service is not empowered to perform the following:

1. Act for, or in lieu of, representatives of governmental agencies having jurisdiction other than State.

2. Give directions to Contractor, Subcontractor or Workers on the job beyond authority of Observation Service stated in these Specifications or agreed to at pre-project meeting.

3. Revise any part or scope of Contract documents.

4. Approve any change in methods agreed upon at pre-project meeting.

D. Failure of Observation Service to notice unacceptable methods and procedures or unacceptable results during progress of work will not absolve Contractor from responsibility to complete Work in accordance with specified requirements and agreed methods.

E. Prior to commencement of Work, Observation Service shall obtain copy of manifests, certificates and notifications from State's Inspector and review and recommend for approval by State; including, but not limited to the following:

1. Hazardous Waste Transport Manifest:

a. Generator Copy.
b. TSDF Copy to Generator.
c. Land Disposal Restriction Notice and Certificates.

2. Notifications:

a. Air Pollution Control District.
b. NESHAPS (when required).
c. Regional District (when required).

3.05 STOPPING THE WORK

A. If, at any time, State or Observation Service decides Work practices are violating Specifications, or State, Federal or local regulations to extent of potential endangerment of building users, workers, State employees or public, it will immediately notify Contractor (followed up in writing) that operations shall cease until corrective action is taken by Contractor. Contractor shall take such corrective action before proceeding with Work. Loss or damage due to Stop Work Order(s) shall be Contractor's responsibility. A Stop Work Order, issued by State or Observation Service shall become effective immediately.

3.06 RECORD REPORT

A. Obtain from State copy(ies) of Survey Edit Report(s) showing asbestos conditions covered in Scope of Work, and document comments or changes to report, to provide for a Record Report of all abatement activities accomplished as part of this Work.

END OF SECTION

DAILY JOB SIGN-IN/SIGN-OUT & VISITORS LOG

DATE: _____

PROJECT: _____

SITE: _____ W.O.: _____

ALL PERSONS ENTERING AND LEAVING WORK AREA SHALL SIGN IN AND OUT EVERY TIME.

COPIES OF ALL LOGS ARE TO BE PLACED IN THE PROJECT FILE.

PERSON'S NAME (PRINT)	EMPLOYER NAME (PRINT)	SIGNATURE	TIME IN	TIME OUT

WORK AREA: Space designated by signs, barriers, tapes, etc. as hazardous due to ongoing asbestos abatement activity.

OBSERVER'S DAILY PROJECT LOG

DATE _____

TIME WORK STARTED:_____ TIME WORK ENDED: _____

PROJECT: _____ CONTRACTOR'S SUPERINTENDENT: _____

SITE:_____

Required Record: Daily comments on the progress of this project. Describe in detail problems and action taken, injuries, equipment breakdown, unusual conditions or situations, inspections, hiring or firing of personnel, extent of work being done, and any other occurrence which may affect the project. This log may be utilized as a legal document.

TIME	**COMMENTS**

SIGNATURE: _____ TITLE:_____

NOTE: On reverse side make a diagram, sketch or schematic (etc.) showing extent of work done.

OBSERVER'S DAILY SURVEY CHECKLIST

DATE: _____ TIME: _____

OBSERVER: _____

OBSERVER FIRM NAME: _____

PROJECT: _____

SITE _____

_____

WORK AREA OBSERVATIONS	**YES**	**NO**	**COMMENTS**
1. Work Area isolated? (note method)	_____	_____	_____
2. All openings to Work Area sealed?	_____	_____	_____
3. Air movement system sealed off?	_____	_____	_____
4. Negative pressure maintained in Work Area? How? _____	_____	_____	_____
5. Warning signs at all entrances/exits?	_____	_____	_____
6. Entrance to Work Area securable?	_____	_____	_____
7. EPA and OSHA regulations posted on site?	_____	_____	_____
8. Number of workers in area _____	_____	_____	_____
9. Evidence of medical exams for each worker?	_____	_____	_____

PERSONAL PROTECTIVE EQUIPMENT

1. NIOSH approved respirators? Type? _____	_____	_____	_____
2. Disposable coveralls?	_____	_____	_____
3. Head covering?	_____	_____	_____
4. Foot/shoe covering?	_____	_____	_____

CHANGE ROOM	YES	NO	COMMENTS
1. Hangers/lockers/bins for street clothes?	_____	_____	_____
2. Lockbox for valuables?	_____	_____	_____
3. Airlock to shower?	_____	_____	_____
4. Sanitary conditions maintained?	_____	_____	_____
5. Airlock to inside change room?	_____	_____	_____
6. Disposal bin for protective equipment?	_____	_____	_____
7. Airlock to Work Area?	_____	_____	_____

WORK PRACTICES

1. Are wet methods employed?	_____	_____	_____
2. EPA recommended wetting agent used?	_____	_____	_____
3. Are HEPA filter vacuums used?	_____	_____	_____
4. Are light fixtures and other equipment cleaned before removal from Work Area?	_____	_____	_____
5. Furniture and other stationary items in Work Area covered and sealed?	_____	_____	_____
6. Are walls and floor covered and sealed?	_____	_____	_____
7. Are polyethylene film barriers disposed of properly?	_____	_____	_____
8. Is waste bagged while wet?	_____	_____	_____
9. Are 6 mil bags used?	_____	_____	_____
10. Are bags properly labeled?	_____	_____	_____
11. Are bags placed in drums and sealed?	_____	_____	_____
12. Are workers wearing protective clothing as required by CALOSHA and FEDOSHA?	_____	_____	_____
13. Are contaminated clothes, spills and rags, etc. disposed of properly?	_____	_____	_____

WORK PRACTICES (CONT.)	YES	NO	COMMENTS
14. Are respirators worn at all times?	_____	_____	_____
15. Eating, drinking, smoking or gum/tobacco chewing in Work Area?	_____	_____	_____
16. Are workers using the shower?	_____	_____	_____

DISPOSAL

1. Labels on shipping container(s)?	_____	_____	_____
2. Are bags of debris disposed of properly?	_____	_____	_____
3. Was debris shipped to a disposal site?	_____	_____	_____

If yes, amount? _____
Manifest Number? _____

INVESTIGATOR'S COMMENTS (Use reverse side of page if necessary)

_____

_____

_____

_____

_____

_____

_____

_____

_____

OBSERVER'S SIGNATURE: _____

NOTE: Should the Observer indicate no response to any of the questions above, he/she is contractually authorized to advise Contractor of the deficiency(ies) and immediately notify the State Construction Supervisor if the Contractor fails to comply.

AIR SAMPLING DATA SHEET

DATE: _____

PROJECT NAME: _____

ABATEMENT CONTRACTOR: _____ **SITE**_____

SAMPLING FIRM: _____ **SAMPLES COLLECTED BY:** _____
(please print)

Sample Number	Sample Location	Start Flow Rate (LPM)	End Flow Rate (LPM)	Average Flow Rate (LPM)	Start Time	End Time	Run Time (MINS)	Sample Volume (LITRES)	Lab Result

SIGNATURE: _____ **TITLE**: _____

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, fire safety, 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, testing agencies, and authorities having jurisdiction.

B. Sewer, Drainage, Water, Gas, Telecommunication and Electric Power Service: Pay connection and service use charges for usage by all entities for construction operations.

1.3 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. Show compliance with requirements of authorities having jurisdiction.

B. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.

C. Erosion and Sedimentation Control Plan: Show compliance with requirements of California State Water Resources Control Board NPDES General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities or authorities having jurisdiction, whichever is more stringent.

D. Fire-Safety Program and Site Safety Plan: Show compliance with requirements of NFPA 241, California Fire Code Chapter 33, and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program. Include the following in Site Safety Plan:

1. Name and contact information of site safety director.
2. Documentation of the training of the site safety director and fire watch personnel.
3. Procedures for reporting emergencies.

4. Fire department vehicle access routes.
5. Location of fire protection equipment, including portable fire extinguishers, standpipes, fire department connections and fire hydrants.
6. Smoking and cooking policies, designated areas to be used where approved, and signage locations.
7. Location and safety considerations for temporary heating equipment.
8. Hot work permit plan.
9. Plans for control of combustible waste material.
10. Locations and methods for storage and use of flammable and combustible liquids and other hazardous materials.
11. Provisions for site security.
12. Changes that affect this plan.
13. Other site-specific information required by the authorities having jurisdiction.

E. 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.

1. Construct and maintain temporary electrical facilities in accordance with California Electrical Code, California Public Utilities Commission “Rules for Overhead Line Construction” (General Order No. 95), and requirements of utility company providing service. Materials, devices, and equipment used for these facilities shall be in good and safe condition but need not be new.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

C. Temporary Facilities: Obtain required certifications and permits from authorities having jurisdiction. Comply with authorities having jurisdiction requirements for temporary facilities.

1.5 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: 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. Construction Equipment: Erect, equip, operate, and maintain construction equipment in strict accordance with applicable statutes, laws, ordinances, rules, and regulations of authorities having jurisdiction.

1. Provide and maintain scaffolding, staging, runways, and similar equipment, as needed.

PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES

A. Field Offices for the State Use: Prefabricated or mobile units with serviceable finishes, toilet facilities, temperature controls, and foundations adequate for normal loading.

1. Trailer shall display California Commercial Coach Insignia as evidence of meeting or exceeding minimum Construction and Fire Safety requirements of Title 25, California Code of Regulations (CCR), Chapter 3, Sub Chapter 2, Article 3.
2. Wind and snow load design requirements shall meet most stringent criteria for project location during Contract period.
3. Install trailer as directed by State and in accordance with above referenced 25 CCR 3.2.3. Jack up trailer and level both ways; mount on concrete piers (with load off wheels). Furnish and install required tie down accessories per Section 4368 of referenced 25 CCR 3.2.3.
4. Provide two exterior doors, with steps and entry platform at each exterior door as required.
5. Windows, doors and vents shall be provided with insect screens and will provide adequate natural light and ventilation; maintain in good condition during Contract.
6. Trailer office and furnishings shall remain property of Contractor, remove from site upon completion of Contract.
7. Maintain field offices until the Completion of the Work. Relocate field offices if necessary to allow for completion of the Project.

B. Field Office: Of sufficient size, minimum 10 x 52 feet to accommodate needs of State personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture required for Project-site documents:

    a. Desk: 2 ea., 34” x 60”, locking, double-pedestal, three drawers on one pedestal, and one drawer and one file drawer on other pedestal; laminated plastic top. One swivel chair per desk, steel, with arms, adjustable with casters.
    b. File cabinet: 2 ea., four drawers, steel, locking, legal size.
    c. Plan table: 1 ea., 42” x 72”, adjustable, wood or steel with drawers. One drafting stool per table, steel, adjustable with casters.
    d. Plan racks: 1 ea.
    e. Bookcases: 2 ea., 36” x 72”, six shelves, wood or steel.
    f. Coat rack: 1 ea.

2. Partition office to provide private office(s), conference room, and separate room to contain plan tables.
3. Conference room of sufficient size to accommodate meetings of **10** individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot-square tack and marker boards.
4. Drinking water dispenser or bottled water service.
5. Private toilet with water closet and handwash station: 1 ea.

a. Each toilet room shall have a locking door and be equipped with toilet tissue dispenser, and toilet seat cover dispenser.
b. Each handwash station shall be equipped with mirror, soap dispenser, and hand-towel dispenser.
c. Maintain toilets in a neat, clean, and orderly manner, and refill all consumables.

6. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.

a. Provide unit mounted on end of trailer: of sufficient function, capacity and ductwork for equal distribution of air conditioning to all rooms. Roof mounted units are not acceptable.

7. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.

C. Field Office for Contractor use: Contractor may provide at their expense field office facilities for Contractor's use as desired.

2.2 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Unless State authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating, Cooling, and Dehumidifying Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.

3. Permanent HVAC System: If State authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of **8** at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 01 77 00 "Closeout Procedures."

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. 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.

1. Locate facilities to limit site disturbance as specified in Section 01 10 00 "Summary."

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. General: Install temporary service or connect to existing service.

1. Arrange with utility company, State, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Water Service: Connect to State's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to State. At Completion of the Work, restore these facilities to condition existing before initial use.

1. Water is available from existing sources on site and shall be metered, and paid for by Contractor.

C. 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.

1. Use of Permanent Toilets: Use of State's existing or new toilet facilities is not permitted.

2. Provide separate temporary toilet and wash facility, with locking door, for exclusive use of State.
3. Maintain toilets in a neat, clean, and orderly manner, and refill all consumables minimum **once a week**.

D. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for storage of materials, curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Follow manufacturer's recommendations and industry practice standards for proper protection of stored and installed materials. Select equipment that will not have a harmful effect on completed installations or elements being installed.

E. Temporary Heating and Cooling: Permanent heating system shall not be used for temporary heat until it has undergone operational testing and is approved by the State. No demand shall be made by Contractor for use of permanent heating system for temporary heat, except with consent of State and by agreement in writing for use mutually acceptable to State and Contractor.

1. Operation and Maintenance: Provide operator, maintain permanent heating system, and continue to do so during entire time temporary heat is required, and until entire Work of this Contract is accepted by State. Maintenance shall include replacement of filters and other dispensable items.

a. Refer to technical specifications for requirements relating to replacement of filters and other items used for temporary heating.

2. Payment for Use: Cost of fuel, operators, and maintenance for permanent heating system shall be borne by Contractor until acceptance of building by State.

3. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
4. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

F. Gas Service: Connect to State's existing gas service. Maintain equipment in a condition acceptable to State.

G. Electric Power Service: Connect to State's existing electric power service. Maintain equipment in a condition acceptable to State.

1. Connect temporary service to State's existing power source, as directed by State.

H. Lighting: Provide temporary lighting that provides adequate illumination for construction operations, observations, inspections, and traffic conditions or as designated by the State.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

I. Electronic Communication Service: Provide secure WiFi wireless connection to internet with provisions for access by State.

1. Minimum Internet Connection Requirements:

a. Download Speed: 40 Mbps.
b. Upload Speed: 10 Mbps.

J. Computer Docking Station: Provide 2 docking station**s** per field office adequate for use by State to access Project electronic documents and maintain electronic communications. Docking station model shall be compatible with the State issued laptop or tablet computer. Equip docking station with not less than the following:

1. Display: 24-inch LCD monitor, two per docking station.
2. Full-size keyboard and mouse.
3. Network Connectivity: Gigabit Ethernet.

Retain "Printer" Paragraph on projects where field office is required.

K. Printer: Provide one printer per field office adequate for use by State. Printer shall be wireless "All-in-one" unit equipped with printer server, combining color printing, photocopying, scanning, emailing and faxing, or separate units for each of these three functions.

3.4 SUPPORT FACILITIES INSTALLATION

A. Comply with the following:

1. Provide construction for temporary field offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible in accordance with ASTM E136. Comply with NFPA 241.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. 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.

D. Parking: Personnel involved in construction operations shall comply with parking and traffic regulations for use of streets, as enforced by authorities having jurisdiction, except for other arrangements as may be agreed to between Contractor and authorities having jurisdiction.

1. Provide onsite parking area for State's personnel.
2. Provide temporary parking areas for construction personnel.

E. Storage and Staging: Provide temporary offsite area for storage and staging needs. State will allocate available onsite storage and work areas to Contractor, subject to change as may be necessary by job progress, such as site development or other intervening work.

F. 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.

G. Project Signs: Not required.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site, except those indicated to be removed or altered. Repair damage to existing facilities.

B. Security: Secure building and grounds at Project site from vandalism or theft, during entire time of Contract.

C. 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.

1. Comply with work restrictions specified in Section 01 10 00 "Summary."

D. Temporary Erosion and Sedimentation Control: Comply with requirements specified in Section 01 57 23 "Temporary Storm Water Pollution Control **and Section 31 25 00 "Storm Water Pollution Prevention Plan**].

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 01 56 39 "Temporary Tree and Plant Protection."

G. 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 Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.

H. 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.

I. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

J. Temporary Egress: Provide temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction. Provide signage directing occupants to temporary egress.

K. Temporary Enclosures: Provide temporary enclosures including insulation 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.

L. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

3.6 MOISTURE AND MOLD CONTROL

A. Moisture and Mold Protection: Protect stored materials and installed Work per manufacturer's recommended practices.

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.

    a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during construction and remain wet for 48 hours are considered defective and require replacing.
    b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to State.
    c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.7 OPERATION, TERMINATION, AND REMOVAL

A. 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.
2. Maintain field office toilets and sanitary facilities in a neat, clean, and orderly manner, and refill all consumables minimum **once a week**.

B. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Completion.

C. 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 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 Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 77 00 "Closeout Procedures."

END OF SECTION

SECTION 01 56 39

TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.

1.2 DEFINITIONS

A. Tree: Woody plant having one erect perennial stem (trunk) at least three inches in diameter at a point 4-1/2 feet above the ground, and a formed crown of foliage.

B. Caliper: Diameter of a trunk measured by a diameter tape at a height 6 inches above the ground for trees up to and including 4-inch size at this height and as measured at a height of 12 inches above the ground for trees larger than 4-inch size.

C. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.

D. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line unless otherwise indicated.

E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to temporary tree and plant protection.

1.4 SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each type of the following:

1. Organic Mulch: 1-pint volume of organic mulch; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch.

C. Tree Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.

1.5 FIELD CONDITIONS

A. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Moving or parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

B. Do not direct vehicle or equipment exhaust toward protection zones.

C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Backfill Soil: Planting soil of suitable moisture content and granular texture for placing around tree; free of stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth.

1. Planting Soil: Planting soil as specified in Section 32 91 13 "Soil Preparation".

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: Ground or shredded bark.
2. Size Range: 3 inches maximum, 1/2 inch minimum.
3. Color: Natural.

C. Protection-Zone Fencing: Fencing fixed in position and meeting the following requirements:

1. Plastic Protection-Zone Fencing: Plastic construction fencing constructed of high-density extruded and stretched polyethylene fabric with 2-inch maximum opening in pattern and weighing a minimum of 0.4 lb/ft.; secured with plastic bands or galvanized-steel or stainless-steel wire ties; and supported by tubular or T-shape galvanized-steel posts spaced not more than 96 inches apart.

a. Height: 48 inches.
b. Color: High-visibility orange, nonfading.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

3.2 PREPARATION

A. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated. Flag each tree trunk at 54 inches above the ground.

B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

3.3 TREE PROTECTION

A. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas indicated. Do not exceed indicated thickness of mulch.

1. Apply 2-inch uniform thickness of organic mulch unless otherwise indicated. Do not place mulch within 6 inches of tree trunks.

3.4 PROTECTION ZONES

A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people from easily entering protected areas except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.

1. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to State.

B. Maintain protection zones free of weeds and trash.

C. Maintain protection-zone fencing in good condition as acceptable to State and remove when construction operations are complete, and equipment has been removed from the site.

1. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.
2. Temporary access is permitted subject to preapproval in writing by State if a root buffer effective against soil compaction is constructed as directed by State. Maintain root buffer so long as access is permitted.

3.5 EXCAVATION

A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Section 31 20 00 "Earth Moving" unless otherwise indicated.

B. Trenching within Protection Zones: Where utility trenches are required within protection zones, excavate under or around tree roots by hand or with air spade, or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots.

C. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

3.6 ROOT PRUNING

A. Prune tree roots that are affected by temporary and permanent construction. Prune roots as follows:

1. Cut roots manually by digging a trench and cutting exposed roots 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.
2. Cut Ends: Do not paint cut root ends.
3. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
4. Cover exposed roots with burlap and water regularly.
5. Backfill as soon as possible according to requirements in Section 31 20 00 "Earth Moving."

B. Root Pruning at Edge of Protection Zone: Prune tree roots 12 inches outside of the protection zone by cleanly cutting all roots to the depth of the required excavation.

C. Root Pruning within Protection Zone: Clear and excavate by hand or with air spade to the depth of the required excavation to minimize damage to tree root systems. If excavating by hand, use narrow-tine spading forks to comb soil to expose roots. Cleanly cut roots as close to excavation as possible.

3.7 CROWN PRUNING

A. Prune branches that are affected by temporary and permanent construction. Prune branches as directed by State.

1. Prune to remove only injured, broken, dying, or dead branches unless otherwise indicated. Do not prune for shape unless otherwise indicated.
2. Do not remove or reduce living branches to compensate for root loss caused by damaging or cutting root system.
3. Pruning Standards: Prune trees according to ANSI A300 (Part 1).

B. Unless otherwise directed by State, do not cut tree leaders.

C. Cut branches with sharp pruning instruments; do not break or chop.

D. Do not paint or apply sealants to wounds.

E. Provide subsequent maintenance pruning during Contract period.

F. Chip removed branches and spread over areas identified by State or dispose of off-site.

3.8 REGRADING

A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

B. Lowering Grade within Protection Zone: Where new finish grade is indicated below existing grade around trees, slope grade away from trees as recommended by arborist unless otherwise indicated.

1. Root Pruning: Prune tree roots exposed by lowering the grade. Do not cut main lateral roots or taproots; cut only smaller roots. Cut roots as required for root pruning.

C. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

D. Minor Fill within Protection Zone: Where existing grade is 2 inches or less below elevation of finish grade, fill with backfill soil. Place backfill soil in a single uncompacted layer and hand grade to required finish elevations.

3.9 REPAIR AND REPLACEMENT

A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or to be relocated that are damaged by construction operations, in a manner approved by State.

1. Perform repairs of damaged trunks, branches, and roots within 24 hours according to State's written instructions.
2. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by State.

B. Trees: Remove and replace trees indicated to remain that are more than 50 percent dead or in an unhealthy condition or are damaged during construction operations that State determines are incapable of restoring to normal growth pattern.

1. Small Trees: Provide new trees of same size and species as those being replaced for each tree that measures 6 inches or smaller in caliper size.
2. Large Trees: Provide two new tree(s) of 4-inch caliper size for each tree being replaced that measures more than 6 inches in caliper size.

a. Species: As selected by State.

3. Plant and maintain new trees as specified in Section 32 93 00 “Plants”.

3.10 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove excess excavated material, displaced trees, trash, and debris and legally dispose of them off State’s property.

END OF SECTION

SECTION 01 57 23

TEMPORARY STORM WATER POLLUTION CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Temporary stormwater pollution controls.
2. Preparation, implementation and monitoring of the General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities (General Permit) and the Storm Water Pollution Prevention Plan for the purpose of preventing the discharge of pollutants and sediments from the Project site into receiving waters.

1.2 REGULATORY REQUIREMENTS

A. Comply with the State Water Resources Control Board, Regional Water Quality Control Board (RWQCB), county, city, municipality, and other local agency requirements regarding storm water discharges and management. The State does not obtain local permits.

B. Electronically file and provide to the State Water Resources Control Board in the Stormwater Multiple Application Report Tracking System (SMARTS) all Permit Registration Documents (PRD) including, but not limited to Notice of Intent (NOI), Site Map, SWPPP, Risk Assessment, Annual Fees, ATS Design Document (if required), Water Balance Calculations (if required) and Certification; and pay fees to the State Water Board.

1. Fact Sheets about the permit can be found at https://www.waterboards.ca.gov/water_issues/programs/stormwater/construction/docs/2022-0057-dwq-with-attachments/cgp2022_factsheet.pdf.

2. Submit Annual Reports electronically in SMARTS and pay annual renewal fees until Completion (as defined by the General Conditions) of the Work at which time the Notice of Termination (NOT) must have been previously approved by the appropriate RWQCB.

C. Employ, for the entire Construction Contract, the services of a a Qualified SWPPP practitioner (QSP) who is assigned responsibility for non-storm water and storm water visual observations, sampling and analysis and responsible to ensure full compliance with the permit and implementation of all the elements of the SWPPP.

1.3 STORMWATER POLLUTION PREVENTION PLAN

A. The Stormwater Pollution Prevention Plan (SWPPP) has been prepared for the site. See prepared SWPPP in the project bid documents.

B. Erosion and sediment controls must be in place prior to the commencement of grading and any storm event.

1.4 MEETINGS

A. Meetings: Conduct conference at Project site.

1. Meet with State and earthwork subcontractor(s).
2. Review requirements of the SWPPP, including permitting process, worker training, and inspection and maintenance requirements.

1.5 SUBMITTALS

A. Closeout Documents: Notice of Termination, filed and approved by the applicable RWQCB where the Project is located.

B. Qualifications Data: Licensing/certifications of the QSP.

C. Schedule of Values shall include separate line items for the SWPPP reporting, and maintenance for the SWPPP Work.

D. Monthly SWPPP reports and related documents. These reports shall be included with the Contractor's Payment Requests.

1.6 QUALITY ASSURANCE

A. QSP: Experienced individual or firm with a record of successful water pollution control management coordination of projects with similar requirements.
1. QSP shall be responsible for inspections and maintaining of all requirements of the SWPPP.

B. Installers: Trained as indicated in the SWPPP.

1.7 LIABILITIES AND PENALTIES

A. State's review of the SWPPP, prepared in its entirety by the Contractor, shall not relieve the Contractor from liabilities arising from non-compliance with storm water pollution regulations.

B. Contractor shall be held responsible for paying all penalties for violations of permit conditions. The State shall recover from the Contractor all costs of any fines against the State, due to non-compliance by the Contractor.

PART 2 - PRODUCTS

2.1 TEMPORARY STORMWATER POLLUTION CONTROLS

A. Provide temporary stormwater pollution controls as required by the SWPPP.

PART 3 - EXECUTION

3.1 IMPLEMENTATION

A. Comply with the requirements of the General Permit and the SWPPP. QSP shall update the SWPPP and have the SWPPP including maps, reports, weather records and training records available at the construction site at all times.

1. All maps and figures that are part of the SWPPP shall be printed, hard copy, full size, and shall always be available on the construction site.
2. Subsequent to the State's verification of the Contractor's QSP's certifications and licenses, the State will authorize access for the QSP like to the project's SMARTS account as "data submitters". As data submitters, the contractor's QSP will upload all required documents including, but not limited to, all the NOI documents, rain event data, exceedance reports and annual reports within the Construction General Permit time frames.

B. Implement best management practices for control of all pollutants including sediment, concrete and cement plaster waste, paint, fertilizers, soil amendments and other construction related pollutants.

C. Implement an effective combination of erosion and sediment controls by stabilizing all disturbed soil, paying attention to exposed slopes. Back up erosion prevention measures with sediment control measures. Ensure all control measures are adequate, in place, and in operable condition.

D. QSP shall conduct site inspections, and no duties shall be delegated to non-certified personnel, in accordance with the General Permit and the SWPPP before, during extended storm events, and after each storm event to identify areas that may contribute to erosion and sediment problems or any other pollutant discharges. If additional control measures are needed, implement them immediately. Document all inspection findings and actions taken in detailed, site specific inspection reports. These reports must be maintained on site for review.

E. Maintain and repair all erosion prevention and sediment control measures throughout the season and until Completion (as defined by the General Conditions) of the project. Keep replacement supplies on the site.

F. Remove SWPPP controls at completion of construction, and restore and stabilize areas disturbed during construction.

G. Train all site personnel in erosion prevention and sediment control techniques, and the responsibilities under the General Permit at the beginning of the project and on a monthly basis.

H. Immediately report to the RWQCB office and the State, of any instances of sediment or other pollutant discharges from the site.

I. Obtain QSP services and pay for such services and for any sampling, testing, and analysis of storm water as required for compliance with the General Permit and the SWPPP.

J. Make the SWPPP available to the RWQCB staff, State staff, and any delegated local agency staff, and correct any requirements imposed as a result of their inspections within 72 hours, or prior to a rain event, whichever is sooner.

3.2 CERTIFICATION AND REPORTS

A. On the first of the month, as determined by the requirements of the General Permit, the SWPPP and the State Water Resources Board, each year during the construction period, submit an annual certification report (for the previous compliance year) as outlined in the General Permit, to the State Water Resources Control Board and the State, indicating that the construction activities are in compliance with the General Permit and the SWPPP.

1. Respond to any comments within 72 hours after receipt. The annual report shall be prepared by the QSD. This reporting shall continue until a Notice of Termination is approved by the Regional Water Quality Control Board.

B. Prior to Completion of the project submit records of all inspections, compliance certifications and noncompliance reports to the State in dated, tabbed, indexed binders and electronically.

C. Prior to Completion of the project, the QSP shall file a Final Annual Report and a Notice of Termination with the State Water Resources Control Board via the SMARTS.

END OF SECTION

SECTION 01 60 00

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 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.

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.

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 substitution request, if applicable.

D. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 01 33 00 "Submittal Procedures."

E. Substitution: Refer to Section 01 25 00 "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.

B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:

    a. Name of product and manufacturer.
    b. Model and serial number.
    c. Capacity.
    d. Speed.
    e. Ratings.

3. See individual identification Sections in Divisions 21, 22, 23, and 26 for additional equipment identification requirements.

1.4 COORDINATION

A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

1.5 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.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and that products are undamaged and properly protected.

C. Storage:

1. Provide a secure location and enclosure at Project site for storage of materials and equipment.
2. Store products to allow for inspection and measurement of quantity or counting of units.
3. Store materials in a manner that will not endanger Project structure.
4. Store products that are subject to damage by the elements under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation and with adequate protection from wind.

5. Store loose granular materials on solid surfaces in well-drained area; prevent mixing with foreign matter.
6. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
7. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
8. Protect stored products from damage and liquids from freezing.

1.6 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.

C. Submittal Time: Comply with requirements in Section 01 77 00 "Closeout Procedures."

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. Components required to be supplied in quantity within individual Specification Sections shall be the same and shall be interchangeable.
3. 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.
4. State reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
5. Where products are accompanied by the term "as selected," State will make selection.
6. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

7. Or Equal: For products specified by name and accompanied by the term "or equal," "or approved equal," comply with requirements in Section 01 25 00 “Substitution Procedures" to obtain approval for use of an unnamed product.

    a. Submit additional documentation required by State in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or equal" product status is by the State, whose determination is final.
    b. Where the words "or equal" are used following trade names, patented products, or proprietary products or methods, they shall be deemed to read "or equal in quality, design, utility and suitability"; as solely determined by the State. Where such trade names, products, or methods are without the use of the words "or equal", they shall be deemed to be followed by the words "or equal in quality, design, utility and suitability" as solely determined by the State.

B. Product Selection Procedures:

1. 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 considered a substitution.

2. 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 considered a substitution.

3. 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.

    a. For approval of products by unnamed manufacturers, comply with requirements in Section 01 25 00 "Substitution Procedures" for substitutions.

C. Visual Selection Specification: Where Specifications include the phrase "as selected by State from manufacturer's full range" or a similar phrase, select a product that complies with requirements. State will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

D. 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.

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 64 00

OWNER-FURNISHED PRODUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes installation of State-furnished products.

B. State will provide and install new and/or used Modular Systems Furniture (MSF).

1. Contractor shall cooperate with State's installers to facilitate the execution of the MSF installers' required services.
2. Contractor shall perform specific components of MSF installation.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 CONTRACTOR'S RESPONSIBILITIES

A. Include MSF installation in baseline and progress construction schedules.

1. State's installation duration for MSF is 15 calendar days.
2. Installation of MSF shall not take place until construction of tenant improvements is complete within the areas of delivery and installation.
3. Confirm construction clear dimensions and Building Code related egress aisles requirements are correct in the field.

B. Attend State-arranged pre-installation meeting(s) for MSF at the project site.

1. Electrical and tele/data sub-contractors must attend pre-installation meeting(s).

C. Perform all hard-wiring of State's MSF electrical, data and voice requirements to include but not limited to the whips to Point-of-Connection. This includes base feed locations and MSF power poles as applicable. Whips and power poles for MSF will be supplied by the State. The complete installation of the MSF electrical, data and voice may be done in phases as the requirements of the MSF installation require.

1. Trim base electrical whips to length.
2. Trim power poles to fit per MSF installer's instructions.
3. Provide and install seismic bracing of MSF power poles.
4. Cut ceiling tile for MSF power poles and install MSF ceiling trim for power poles. Trim provided by MSF installers.

D. Install and terminate project tele/data cabling and outlets in MSF workstations in panel bases or at panel mid-line.

1. Cabling, outlets, and terminations shall all be provided by Contractor and are not considered part of the State's MSF equipment.
2. Tele/data termination outlets must fit in the State's standard MSF bases. Size of base standard punch-outs shall be confirmed by Contractor prior to submittal of tele/data termination outlets.

END OF SECTION

SECTION 01 73 00

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. Installation of the Work.
3. Cutting and patching.
4. Coordination of State's portion of the Work.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection and repair of installed construction.

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 PREINSTALLATION MEETINGS

A. Cutting and Patching Conference: Conduct conference at Project site.

1. Prior to commencing work requiring cutting and patching, review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result from cutting and patching work. Inform State of scheduled meeting.

2. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.4 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural and Other Construction 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 of locations and details of cutting and await directions from State 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. 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.

2. Patching shall achieve security, strength, and weather protection, and shall preserve continuity of existing fire ratings.

3. 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. Patching shall successfully duplicate undisturbed adjacent finishes, colors, textures, and profiles. Where there is a dispute as to whether duplication is successful or has been achieved to a reasonable degree, the State's judgment shall be final.

B. 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.

1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.

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 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 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 all underground utilities, and other construction affecting the Work.

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.

C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. 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.

B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

C. 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 in accordance with requirements in Section 01 31 00 "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 promptly.

B. Engage a land surveyor experienced in laying out the Work, using the following accepted surveying practices:

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.

3.4 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 the 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. Maintain conditions required for product performance until 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. 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.

G. 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.
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.

H. 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. Fit exposed connections together to form hairline joints.

I. Repair or remove and replace damaged, defective, or nonconforming Work.

1. Comply with Section 01 77 00 "Closeout Procedures" for repairing or removing and replacing defective Work.

3.5 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. 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.

F. 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.

G. 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. Provide materials and comply with installation requirements specified in other Sections, where applicable.

H. Paint over complete surface plane, unless otherwise indicated. Over patched wall or ceiling surfaces, paint to nearest cutoff line for entire surface, such as intersection with adjacent wall or ceiling, beam, pilasters, or to nearest opening frame, unless otherwise indicated. Painted surfaces shall not present a spotty, touched-up appearance.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.6 COORDINATION OF STATE’S PORTION OF THE WORK

A. Site Access: Provide access to Project site for State’s construction personnel and State’s separate contractors.

B. Coordination: Coordinate construction and operations of the Work with work performed by State’s construction personnel and State’s separate contractors.

1. Construction Schedule: Inform State of Contractor's preferred construction schedule for State’s portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify State if changes to schedule are required due to differences in actual construction progress.
2. Preinstallation Conferences: Include State’s construction personnel and State’s separate contractors at preinstallation conferences covering portions of the Work that are to receive State’s work. Attend preinstallation conferences conducted by State’s construction personnel if portions of the Work depend on State’s construction.

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.

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.

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.

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 Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.

3.8 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 01 91 13 "General Commissioning Requirements."

B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace them with new units, and retest.

C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Manufacturer's Field Service: Comply with qualification requirements in Section 01 40 00 "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 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

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for the construction waste management and disposal.

B. Waste Management Objective for the Project:

1. Project shall minimize the generation of construction and demolition waste at the site.
2. Waste disposal in landfills shall be minimized.

1.2 DEFINITIONS

A. Construction Waste: Building, structure, and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building, structure, and site improvement materials resulting from demolition operations.

C. Disposal: Removal of demolition or construction waste and subsequent salvage, sale, recycling, or deposit in landfill, incinerator acceptable to authorities having jurisdiction, or designated spoil areas on Owner’s property.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.3 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition and construction waste becomes property of the Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to State that may be uncovered during demolition remain the property of State.

1. Carefully salvage in a manner to prevent damage and promptly return to State.

1.4 SUBMITTALS

A. Construction Waste Estimate: Within 14 calendar days after Start Date of the Work, or prior to any waste removal, whichever occurs sooner, submit construction waste estimate, using the Form 01 74 19.01 “Construction Waste Estimate”. Include the following information:

1. Estimate of total job site waste to be generated, including material types and quantities.
2. Estimate of percentages of waste categories to landfill, to be reused, and to be recycled.

B. Waste Management Report: Upon completion of Work, including final cleanup, provide a final waste management report containing the information required in Form 01 74 19.02 “Waste Management Report”. Include the following information:

1. Total quantity of each waste material generated; and the date(s) removed from the project site.
2. Percentages of waste categories to landfill, to be reused, and to be recycled.
3. 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.
4. For each material reused or recycled from the Project, include the total costs of handling and transportation, and income. Attach manifests, weight tickets, receipts, and/or invoices.

C. Waste Management Plan: Submit plan within **30** days of date established for the Notice to Proceed.

D. Qualification Data: For waste management coordinator.

1.5 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: Experienced firm, or individual employed and assigned by General Contractor, with a record of successful waste management coordination of projects with similar requirements. Superintendent may serve as Waste Management Coordinator.

B. Regulatory Requirements: Comply with transportation and disposal regulations of authorities having jurisdiction.

1. California Department of Resources Recycling and Recovery (CalRecycle); Telephone (916) 341-6300; https://www.calrecycle.ca.gov/condemo.
2. Local Integrated Waste Management Programs and Re-Use Programs in the Project area.
3. California Department of Toxic Substances Control (DTSC).

1.6 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan according to requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of **demolition**, **site-clearing and construction** waste generated by the Work. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work in compliance with Section 02 41 19 "Selective Demolition.
2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.

D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there were no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:

1. Total quantity of waste.
2. Estimated cost of disposal (cost per unit). Include transportation and tipping fees and cost of collection containers and handling for each type of waste.
3. Total cost of disposal (with no waste management).
4. Revenue from salvaged materials.
5. Revenue from recycled materials.
6. Savings in transportation and tipping fees by donating materials.
7. Savings in transportation and tipping fees that are avoided.
8. Handling and transportation costs. Include cost of collection containers for each type of waste.
9. Net additional cost or net savings from waste management plan.

1.7 PERFORMANCE REQUIREMENTS

A. General: Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials.

B. LEED Certification Requirements: Follow Waste Management Plan and divert at least 50 percent of the total construction and demolition materials from landfills and incineration facilities.

C. LEED Certification Requirements: Follow Waste Management Plan and divert at least 50 percent of all demolition waste, if any. Generate less than 10 lbs./sq. ft. of waste materials from all new construction activities

D. 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. Bricks.
7. Concrete Masonry Units (CMU).
8. Asphalt Concrete.
9. Paper.

a. Bond.
b. Newsprint.

c. Cardboard and paper packaging materials.

10. Cement Fiber Products: Shingles, panels, and siding.
11. Metals.

    a. Ferrous.
    b. Non-ferrous.

12. Paint.
13. Rigid Foam.
14. Glass.
15. Plastics.
16. Carpet and pad.
17. Beverage containers.
18. Insulation.
19. Gypsum Board.
20. Piping.
21. Electrical conduit.
22. Porcelain Plumbing Fixtures.
23. Fluorescent Light Tubes (per Department of Toxic Substances Control regulations).

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 IMPLEMENTATION

A. General: Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management during the entire duration of the Contract.

    1. Comply with operation, termination, and removal requirements in Section 01 50 00 "Temporary Facilities and Controls."

B. Waste Management Coordinator: Engage a waste management coordinator or designate on-site party to be responsible for implementing, monitoring, and reporting status of waste management work.

    1. Distribute copies of the Construction Waste Estimate and Waste Management Report forms to the Job Site Foreman and each Subcontractor.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.

D. Meetings: Conduct Waste Management meetings with subcontractors who generate construction waste. Present current status of the Waste Management Report at regular job-site meetings.

3.2 SALVAGING DEMOLITION WASTE

A. Comply with requirements in **Section 02 41 19 "Selective Demolition"** for salvaging demolition waste.

3.3 DEMOLITION AND CONSTRUCTION WASTE MANAGEMENT

A. Materials Handling Procedures: Provide means by which waste materials will be protected from contamination and means to be employed in reuse or recycling of waste material consistent with requirements for acceptance by receiving facilities.

B. Separation Facilities: 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 to avoid contamination of materials.

C. Hazardous Wastes: Hazardous wastes shall be separated, stored, and disposed of according to local regulations, and in accordance with specifications for such work as may be included in this Project.

D. Instruction: 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.

3.4 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged or recycled, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

3.5 ATTACHMENTS

A. Form 01 74 19.01: Construction Waste Estimate.

B. Form 01 74 19.02: Waste Management Report.

END OF SECTION

FORM 01 74 19.01 CONSTRUCTION WASTE ESTIMATE

This form must be completed by the Contractor. Attach additional sheets if necessary. Waste categories appropriate for diversion from landfill shall include but not be limited to categories listed below. Edit the list to suit Project's scope.

PROJECT NAME: _____ **PROJECT NUMBER:** _____

CONTRACTOR'S / VENDOR'S NAME: _____ **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				
Metal (non-ferrous)	LBS				
Paint	CF				
Rigid Foam	CF				
Glass	CF				
Plastics	CF				
Carper and Pad	SY				
Beverage Containers	LBS				
Insulation	CF				
Gypsum Board	CF				
Porcelain Plumbing Fixtures	EA				
Fluorescent Light Tubes	EA				

FORM 01 74 19.02 WASTE MANAGEMENT REPORT

QUANTITIES

Waste Material (edit to suit)	Unit	Date Removed	Total 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					
Metal (non-ferrous)	LBS					
Paint	CF					
Rigid Foam	CF					
Glass	CF					
Plastics	CF					
Carper and Pad	SY					
Beverage Containers	LBS					
Insulation	CF					
Gypsum Board	CF					
Porcelain Plumbing Fixtures	EA					
Fluorescent Light Tubes	EA					

FORM 01 74 19.02 WASTE MANAGEMENT REPORT

COST/INCOME

Waste Material (edit to suit)	Unit	Receiving Facility	Landfill Cost in $			Reused in $		Recycled in $	
			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								
Metal (non-ferrous)	LBS								
Paint	CF								
Rigid Foam	CF								
Glass	CF								
Plastics	CF								
Carper and Pad	SY								
Beverage Containers	LBS								
Insulation	CF								
Gypsum Board	CF								
Porcelain Plumbing Fixtures	EA								
Fluorescent Light Tubes	EA								
		TOTAL:							

SECTION 01 74 20

RECYCLED CONTENT CERTIFICATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for the recycled content certification.

1.2 REFERENCES

A. State Agency Buy Recycled Campaign: https://www.calrecycle.ca.gov/buyrecycled/stateagency.

1. Access this website for information on the Buy Recycled Campaign.

1.3 DEFINITIONS

A. Product Categories: Recycled content categories identified for purchasing and reporting of products.

1. Paper products.
2. Printing and writing papers.
3. Soil amendments and toppings.
4. Erosion control products.
5. Glass products.
6. Lubricating oils.
7. Plastic products.
8. Paint.
9. Tires.
10. Tire-derived products.
11. Antifreeze.
12. Metals.
13. Carpet.
14. Pavement surfacing.
15. Building finishes.
16. Textiles.

B. Recycled Content Product (RCP): All materials, goods, and supplies that are from one of the sixteen (16) Product Categories that meet the requirements identified in Public Contract Code, Section 12209, including any good or material that has been reused or refurbished without substantial alteration of its original form. For reused or refurbished products, there is no minimum content requirement.

C. Non-Recycled Content Product (non-RCP): All materials, goods, and supplies that are from one of the sixteen (16) Product Categories having no recycled content or less than the minimum content or not meeting recyclability requirements, as identified in Public Contract Code, Section 12209.

1.4 REQUIREMENTS

A. Recycled content reporting for the Project.

1. Document and report the percentage of recycled content in materials, products, equipment and furnishings installed and provided for this Project.
2. State Agency Buy Recycled Campaign (SABRC) is a joint effort between the Department of General Services and the California's Department of Resources Recycling and Recovery (CalRecycle) to implement State law. Public Contract Code, Sections 12200-12320, requires State agencies to purchase recycled content products instead of non-recycled content products in sixteen (16) product categories whenever price, quality, and availability are comparable, to ensure that a minimum percentage of purchases in those categories have recycled content, and report these purchases annually to CalRecycle. This certification and reporting are utilized to comply with those requirements.
3. State and State's contractor(s) are required to purchase recycled content products in sufficient quantities to ensure that mandated recycled content products procurement goals are attained within sixteen (16) product categories.
4. The sixteen (16) product categories and their respective minimum postconsumer-content requirements are outlined in SABRC Handout on CalRecycle website: https://www2.calrecycle.ca.gov/Docs/Web/114687 .
5. In order to help state agencies identify all reportable purchases and all reportable recycled content products purchases, Contractor is mandated by the Public Contract Code, Section 12205 to certify in writing to the State the minimum percentage, if not the exact percentage, of postconsumer recycled-content material in the products, materials, goods, and supplies offered or sold to the State regardless of whether the product meets the requirements of Public Contract Code, Section 12209.
6. All products that can be classified as being in one of the sixteen (16) categories must be included in the reporting, whether the product is recycled content products or non- recycled content products. Only products that can be classified in one of the categories shall be reported.

1.5 SUBMITTALS

A. Form 01 74 20.01 "Recycled Content Certification Worksheet": Submit with each product submittal from one of the sixteen (16) Product Categories, containing the following information:

1. Product Description, with applicable specification section of product.
2. Quantity of product.
3. Estimated material dollar value including any taxes and delivery cost.
4. Designate the Product Category for each product listed.
5. Designate whether product is a Recycled Content Product.
6. Estimate of percentage of material content.
7. Attach a copy of the manufacturer's or vendor's data sheet showing recycled content percentages if product is reported as a Recycled Content Product.

B. Form 01 74 20.02 "State Agency Buy Recycled Campaign Procurement Summary": Submit with each product submittal from one of the sixteen (16) Product Categories, containing the following information:

1. Product Category.
2. All reportable purchases, quantity and dollar value including any taxes and delivery cost.
3. Recycled Content Product purchases, quantity and dollar value including any taxes and delivery cost.

4. Percent of Recycled Content Product purchases, quantity and dollar value including any taxes and delivery cost.

1.6 CLASSIFICATION OF PRODUCTS

A. Recycled content products and non-recycled content products that are made from multiple material types should be reported in the product category of the material type representing most of the product.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION

3.1 IMPLEMENTATION

A. Recycled Content Manager: Designate an individual responsible for instructing suppliers and subcontractors, and overseeing and documenting results of Recycled Content Certification for the Project.

B. Recycled Content Manager shall document results of submitted Form 01 74 20.01 “Recycled Content Certification Worksheets” on the Form 01 74 20.02 “State Agency Buy Recycled Campaign Procurement Summary”, in total for each product category. Only reportable products from one of the sixteen (16) categories should be recorded.

C. Distribution:

1. Recycled Content Manager shall insure that Form 01 74 20.01 “Recycled Content Certification Worksheet” is submitted with each product submittal from one of the sixteen (16) Product Categories or at intervals agreed to by the State’s Representative for monitoring of the program.
2. Recycled Content Manager shall provide copies of the Form 01 74 20.02 “State Agency Buy Recycled Campaign Procurement Summary” at intervals agreed to by the State’s Representative for monitoring of the program. At the conclusion of the construction and prior to final payment, Recycled Content Manager shall provide a copy of the final Form 01 74 20.02 “State Agency Buy Recycled Campaign Procurement Summary” under provisions of Section 01 77 00 “Closeout Procedures”.

3.2 ATTACHMENTS

A. Form 01 74 20.01: Recycled Content Certification Worksheet (Example).

1. An example of a completed form is attached for Contractor’s reference. An electronic version of this form for Contractor’s use will be provided by the State at the Project start meeting.

B. Form 01 74 20.02: State Agency Buy Recycled Campaign Procurement Summary (Example).

1. An example of a completed form is attached for Contractor's reference. An electronic version of this form for Contractor's use will be provided by the State at the Project start meeting.

END OF SECTION

FORM 01 74 20.01 RECYCLED CONTENT CERTIFICATION WORKSHEET (EXAMPLE)

This form must be completed by the contractor. The contractor must submit a worksheet with each product submittal to the State agency, with a row completed for each product supplied to the State. Attach additional sheets if necessary. Information must be included, even if the product does not contain recycled content material but it is within one of the 16 categories. Refer to footnotes following this form.

PROJECT NAME: Visitor's Non-Secure Entrance, Statewide Youth Correctional Agency **PROJECT NUMBER:** 000000000001234

CONTRACTOR'S / VENDOR'S NAME: XYZ Contractors **DATE:** December 1, 2024

ADDRESS: 4300 Pleasant Valley Dr, Lincoln Logs, CA 95000 **PROJECT DIRECTOR:** (AS NAMED)

PHONE: (123) 456-7890 **EMAIL:** Super.Intendent@xyzcont.com

Product Description / Specification Section	Quantity	Estimated Dollars	Product Category[1]	RCP Y/N?	Virgin Content (Percent)[2]	Postconsumer Material (Percent)[3]	Secondary Material (Percent)[4]	Total Percent[5]
High Impact Resistant Gypsum Board / 092900	N/A	$2,500	Paper	Y	50	10	40	100%
Cellulose Building Insulation / 072126	N/A	$10,000	Paper	Y	20	10	70	100%
Underslab Vapor Barrier / 033000	N/A	$1,500	Plastic	Y	20	20	60	100%
Electrical Cover Plates / 260533	N/A	$2,500	Plastic	N	90	0	10	100%
Interior and Exterior Paint / 099100	300gal	$8,000	Paint	N	100	0	0	100%
Recessed Entrance Mats / 124800	N/A	$1,800	Tire Derived	Y	40	20	40	100%
Ceramic Tile / 093013	N/A	$5,000	Glass	Y	35	10	55	100%
Exterior and Interior Windows / 085000	N/A	$30,000	Glass	N	70	10	20	100%
Metal Studs / 092216	N/A	$6,000	Metal	Y	65	15	10	100%

EXAMPLE

Public Contract Code Section 12205 (b) requires all businesses to certify in writing, under penalty of perjury, the minimum percentage, if not the exact percentage, of postconsumer material in the products, materials, goods, or supplies offered or sold to the State.

Public Contract Code Section 12205 (a) requires all State agencies to require all contractors to certify in writing, under penalty of perjury, the minimum percentage, if not the exact percentage, of postconsumer material in the products, materials, goods, or supplies offered or sold to the State.

EXAMPLE

Signature of person completing form

Printed name of person completing form | Title

Footnotes

You must submit copies of this form and/or other documentation for each product that is reportable.

1. Product category refers to one of the product categories into which the reportable product purchase falls. For products made from multiple materials, choose the category that comprises most of the product, either by a weight or volume criteria. The product categories and corresponding content requirements are defined as follows:

   1. Paper products
   2. Printing and writing papers
   3. Soil amendments and toppings
   4. Erosion control products
   5. Glass products
   6. Lubricating oils
   7. Plastic products
   8. Paint
   9. Tires
   10. Tire-derived products
   11. Antifreeze
   12. Metal
   13. Carpet
   14. Pavement surfacing
   15. Building finishes
   16. Textiles

   Minimum content and recyclability requirements for the above product categories are identified in Public Contract Code, Section 12209. For reused or refurbished products, there is no minimum content requirement.

2. Virgin material content is that portion of the product made from non-recycled material, that is, the material is neither secondary nor postconsumer material.
3. Postconsumer material is defined as “a finished material which would have been disposed of as a solid waste, having completed its life cycle as a consumer item, and does not include manufacturing wastes.” This is material such as newspaper that you read and was recycled and then made into recycled-content newsprint or some other recycled product. Postconsumer material is generally any product that was bought by the consumer, used, and then recycled into another product.

4. Secondary material is defined as “fragments of finished products or finished products of a manufacturing process, which has converted a resource into a commodity of real economic value, and includes postconsumer material, but does not include excess virgin resources of the manufacturing process.” This is material such as newsprint that is trimmed from a roll in the paper plant that is returned to the beginning of the process to make recycled-content newsprint. The material (product) did not get to the consumer before being recycled.
   For example, if a printing and writing paper contained 20 percent postconsumer material, you would indicate 20 percent in the postconsumer column and 80 percent in the virgin column. If the product had 40 percent secondary material and 20 percent postconsumer material, you would indicate 40 percent in the secondary column, 20 percent in the postconsumer column, and 40 percent in the virgin column. To meet the 50/10 content requirement of another product category, the product would contain 50 percent recycled content (40 percent secondary and 10 percent postconsumer material) and 50 percent virgin material.
5. The sum of the virgin column, the postconsumer column, and the secondary column must equal 100 percent.

Note: Products that are made from multiple material types should be reported in the product category of the material type representing most of the product. The amount of material used in the product can be measured by weight or volume. If, for instance, a chair is made from steel, aluminum, and plastic and most of the material, either by weight or volume, is plastic, report it as a plastic product. If, however, most of the product, either by weight or volume, is metal, report the purchase as a metal product.

FORM 01 74 20.01 RECYCLED CONTENT CERTIFICATION WORKSHEET

This form must be completed by the contractor. The contractor must submit a worksheet with each product submittal to the State agency, with a row completed for each product supplied to the State. Attach additional sheets if necessary. Information must be included, even if the product does not contain recycled content material but it is within one of the 16 categories. Refer to footnotes following this form.

PROJECT NAME: _____ **PROJECT NUMBER:** _____

CONTRACTOR'S / VENDOR'S NAME: _____ **DATE:** _____

ADDRESS: _____ **PROJECT DIRECTOR:** _____

PHONE: _____ **EMAIL:** _____

Product Description / Specification Section	Quantity	Estimated Dollars	Product Category[1]	RCP Y/N?	Virgin Content (Percent)[2]	Postconsumer Material (Percent)[3]	Secondary Material (Percent)[4]	Total Percent[5]

Public Contract Code Section 12205 (b) requires all businesses to certify in writing, under penalty of perjury, the minimum percentage, if not the exact percentage, of postconsumer material in the products, materials, goods, or supplies offered or sold to the State.

Public Contract Code Section 12205 (a) requires all State agencies to require all contractors to certify in writing, under penalty of perjury, the minimum percentage, if not the exact percentage, of postconsumer material in the products, materials, goods, or supplies offered or sold to the State.

Signature of person completing form

Printed name of person completing form | Title

Footnotes

You must submit copies of this form and/or other documentation for each product that is reportable.

1. Product category refers to one of the product categories into which the reportable product purchase falls. For products made from multiple materials, choose the category that comprises most of the product, either by a weight or volume criteria. The product categories and corresponding content requirements are defined as follows:

   1. Paper products
   2. Printing and writing papers
   3. Soil amendments and toppings
   4. Erosion control products
   5. Glass products
   6. Lubricating oils
   7. Plastic products
   8. Paint
   9. Tires
   10. Tire-derived products
   11. Antifreeze
   12. Metal
   13. Carpet
   14. Pavement surfacing
   15. Building finishes
   16. Textiles

   Minimum content and recyclability requirements for the above product categories are identified in Public Contract Code, Section 12209. For reused or refurbished products, there is no minimum content requirement.

2. Virgin material content is that portion of the product made from non-recycled material, that is, the material is neither secondary nor postconsumer material.

3. Postconsumer material is defined as “a finished material which would have been disposed of as a solid waste, having completed its life cycle as a consumer item, and does not include manufacturing wastes.” This is material such as newspaper that you read and was recycled and then made into recycled-content newsprint or some other recycled product. Postconsumer material is generally any product that was bought by the consumer, used, and then recycled into another product.

4. Secondary material is defined as “fragments of finished products or finished products of a manufacturing process, which has converted a resource into a commodity of real economic value, and includes postconsumer material, but does not include excess virgin resources of the manufacturing process.” This is material such as newsprint that is trimmed from a roll in the paper plant that is returned to the beginning of the process to make recycled-content newsprint. The material (product) did not get to the consumer before being recycled.
   For example, if a printing and writing paper contained 20 percent postconsumer material, you would indicate 20 percent in the postconsumer column and 80 percent in the virgin column. If the product had 40 percent secondary material and 20 percent postconsumer material, you would indicate 40 percent in the secondary column, 20 percent in the postconsumer column, and 40 percent in the virgin column. To meet the 50/10 content requirement of another product category, the product would contain 50 percent recycled content (40 percent secondary and 10 percent postconsumer material) and 50 percent virgin material.
5. The sum of the virgin column, the postconsumer column, and the secondary column must equal 100 percent.

Note: Products that are made from multiple material types should be reported in the product category of the material type representing most of the product. The amount of material used in the product can be measured by weight or volume. If, for instance, a chair is made from steel, aluminum, and plastic and most of the material, either by weight or volume, is plastic, report it as a plastic product. If, however, most of the product, either by weight or volume, is metal, report the purchase as a metal product.

FORM 01 74 20.02 STATE AGENCY BUY RECYCLED CAMPAIGN PROCUREMENT SUMMARY (EXAMPLE)

Attach copies of the recycled-content certification form(s) and/or other documentation for each product that contains any amount of recycled material. Refer to footnotes following this form.

PROJECT NAME: Visitor's Non-Secure Entrance, Statewide Youth Correctional Agency **PROJECT NUMBER:** 000000000001234

CONTRACTOR'S / VENDOR'S NAME: XYZ Contractors **DATE:** December 1, 2024

ADDRESS: 4300 Pleasant Valley Dr, Lincoln Logs, CA 95000 **PROJECT DIRECTOR:** (AS NAMED)

PHONE: (123) 456-7890 **EMAIL:** Super.Intendent@xyzcont.com

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7
Product Category[1]	**All Reportable Purchases (QUANTITY)[2]**	**All Reportable Purchases (DOLLARS)[3]**	**RCP Purchases (QUANTITY)[4]**	**RCP Purchases (DOLLARS)[5]**	**Percent of RCP (QUANTITY)[6]**	**Percent of RCP (DOLLARS)[7]**
Paper products		$ 18,000.00		$ 12,500.00		70%
Printing and writing paper		$ 0.00		$0.00		0%
Soil amendments and toppings	0(cu yd)	$ 0.00	0(cu yd)	$ 0.00	0%	0%
Erosion control products		$ 20,000.00		$ 20,000.00		100%
Glass products		$ 35,000.00		$ 5,000		14%
Lubricating oils	0(gal)	$ 0.00	0(gal)	$ 0.00	0%	0%
Plastic products		$ 4,000.00		$ 1,500.00		38%
Paint	300(gal)	$ 8,000.00	0(gal)	$ 0.00	0%	0%
Tires	0	$ 0.00	0	$ 0.00	0%	0%
Tire-derived products		$ 2,000.00		$ 2,000.00		100%
Antifreeze	0(gal)	$ 0.00	0(gal)	$ 0.00	0%	0%
Metal		$ 11,000.00		$ 6,000.00		54%
Carpet	12,000 (sq ft)	$ 78,000.00	4,000 (sq ft)	$ 42,000.00	33%	54%
Pavement surfacing	150 (ton)	$50,000	75 (ton)	$ 20,000.00	50%	40%

EXAMPLE

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7
Product Category[1]	**All Reportable Purchases (QUANTITY)[2]**	**All Reportable Purchases (DOLLARS)[3]**	**RCP Purchases (QUANTITY)[4]**	**RCP Purchases (DOLLARS)[5]**	**Percent of RCP (QUANTITY)[6]**	**Percent of RCP (DOLLARS)[7]**
Building finishes		$ 25,000.00		$ 5,000.00		20%
Textiles		$12,000.00		$2,000.00		17%
		Total[8]: $ 263,000		**Total[9]: $ 116,000**		**Total[10]: 44.1%**

Footnotes

Attach copies of the recycled-content certification forms and/or other documentation for each product.

Note: All purchases within these product categories, regardless of the source of the product or the type of contract used to purchase them, should be included in your report. Include **all** product purchases — RCPs and non-RCPs.

1. Include **all** purchases (RCPs and non-RCPs) within the 16 product categories. RCPs outside of the 16 product categories **cannot** be counted toward attaining the procurement goals and are not reportable.
2. Indicate the quantity (units) of **all** purchases (RCPs and non-RCPs) in each product category during the course of the project. Quantities do not need to be reported for the product categories with shading.
3. Indicate the total dollars spent on **all** purchases (RCPs and non-RCPs) in each product category purchased during the course of the project.
4. Indicate the total quantity (units) of RCPs purchased during the course of the project. Quantities do not need to be reported for the product categories with shading.
5. Indicate the total dollars spent on RCPs during the course of the project for each category.
6. Indicate the percentage of RCPs purchased. The percent recycled is calculated by dividing the figure in column 4 by the figure in column 2 and multiplying by 100. Percentages do not need to be calculated for the product categories with shading.
7. Indicate the percentage of total dollars spent on RCPs in each category. The percentage recycled is calculated by dividing the figure in column 5 by the figure in column 3 and multiplying by 100.
8. The total of column 3 should be equivalent to the total estimated dollars spent on **all** products (RCPs and non-RCPs) during the course of the project.
9. The total of column 5 should be equivalent to the estimated total dollars spent on reportable RCPs during the course of the project.
10. Column 7 is calculated by dividing the figure in column 5 by the figure in column 3 and multiplying by 100.

EXAMPLE

SECTION 01 75 00

STARTING AND ADJUSTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Procedures for starting, testing, adjusting, and balancing of the following systems:

a. As specified in Specification 23 08 00.

1.2 SUBMITTALS

A. Sequencing Schedule:

1. Preliminary schedule listing times and dates for start-up of each item of equipment, in sequence: Submit two weeks prior to proposed dates. Accepted Schedule shall be the sequencing schedule.

B. Reports:

1. Submit manufacturer authorized representative's reports within one week after start-up, listing start-up dates.
2. Submit final reports of testing, adjusting, and balancing performed. Submit reports of testing, adjusting, and balancing which are postponed due to seasonal, climatic, occupancy, or other reasons beyond Contractor's control, promptly after execution of those services.

C. Qualification Statements: For manufacturer's authorized representative.

1.3 QUALITY ASSURANCE

A. When specified in individual Specifications Sections, require manufacturer to provide authorized representative to be present at site to perform the following:

1. Inspect, check, and approve equipment or system installation prior to start-up.
2. Supervise placing equipment or system in operation.
3. Provide written report that equipment or system has been properly installed and is functioning correctly.

B. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to the State Construction Inspector to facilitate spot checks during testing. Retain possession of instruments and remove upon completion of services.

1.4 PROJECT CONDITIONS

A. Ensure building is enclosed and weathertight.

B. Ensure excess packing and shipping bolts are removed.

C. Ensure interdependent systems have been checked and are operational.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 GENERAL

A. Prepare each system for testing and balancing.

B. Comply with procedural standards of certifying association under whose standards service will be performed. Accurately record data for each step.

C. Report to State Construction Inspector about defects or deficiencies noted during performance of services.

3.2 EXAMINATION

A. Verify Project conditions comply with specified and manufacturer’s requirements.

B. Verify status of work meets requirements for start-up of equipment and systems.

3.3 PREPARATION

A. Coordinate sequence of start-up for various items of equipment.

B. Notify the State Inspector seven (7) days prior to start-up of each item of equipment.

C. Have Contract Documents, shop drawings, product data, and operation and maintenance data at hand during entire start-up process.

D. Verify each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.

E. Verify control systems are fully operational in automatic mode.

F. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

G. Verify that wiring and support components for equipment, motors and controls are complete and tested.

1. Bearings: Inspect for cleanliness. Clean and remove foreign matter. Verify alignment and take corrective measures, if required.
2. Drives: Inspect for tension on belt drives, adjustment of variable pitch sheaves and drives, alignment, proper equipment speed and cleanliness. Take corrective measures, if required.
3. Motors: Verify that motor amperage agrees with nameplate value. Inspect for conditions which produce excessive current flow, and which exist due to equipment malfunction. Take corrective measures, if required.

3.4 STARTING SYSTEMS

A. Execute start-up under supervision of Contractor's personnel and/or manufacturer’s representative when so specified in accordance with manufacturer’s instructions.

B. Place equipment for operation in proper sequence, in accordance with approved sequencing schedule.

END OF SECTION

State of California
Department of General Services - Procurement Division
Prime Contractor's Certification - DVBE Subcontractor Report
STD 817, Formerly DGS PD 810P

STATE DEPARTMENT AND CONTRACT INFORMATION

State Department Information		Contract Information		Prime Contractor Information:		FOR STATE USE ONLY	
State Department Name:		Contract #:		Name:		Date Received:	
State Department Address:		FI$Cal Supplier ID#:		Address:			
Contract Manager Name:		Contract Execution Date:		Phone #:			
Contract Manager Phone #:		Date Work Completed:		Email:			
Contract Manager Email Address:		Contract Award Amount:		Date Last Payment Received:			
				Contract Received Amount:			

SECTION 3 — **List all Disabled Veteran Business Enterprise firms involved with this contract.**

	(A) DVBE Subcontractor(s) Name	(B) DVBE Subcontractor(s) Address	(C) DVBE Certification ID Number	(D) Total Contract Commitment Percentage to DVBE	(E) Total Contract Commitment Amount to DVBE	(F) Total Payment Amount to DVBE	(G) Difference in Amount Paid to DVBE (F - E)	(H) Percentage Paid to DVBE (F/Contract Received Amount)
Number of DVBE Subcontractors			**Grand Total**		$ 0.00	$ 0.00	$ 0.00	0.00%
1.				0.00%			0.00	0.00%
2.				0.00%			0.00	0.00%
3.				0.00%			0.00	0.00%
4.				0.00%			0.00	0.00%
5.				0.00%			0.00	0.00%
6.				0.00%			0.00	0.00%
7.				0.00%			0.00	0.00%
8.				0.00%			0.00	0.00%
9.				0.00%			0.00	0.00%
10.				0.00%			0.00	0.00%
11.				0.00%			0.00	0.00%
12.				0.00%			0.00	0.00%
13.				0.00%			0.00	0.00%

	(I) Comments/Explanations	

Use next page for additional lines

I certify under penalty of perjury under the laws of the State of California that all information submitted is true and correct.

Prime Contractor	Print Name:		Date:	
	Title:			
	Signature:			

Return upon completion of contract.

Americans with Disabilities (ADA) Notice: Persons with disabilities requiring reasonable modifications should contact the OSDS Report Coordinator at OSDSReports@dgs.ca.gov

State of California
Department of General Services - Procurement Division
Prime Contractor's Certification - DVBE Subcontractor Report
STD 817, Formerly DGS PD 810P

STATE DEPARTMENT AND CONTRACT INFORMATION							
State Department Information		**Contract Information**		**Prime Contractor Information**		**FOR STATE USE ONLY**	
State Department Name:		**Contract #:**		**Name:**		**Date Received:**	
State Department Address:		FI$Cal Supplier ID#:		**Address :**			
Contract Manager Name:		Contract Execution Date:		**Phone #:**			
Contract Manager Phone #:		Date Work Completed:		**Email:**			
Contract Manager Email Address:		Contract Award Amount:		**Date Last Payment Received:**			
				Contract Received Amount:			

List all Disabled Veteran Business Enterprise firms involved with this contract.

	(A) DVBE Subcontractor(s) Name	(B) DVBE Subcontractor(s) Address	(C) DVBE Certification ID Number	(D) Total Contract Commitment Percentage to DVBE	(E) Total Contract Commitment Amount to DVBE	(F) Total Payment Amount to DVBE	(G) Difference in Amount Paid to DVBE (F - E)	(H) Percentage Paid to DVBE (F/Contract Received Amount)
Number of DVBE Subcontractors			**Total**		$ 0.00	$ 0.00	$ 0.00	0.00%
14.				0.00%			0.00	0.00%
15.				0.00%			0.00	0.00%
16.				0.00%			0.00	0.00%
17.				0.00%			0.00	0.00%
18.				0.00%			0.00	0.00%
19.				0.00%			0.00	0.00%
20.				0.00%			0.00	0.00%
21.				0.00%			0.00	0.00%
22.				0.00%			0.00	0.00%
23.				0.00%			0.00	0.00%
24.				0.00%			0.00	0.00%
25.				0.00%			0.00	0.00%
26.				0.00%			0.00	0.00%
27.				0.00%			0.00	0.00%
28.				0.00%			0.00	0.00%
29.				0.00%			0.00	0.00%
30.				0.00%			0.00	0.00%
31.				0.00%			0.00	0.00%
32.				0.00%			0.00	0.00%
33.				0.00%			0.00	0.00%
34.				0.00%			0.00	0.00%
35.				0.00%			0.00	0.00%
36.				0.00%			0.00	0.00%

Attach copies of this page for additional lines

I certify under penalty of perjury under the laws of the State of California that all information submitted is true and correct.

Americans with Disabilities (ADA) Notice: Persons with disabilities requiring reasonable modifications should contact the OSDS Report Coordinator at OSDSReports@dgs.ca.gov

Form Completion Instructions

GENERAL INFORMATION: Military and Veteran Code (MVC) 999.5(d), 999.7 and Government Code (GC) 14841, and California Code of Regulations (CCR) 1896.78(e) requires all Prime Contractors that committed to have a Disabled Veteran Business Enterprise (DVBE) perform an element of work for a contract to report DVBE subcontractor participation information and certify to the state that all DVBE subcontracting payments were made. Departments are required to withhold $10,000 from the final payment, or the full payment if less than $10,000, on contracts until the Prime Contractor complies with the certification requirements by submitting this form.

If prime contractors do not comply with the requirements after given notice to cure by the state departments, the withheld amount will be permanently deducted.

All contracted work must be completed before submission of invoice(s) and this certification form.

Prime Contractors are required to maintain records supporting the information submitted on this form and that all payments to DVBE subcontractor(s) were made. Upon request, proof of payment must be provided (MVC 999.5(d)).

INCLUDE

- **ONLY ONE contract per Report**
- **All DVBEs that performed an element of work for this contract regardless of tier**

State Department Information:

State Department Name: Enter the State Department name

State Department Address: Enter the State Department address

Contract Manager Name: Enter the Contract Manager name

Contract Manager Phone Number: Enter the Contract Manager phone #

Contract Manager Email Address: Enter the Contract Manager email address

Contract Information

Contract Number: Enter the Contract Number

Contractor's FI$Cal Supplier ID Number: Enter your FI$Cal supplier ID number

Contract Execution Date: Enter the date contract was signed

Date Work Completed: Enter the date the work was completed on the contract

Contract Award Amount: Enter the total dollar amount awarded for this contract including all financial amendments

State of California
Department of General Services Procurement Division
Prime Contractor's Certification - DVBE Subcontracting
Report STD 817, Formerly DGS PD 810P
(Rev. 10/2021)

Form Completion Instructions

Prime Contractor Information:

Prime Contractor Name: Enter your name as shown on the contract

Prime Contractor Address: Enter your address

Phone Number: Enter your number (with area code)

Email Address: Enter your email address

Date Last Payment Received: Enter the date the last payment for work performed was received

Contract Received Amount: Enter the dollar amount of the last payment received

For State Use Only

Date STD 817 Received: Enter date the Contract Manager received the STD 817 from the Prime Contractor

TABLE INSTRUCTIONS

A) DVBE Subcontractor(s) Name: Enter the name of all DVBEs that are listed to perform an element of work or supplies for this contract and any formal approved substitution(s). (Use additional lines if the name does not fit on a single line) Use page two for additional lines.

B) DVBE Subcontractor(s) Address: Enter the address of each DVBE (Use page 2 for additional lines if address does not fit on a single line)

C) DVBE Certification ID Number: Enter each DVBE's certification number

D) Total Contract Commitment Percentage to DVBE: Enter the total percentage of contracted dollars to each DVBE at the time of award

E) Total Contract Commitment Amount to DVBE: Enter the entire amount contracted to each DVBE at the time of award

F) Total Payment Amount to DVBE: Enter the total amount paid to all DVBEs that performed an element of work or were suppliers for this contract

Form Completion Instructions

G) **Difference in Amount Paid to DVBE**: The form will compute the difference of DVBE dollars contracted compared to dollars paid

H) **Percentage Paid to DVBE:** The form will compute the percentage paid to DVBEs using the Contract Received Amount entered under State and Contract Information

Instructions I

I) **Comments/Explanations:** Enter any relevant comments and explanations for any differences between the DVBE amounts or percentages committed and paid. Reference the line number if comments and explanations are used.

SIGNATURE BLOCK

Prime Contractor's Signature: Enter your printed name, title, sign with an electronic signature or a wet signature, and date

Note: Complete and accurate certifications are due upon completion of contract.

STATE OF CALIFORNIA DEPARTMENT OF GENERAL SERVICES

CONTRACTOR'S CERTIFICATION OF SMALL BUSINESS PARTICIPATION

TO:	Real Estate Services Division (Construction Services Area Office Address)	Date: Project Number: Contract Number:

FROM:

PROJECT TITLE:

THIS IS TO CERTIFY THAT I, _____
(Print Name)

AS AN AUTHORIZED OFFICIAL OF _____
(Firm or Corporation)

WORKING IN THE CAPACITY OF _____
(Title)

HAVE BEEN PROPERLY AUTHORIZED BY SAID FIRM OR CORPORATION TO SIGN THE FOLLOWING STATEMENT PERTAINING TO SUBJECT CONTRACT.

Pursuant to Government Code, Section 14841,

I, the undersigned, hereby certify that to the best of my knowledge, the Small Business participation information listed on the attached report for the above contract is complete and correct.

SIGNED: DATE:

FORM 01 77 00.02 CONTRACTOR'S CERTIFICATION OF SMALL BUSINESS PARTICIPATION

State of California · Department of General Services

☐ **PRELIMINARY REPORT**

CONTRACTOR'S CERTIFICATION OF SMALL BUSINESS (SB) PARTICIPATION

☐ **FINAL REPORT**

CONTRACT NUMBER	PROJECT NUMBER	CONTRACT COMPLETION DATE	CONTRACT ACCEPTANCE DATE

PRIME CONTRACTOR	ORIGINAL CONTRACT AMOUNT	FINAL CONTRACT AMOUNT

DESCRIPTION OF WORK PERFORMED AND MATERIALS PROVIDED	SB BUSINESS NAME AND ADDRESS	SB CERT. NO.	SB CONTRACT PAYMENTS			
			PAYMENT AMOUNT	DATE WORK COMPLETED	DATE OF FINAL PAYMENT	COMMENTS
		TOTAL $				

ORIGINAL SMALL BUSINESS COMMITMENT: _____%

ACTUAL SMALL BUSINESS ACHIEVED: _____%

SECTION 01 79 00

DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for instructing State's personnel, including the following:

1. Instruction in operation and maintenance of systems, subsystems, products and equipment.
2. Demonstration and training video recordings.

1.2 SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. Submit a minimum of 6 weeks prior to requesting inspection for determining date of Completion of the Work.
2. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Attendance Record: For each training module, within seven days of end training, submit list of participants and length of instruction time.

C. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:

a. Name of Project.
b. Name of Contractor.
c. Date of video recording.

2. At completion of training, submit complete training manual(s) for State's use prepared in same PDF file format required for operation and maintenance manuals.

1.3 QUALITY ASSURANCE

A. When so specified in individual Sections, provide demonstration and instruction to State personnel, performed by a representative approved by the equipment or system manufacturer.

1.4 COORDINATION

A. Coordinate instruction schedule with State's operations. Adjust schedule as required to minimize disrupting State's operations and to ensure availability of State's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and accepted by State.

1.5 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.

2. Documentation: Review the following items in detail:

    a. Emergency manuals.
    b. Systems and equipment operation manuals.
    c. Systems and equipment maintenance manuals.
    d. Product maintenance manuals.
    e. Project Record Documents.
    f. Identification systems.
    g. Warranties and bonds.
    h. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

    a. Instructions on meaning of warnings, trouble indications, and error messages.
    b. Instructions on stopping.
    c. Shutdown instructions for each type of emergency.
    d. Operating instructions for conditions outside of normal operating limits.
    e. Sequences for electric or electronic systems.
    f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

    a. Startup procedures.
    b. Equipment or system break-in procedures.
    c. Routine and normal operating instructions.
    d. Regulation and control procedures.
    e. Control sequences.
    f. Safety procedures.
    g. Instructions on stopping.
    h. Normal shutdown instructions.
    i. Operating procedures for emergencies.
    j. Operating procedures for system, subsystem, or equipment failure.
    k. Seasonal and weekend operating instructions.
    l. Required sequences for electric or electronic systems.
    m. Special operating instructions and procedures.

5. Adjustments: Include the following:

    a. Alignments.
    b. Checking adjustments.
    c. Noise and vibration adjustments.
    d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

    a. Diagnostic instructions.
    b. Test and inspection procedures.

7. Maintenance: Include the following:

    a. Inspection procedures.
    b. Types of cleaning agents to be used and methods of cleaning.
    c. List of cleaning agents and methods of cleaning detrimental to product.
    d. Procedures for routine cleaning.
    e. Procedures for preventive maintenance.
    f. Procedures for routine maintenance.
    g. Instruction on use of special tools.

8. Repairs: Include the following:

    a. Diagnosis instructions.
    b. Repair instructions.
    c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
    d. Instructions for identifying parts and components.
    e. Review of spare parts needed for operation and maintenance.

1.6 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 01 77 00 "Closeout Procedures."

B. Set up instructional equipment at instruction location.

1.7 INSTRUCTION

A. Engage qualified instructors to instruct State’s personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. State will furnish Contractor with names and positions of participants.

B. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction for all seasons of operations.

1. Schedule training with State with at least 14 days' advance notice.
2. All demonstration and training shall be completed prior to requesting final inspection.

C. Time Allocated for Instructions: Amount of time required for instruction on each item of equipment and system shall be as specified in individual Sections, and not less than **one** hour.

D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

1. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instructions.

E. Cleanup: Collect used and leftover educational materials and give them to State. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

PART 2 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 81 13.20

SUSTAINABLE DESIGN REQUIREMENTS - LEED v4.1 BD+C: NEW CONSTRUCTION AND MAJOR RENOVATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements and procedures for compliance with USGBC's LEED prerequisites and credits needed for Project to obtain LEED **Silver** certification based on USGBC's "LEED v4.1 for Building Design and Construction" (hereafter, LEED v4.1 BD+C).

1. Specific requirements for LEED are also included in other Sections.
2. Other LEED prerequisites and credits needed to obtain LEED certification depend on product selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.
3. A copy of LEED Project checklist is attached at end of this Section for information only.

    a. Some LEED prerequisites and credits needed to obtain indicated LEED certification depend on State’s design and other aspects of Project that are not part of the Work of the Contract.

1.2 DEFINITIONS

A. ANSI/BIFMA e3 Furniture Sustainability Standard: Standard addressing environmental and social impacts throughout the furniture supply chain.

B. Bio-Based Materials: Products containing some percentage of biologically renewable resource.

C. BUG Rating Method: The BUG rating of a fixture determines how much light trespass is produced by considering backlight (B), uplight (U), and glare (G).

D. Chain-of-Custody Certificates: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001. Certificates are to include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.

E. Cradle to Cradle: Product certification assessing material health, material reutilization, renewable energy and carbon management, water stewardship, and social fairness.

F. Declare: A product transparency disclosure that identifies material source, composition, and end-of-life procedures.

G. Environmental Product Declaration (EPD): A transparency reporting tool communicating what a product is made of and the environmental impact.

H. Extended Producer Responsibility: A waste management strategy promoting integration of life-cycle costs associated with goods into the market price of products. Typically, this involves a take-back or recycling program run by manufacturers at the end of the product's lifespan.

I. Facts: Standard evaluating sustainability of furniture products over the product life cycle.

J. Health Product Declaration (HPD): Disclosure of products contents and associated health information.

K. LEED: USGBC's "LEED v4.1 for Building Design and Construction." Definitions that are part of this document apply to this Section.

L. Living Product Challenge: A product framework for manufacturers examining place, water, energy, health, materials, and equity in production of materials.

M. Manufacturer Inventory: A published, complete content inventory for products.

N. Product Lens: Transparency disclosure highlighting hazard information.

O. REACH Optimization: International standard outlining hazardous substances of high concern to be avoided in material composition.

P. Recycled Content: The recycled content value of a material assembly to be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.

1. "Postconsumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
2. "Preconsumer" material is defined as material diverted from the waste stream during the manufacturing process. Reutilization of materials (such as rework, regrind, or scrap, generated in a process and capable of being reclaimed within the same process that generated it) is excluded.

Q. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) contributes to the regional value.

R. WaterSense Label: The WaterSense label from the EPA specifies water efficiency and performance.

S. Whole-Building Life-Cycle Assessment: The Life Cycle Assessment (LCA) is a methodology that evaluates the carbon and other environmental impacts of building materials over the projected lifespan of the building.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site. Review sustainability goals, state sustainability requirements, LEED objectives, and action plans for meeting requirements.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Respond to questions and requests from State about USGBC's LEED prerequisites and credits that are Contractor's responsibility, that depend on product selection or product qualities, or that depend on Contractor's procedures until USGBC has made its determination on Project's LEED certification application.

1.5 SUBMITTALS

A. General: Submit sustainable design submittals required by other Sections.

B. Sustainable Design Documentation Submittals:

1. Architectural material cut sheets with verification of LEED v4.1 conformance as applicable.
2. Plumbing submittal packages.
3. Mechanical submittal packages.
4. EPDs complying with LEED requirements.
5. Documentation for products that comply with LEED requirements for multi-attribute optimization.
6. Sustainability reports for products that comply with LEED requirements for sourcing of raw materials.
7. Material ingredient reports for products that comply with LEED requirements for material ingredient reporting.
8. Documentation for products that comply with LEED requirements for material ingredient optimization.
9. Documentation complying with Section 01 74 19 "Construction Waste Management and Disposal."
10. Product data for adhesives and sealants used inside the weatherproofing system, indicating VOC content and laboratory test reports showing compliance with requirements for low-emitting materials.
11. Product data for paints and coatings used inside the weatherproofing system, indicating VOC content and laboratory test reports showing compliance with requirements for low-emitting materials.
12. Laboratory test reports for flooring, indicating compliance with requirements for low-emitting materials.
13. Laboratory test reports for wall materials, indicating compliance with requirements for low-emitting materials.
14. Laboratory test reports for ceilings, indicating compliance with requirements for low-emitting materials.
15. Laboratory test reports for insulation, indicating compliance with requirements for low-emitting materials.
16. Laboratory test reports for furniture, indicating compliance with requirements for low-emitting materials.
17. Laboratory test reports for products containing composite wood or agrifiber products or wood glues, indicating compliance with requirements for low-emitting materials.

18. Construction Indoor Air Quality (IAQ) Management:

    a. Construction IAQ management plan.

    b. Product data for temporary filtration media.

    c. Product data for filtration media used during occupancy.

    d. Construction Documentation: Six photographs at three different times during construction period, along with a brief description of SMACNA approach employed, documenting implementation of IAQ management measures, including protection of ducts and on-site stored or installed absorptive materials.

19. IAQ Assessment:

    a. Signed statement describing the building air flush-out procedures, including dates when flush-out was begun and completed and statement that filtration media was replaced after flush-out.

    b. Product data for filtration media used during flush-out and occupancy.

    c. Report from testing and inspecting agency indicating results of IAQ testing and documentation showing compliance with IAQ testing procedures and requirements.

20. Construction and Demolition Materials Management Plan

    a. Provide a final waste management report detailing all waste generated, including disposal and diversion rates for the project. Calculations can be by weight or volume but must be consistent throughout. Points are awarded according to Table 1.

    b. Divert C&D waste materials by using strategies including off-site salvage, source-separation for single-material recycling, mixed C&D recycling, and industry/manufacturer take-back programs.

    c. Source-separated materials are considered 100% diverted for credit calculation purposes. These include:

        i. Recovered materials sent to a single-material recycler

        ii. Recovered materials sent for off-site salvage/reuse

        iii. Materials sent to a qualifying manufacturer or industry take-back program

        iv. Salvaged materials, which are valued at twice the diversion rate (200%) of other diverted materials for credit calculation purposes and include recovered materials sent off-site for reuse

        v. NOTE: Materials reused on-site contribute to MRc1: Building and Materials Reuse.

    d. Mixed C&D materials sent to a processing facility for recovery must take the facility average recycling rate. Recycling rates not verified by a third party must assume a maximum of 35% diversion rate.

    e. Materials destined for alternative daily cover or incineration/energy recovery are considered waste (0% diverted).

    f. Exclude hazardous waste from calculations. Exclude on-site reuse from credit calculations (include in MRc1: Building and Materials Reuse).

    g. Exclude excavated soil and land-clearing debris from calculations.

C. Project Materials Cost Data: Provide statement indicating total cost for materials used for Project. Costs exclude labor, overhead, and profit. Include breakout of costs for the following categories of items:

1. Plumbing.
2. Mechanical.
3. Electrical.
4. Specialty items, such as elevators and equipment.

D. Sustainable Design Action Plans: Provide preliminary submittals within **45** days of date established for the Notice to Proceed, indicating how the following requirements will be met:

1. List of proposed products with EPDs.
2. List of proposed products complying with requirements for multi-attribute optimization.
3. List of proposed products complying with requirements for sourcing of raw materials.
4. List of proposed products complying with requirements for material ingredient reporting.
5. List of proposed products complying with requirements for material ingredient optimization.
6. Waste management plan complying with Section 01 74 19 "Construction Waste Management and Disposal."
7. Construction IAQ management plan.
8. IAQ assessment plan.
9. Construction and Demolition Materials Management Plan

E. Sustainable Design Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with sustainable design action plans.

1.6 QUALITY ASSURANCE

A. LEED Coordinator: Engage an experienced LEED Accredited Professional to coordinate LEED requirements. LEED coordinator may also serve as waste management coordinator.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide products and procedures necessary to obtain LEED credits indicated as Contractor's responsibility. Although other Sections may specify some requirements that contribute to these LEED credits, Contractor provides additional materials and procedures necessary to obtain LEED credits indicated.

B. At least 20 different products from at least five different manufacturers have EPDs that comply with LEED requirements. Product-specific Type III EPDs are valued as one and one-half of a product.

C. At least 10 percent, by cost, of permanently installed products for Project comply with LEED requirements for multi-attribute optimization.

D. At least 20 different products from at least five different manufacturers have publically released reports that comply with LEED requirements for sourcing of raw materials.

E. At least 20 different products from at least five different manufacturers comply with LEED requirements for material ingredient reporting.

F. At least 10 percent, by cost, of permanently installed products for Project comply with LEED requirements for material ingredient optimization.

G. Recycled Content: Use products that meet one or more of the following criteria. At least 70% of each compliant building component, by weight or volume, must meet one of the requirements below. A single component that meets more than one criterion does not earn additional credit.

1. The product contains at least 25% reclaimed material, including salvaged, refurbished, or reused materials. For renovation projects, existing components are considered reclaimed. Wood by-products can be counted as reclaimed material. These include items from secondary manufacturers; felled, diseased, or dead trees from urban or suburban areas; orchard trees that are unproductive and cut for replacement; and wood recovered from landfills or water bodies.
2. The product contains at least 25% postconsumer or 50% preconsumer content.
3. Wood products must be Forest Stewardship Council (FSC) Certified, or USGBC-approved equivalent.
4. Bio-based materials. Bio-based products must meet the Sustainable Agriculture Network's Sustainable Agriculture Standard. Bio-based raw materials must be tested using ASTM Test Method D6866 and be legally harvested, as defined by the exporting and receiving country. Exclude hide products, such as leather and other animal skin material.
5. Concrete that consists of at least 30% fly ash or slag used as a cement substitute
6. Extended producer responsibility. Products purchased from a manufacturer (producer) that participates in an extended producer responsibility program or is directly responsible for extended producer responsibility.
7. Do not include [**furniture,**]plumbing, mechanical and electrical components, and specialty items, such as elevators and equipment, in the calculation.

2.2 LOW-EMITTING MATERIALS

A. Paints and Coatings: For field applications that are inside the weatherproofing system, 75 percent of paints and coatings meet the VOC emissions evaluation and 100 percent meet the VOC content evaluations.

B. Adhesives and Sealants: For field applications that are inside the weatherproofing system, 75 percent of adhesives and sealants meet the VOC emissions evaluation and 100 percent meet the VOC content evaluations.

C. Flooring: A minimum of 90 percent of flooring products meet the VOC emissions evaluation or inherently non-emitting sources criteria or salvaged and reused materials criteria. Subflooring is excluded.

D. Walls: A minimum of 75 percent of wall panel products meet the VOC emissions evaluation or inherently non-emitting sources criteria or salvaged and reused materials criteria. Wall panel products include wall paneling, wall coverings, wall tile, surface wall structures, cubicle/curtain/partition walls, trim, doors, frames, windows, and window treatments. Removable/interchangeable fabric panels, built-in cabinetry, and vertical structural elements are excluded.

E. Ceilings: A minimum of 90 percent of ceilings meet the VOC emissions evaluation or inherently non-emitting sources criteria or salvaged and reused materials criteria. Ceiling products include ceiling panels, ceiling tile, surface ceiling structures, suspended systems, and glazed skylights. Overhead structural elements are excluded.

F. Insulation: A minimum of 75 percent of insulation products meet the VOC emissions evaluation. Insulation products include all thermal and acoustic boards, batts, rolls, blankets, sound attenuation fire blankets, and foamed-in-place, loose-fill, blown, and sprayed insulation. HVAC duct and plumbing piping insulation are excluded.

G. Furniture: A minimum of 75 percent of furniture meets the furniture emissions evaluation or inherently non-emitting sources or salvaged and reused materials criteria. All standalone furniture is included.

H. Composite Wood: A minimum of 75 percent of all composite wood meet the formaldehyde emissions evaluation or salvaged and reused materials criteria. Composite wood materials include particleboard, MDF, hardwood veneer plywood, and structural composite wood.

PART 3 - EXECUTION

3.1 NONSMOKING BUILDING

A. Smoking is not permitted within the building or within 25 ft. of entrances, operable windows, or outdoor-air intakes.

3.2 CONSTRUCTION WASTE MANAGEMENT

A. Comply with Section 01 74 19 "Construction Waste Management and Disposal."

3.3 CONSTRUCTION INDOOR AIR QUALITY (IAQ) MANAGEMENT

A. Comply with SMACNA's "SMACNA IAQ Guideline for Occupied Buildings under Construction."

1. If State authorizes use of permanent heating, cooling, and ventilating systems during construction period as specified in Section 01 50 00 "Temporary Facilities and Controls," install MERV 8 filter media in accordance with ASHRAE 52.2 at each return-air inlet for the air-handling system used during construction.
2. Replace air filters immediately prior to occupancy with new filters specified in Section 23 41 00 "Particulate Air Filtration."

3.4 INDOOR AIR QUALITY (IAQ) ASSESSMENT

A. Flush-Out:

1. After construction ends, prior to occupancy and with all interior finishes installed, perform a building flush-out by supplying a total volume of 14,000 cu. ft. of outdoor air per sq. ft. of floor area while maintaining an internal temperature of at least 60 deg F and a relative humidity no higher than 60 percent.

In first subparagraph below, indicate operating procedure for each HVAC system and piece of equipment and the operating duration required for flush-out.

a. Consult with Mechanical Engineer of Record for sequence of operations and equipment used for building flush-out.

2. If occupancy is desired prior to flush-out completion, the space may be occupied following delivery of a minimum of 3500 cu. ft. of outdoor air per sq. ft. of floor area to the space. Once a space is occupied, it is ventilated at a minimum rate of 0.30 cfm per sq. ft. of outside air or the design minimum outside-air rate prerequisite, whichever is greater. During each day of the flush-out period, ventilation begins a minimum of three hours prior to occupancy and continues during occupancy. These conditions are maintained until a total of 14,000 cu. ft./sq. ft. of outside air has been delivered to the space.

B. Air-Quality Testing: Engage testing agency to perform the following:

1. Conduct baseline IAQ testing, after construction ends and prior to occupancy, using testing protocols consistent with the EPA's "Compendium of Methods for the Determination of Air Pollutants in Indoor Air," and as additionally detailed in USGBC's "LEED v4.1 Reference Guide for Building Design and Construction."

2. Demonstrate that contaminant maximum concentrations listed below are not exceeded:

a. Carbon Monoxide: 9 ppm and no greater than 2 ppm above outdoor levels.
b. Particulates (PM10): 50 mcg/cu. m.
c. Particulates (PM2.5): 12 mcg/cu. m.
d. Ozone: 0.07 ppm, in accordance with ASTM D5149.
e. Formaldehyde: 20 mcg/cu. m.
f. Acetaldehyde: 140 mcg/cu. m.
g. Benzene: 3 mcg/cu. m.
h. Hexane: 7000 mcg/cu. m.
i. Naphthalene: 9 mcg/cu. m.
j. Phenol: 200 mcg/cu. m.
k. Styrene: 900 mcg/cu. m.
l. Tetrachloroethylene: 35 mcg/cu. m.
m. Toluene: 300 mcg/cu. m.
n. Vinyl Acetate: 200 mcg/cu. m.
o. Dichlorobenzene: 800 mcg/cu. m.
p. Xylenes - Total: 700 mcg/cu. m.

3. For each sampling point where the maximum concentration limits are exceeded, take corrective action until requirements have been met.

4. Air-sample testing to be conducted as follows:

a. All measurements to be conducted prior to occupancy but during normal occupied hours, and with building ventilation system starting at the normal daily start time and operated at the minimum outside-airflow rate for the occupied mode throughout the duration of the air testing.

b. Building to have all interior finishes installed, including, but not limited to, millwork, doors, paint, carpet, and acoustic tiles. Nonfixed furnishings such as workstations and partitions are encouraged, but not required, to be in place for the testing.

c. Number of sampling locations varies depending on the size of building and number of ventilation systems. For each portion of building served by a separate ventilation system, the number of sampling points to not be less than one per 5000 sq. ft.. For large open spaces, one sampling point per 50,000 sq. ft. may be used.

d. Air samples to be collected between 3 and 6 ft. from the floor to represent the breathing zone of occupants, and over a minimum four-hour period.

END OF SECTION

SECTION 019113

GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Commissioning is a designed quality-focused process for evaluating and documenting that the performance of facilities, systems and assemblies meets the Owner's acceptance criteria, as documented in the approved Owner's Project Requirements and Construction Documents. The Design Team, General Contractor and installation subcontractors provide the quality control for the design, installation and start-up of the building systems. The commissioning process provides a level of confidence that the quality control efforts of the designers and contractors are successfully completed through independent review and objective functional testing of systems.

B. Commissioning includes the completion of a formal commissioning process on the equipment and systems within the Commissioning Scope of Work, as specified within this Section 019113. Commissioning is performed by the Commissioning Team under the leadership of the Commissioning Provider (CxP) [also formerly termed Commissioning Authority (CxA)]. The entire Commissioning Team (see Definition of Terms in this Section 019113) is responsible for performing the process and achieving successful commissioning results. The CxP is from a totally independent firm under contract directly with the Owner and is not contractually or financially associated with the Design Team or any contractor performing work on this project. The CxP is Veregy.

C. Commissioning Standards: The commissioning process shall be in accordance with:

1. The Construction Documents
2. The Building Commissioning Association's (BCxA) "Essential Attributes of Building Commissioning (2018)"
3. ASHRAE Guideline 0-2019: The Commissioning Process

D. Contractors' Responsibility: The Contractor is responsible for completion of the specified commissioning work. The contractors' responsibilities include:

1. The General Contractor (GC) shall provide a Commissioning Coordinator (CxC) (see Definition of Terms in this Section 019113). The GC's CxC is responsible for managing the commissioning work specified for the subcontractors.
2. The Contractor shall be responsible for providing material, equipment and labor to participate in the specified commissioning process. The Contractor will assure the participation and cooperation of subcontractors under their jurisdiction as required to complete the commissioning process.
3. The Contractor will support the commissioning process by integrating it into the construction process and schedule.

E. Support of Materials, Equipment and Systems Suppliers: Suppliers of major equipment and systems within the Commissioning Scope of Work (specified elsewhere in this Section 019113) shall support the commissioning process. Minimum support shall consist of the following:

1. Submit the manufacturer's installation & start-up manuals as a part of the initial equipment submittal in accordance with the equipment specifications.
2. Submit the manufacturer's operating and maintenance manuals as a part of the initial equipment submittal in accordance with the equipment specifications.

3. Assist in developing the final functional test procedures as specified in Sections 019113, 220800, 230800 and 260800 and related sections.
4. Provide authorized start-up technician to perform functional performance testing as specified in Sections 019113, 220800, 230800 and 260800 and related sections.

1.2 RELATED SECTIONS

A. SECTION 220800 COMMISSIONING OF PLUMBING SYSTEMS

B. SECTION 230800 COMMISSIONING OF MECHANICAL SYSTEMS

C. SECTION 260800 COMMISSIONING OF ELECTRICAL SYSTEMS

D. All project specifications related to the "Systems Within The Commissioning Scope Of Work"

1.3 SYSTEMS WITHIN THE COMMISSIONING SCOPE OF WORK

A. Mechanical, including HVAC&R equipment and controls

B. Electrical, including the electrical system, lighting/daylighting and controls

C. Plumbing, including domestic hot water systems, pumps and controls

D. Energy/water meters and monitoring

E. Renewable energy systems, including solar thermal/PV, as applicable

F. Landscape irrigation systems, as applicable

G. Water reuse systems, as applicable

H. Building enclosure, as applicable

1.4 DEFINITION OF TERMS

A. Acceptance Criteria: Acceptance of the systems is based on the contractor's ability to demonstrate that the systems and their components function in accordance with the commissioning acceptance criteria.

1. Installation and static testing acceptance criteria: The acceptance criteria for installation and static testing are the materials and methods requirements specified in Divisions 22, 23 and 26.
2. Functional testing acceptance criteria: The acceptance criteria for functional performance tests are described within the procedures. The functional performance test procedures include descriptions of system's and component's responses that are to be verified; these are the functional testing acceptance criteria. The functional testing acceptance criteria are based on the Construction Documents and the Basis of Design.

B. Back-Checking: Back-Checking is the process of confirming that commissioning related issues have been resolved by the responsible party. The back-checking process takes place once the responsible party has provided written notification that issues in the Commissioning Issues & Resolutions Log have been resolved, at which time the CxP confirms the resolution of the issue(s).

C. Commissioning Coordinator (CxC): The GC shall provide a CxC. The CxP, the Owner's representative and the CxC will comprise a commissioning management team. While the

CxP leads the overall commissioning process, the CxC is responsible for managing contractors in their day to day performance of the specified commissioning work. The CxC is an employee of the GC who is regularly and frequently on site. Qualifications for the CxC include experience and excellent abilities to schedule, coordinate and manage subcontractors. The following tasks are some of the critical items included in the CxC's scope of work:

1. Integrating the specified commissioning activities into an overall construction schedule, updating the schedule and providing two-week look-ahead schedules showing the upcoming commissioning related activities.
2. Providing all commissioning submittals to the CxP.
3. Coordinating Owner training and ensuring that training is provided in accordance with the commissioning specifications.
4. Ensuring that subcontractor and supplier reviews of the CxP provided FPT procedures and forms are completed and submitted in accordance with the specifications. This includes providing written comments (even if no exception is taken) regarding issues pertaining to safety, equipment protection/warranty and appropriateness of the procedure for the systems as provided from all required FPT participants for each FPT.
5. Coordinating development and submittal of specified flushing, cleaning and start-up procedures and ensuring that these procedures are completed and documentation is submitted.
6. Providing test reports and progress reports in accordance with the commissioning specifications.
7. Managing the contractors' participation in the FPT process in accordance with the commissioning specifications.
8. Managing the contractors' participation in resolution of issues identified during commissioning.
9. Ensuring that subcontractors perform preliminary testing to verify readiness for final FPT demonstrations, submitting documented verification that systems will pass functional tests with acceptable results as documented in the FPTs and coordinating the demonstration of the FPTs to the Owner and the CxP.
10. Coordinating repeat FPTs that fail due to contract deficiencies until acceptable results are achieved and managing the reimbursement of the Owner's costs for repeated tests in accordance with the commissioning specifications.

D. Commissioning Issues & Resolutions Log: This document is maintained by the CxP and includes descriptions of all issues discovered through the commissioning process. The log tracks each issue's current status, assignment to the responsible party, and date of final resolution as confirmed by the CxP. Items listed may include issues where design, products, execution or performance does not appear to satisfy the Construction Documents and/or the design intent. The resolution of issues identified on this list may be the responsibility of the Contractor, the Design Team and/or the Owner.

E. Commissioning Plan: This is a detailed document prepared and maintained by the CxP that describes the entire commissioning process.

F. Commissioning Provider (CxP): The CxP is the Owner's commissioning consultant and the leader of the Commissioning Team. The CxP oversees the commissioning process and advises the Owner on commissioning issues, emphasizing the long-term performance and maintainability of the systems included in the commissioning scope of work. The CxP is required to advise the Owner of issues involving the design, construction, testing, adjusting and balancing, and/or other issues that would compromise the ability of the facility to meet the needs of the Owner. The CxP is authorized to recommend to the Owner the acceptance, modification or rejection of all materials, procedures, schedules, tests, reports or other required commissioning

submittals. The CxP is not authorized to change existing Construction Documents, schedules, costs or scope of work for any of the parties involved (Contractor or Design Team).

G. Commissioning Report: The Final Commissioning Report contains a summary description of the commissioning process as it occurred during the project as well as the final versions of all commissioning documentation. The Final Commissioning Report will be prepared by the CxP.

H. Commissioning Team: The commissioning process is performed by the Commissioning Team, which consists of the Owner/Primary Owner's Representative, the CxP, the GC, the CxC, the Design Team, all subcontractors performing work on the equipment and systems within the commissioning scope of work, and all material and equipment suppliers for equipment and systems within the commissioning scope of work. The Commissioning Team is led by the CxP. The CxC is the on-site manager of the commissioning process for the GC.

I. Construction Phase Commissioning Kickoff Meeting: This meeting is intended to present the Commissioning Plan to the commissioning team, which describes the commissioning process along with each party's role and responsibilities within the process. This meeting is typically scheduled to occur after bid award and prior to installation of commissioned systems.

J. Contract Documents: As defined elsewhere in Division 1 specifications.

K. Design Team: The team of architects and engineers that designs the project and produces the Construction Documents.

L. Functional Performance Testing: This process evaluates the function of the systems within the commissioning scope against the Construction Documents, the Owner's design intent and the Design Team's Basis of Design. The process includes the documented testing of the systems under actual and simulated operating conditions using detailed instructions that allow experienced system technicians to perform the FPTs with repeatable results. Functional performance testing of systems will begin only after the General Contractor certifies that such systems are completely installed and ready for functional testing and after the CxP has completed the subsequent system readiness review process for the systems to be tested.

M. General Contractor (GC): The contractor with overall responsibility for the project and all work within their contract scope, including that of the installation subcontractors.

N. Percent Sampling: Inspecting or testing only a fraction of the total number of identical or near-identical pieces of equipment, such as VAV boxes.

O. Primary Owner's Representative: This individual has contractual authority to make decisions and change orders on the project in an effort to protect the best interests of the Owner.

P. Seasonal (or Deferred) Testing: Testing completed during conditions that do not occur during the initial functional testing period (e.g. during design or seasonal transition temperatures). Seasonal or Deferred FPTs are a limited sub-set of the original tests and are designed to evaluate the capacity and interaction of systems.

Q. Start-up and Test Forms: Checklists and test forms completed for a piece of equipment or system in preparation for initial operation. Examples include electrical spot measurements on motors, spot flow measurements, pressure testing, pipe flush-out and cleaning, control point-to-point checks, sensor calibration, actuator testing, etc., as well

as Mechanical system Testing, Adjusting and Balancing (TAB). Contractor's Start-up and Test Forms are initially provided to the CxP for review and reference. Based on these forms, the CxP creates accompanying System Readiness Checklist (SRC) forms that are later completed and returned to the CxP as part of the System Readiness Manual.

R. System Readiness Checklists (SRCs): These checklists are provided by the CxP for each system within the commissioning scope of work. They are used to formally document that the equipment installation and start-up has been fully completed and that the systems are ready for functional testing. These checklists shall be compiled along with completed start-up forms by the General Contractor and returned to the CxP as the Contractor's System Readiness Manual.

S. System Readiness Manual (SRM): This document is separated by sections for each system within the commissioning scope of work, with each section including the System Readiness Checklist provided by the CxP followed by the associated completed contractor Start-up and Test Forms. This document shall be compiled and completed by the General Contractor and submitted to the CxP for the system readiness review prior to the functional performance testing process. By submitting these completed forms, the Contractor signals that the relevant systems are installed, operational and will meet functional testing acceptance criteria.

T. System Readiness Review: The process of reviewing system installation and documentation to confirm readiness for functional performance testing. Upon receipt of the System Readiness Manual, the CxP will review the manual in detail to identify any issues or missing information and assign to the appropriate party for resolution.

U. TAB: Testing, Adjusting and Balancing.

V. Trending: Using the Building Management System (BMS) to record data on the operation of systems as an extension of functional testing and a means to evaluate system operation and performance under actual operating conditions.

W. Warranty Issues: Operational and outstanding issues and deficiencies identified during the Warranty Period.

X. Warranty Period: Warranty Period for the entire project, including components. Refer to warranty information as specified elsewhere in the Construction Documents.

1.5 SUBMITTALS

A. Provide the following submittals in accordance with the general submittal requirements specified elsewhere in Division 1:

1. Contractor's Start-up and Test Forms as specified in this Section 019113.
2. Start-up and balancing procedures as required in the specifications for systems and equipment within the commissioning scope of work.
3. Contractors' review of initial, draft System Readiness Checklists (SRCs).
4. Contractors' review of initial, draft Functional Performance Tests (FPTs).
5. Completed System Readiness Manual as specified in this Section 019113.
6. Trend data exported from the BMS for CxP review, if applicable.

1.6 CONSTRUCTION AND ACCEPTANCE PHASE COMMISSIONING PROCESS OVERVIEW

A. The CxP will conduct a construction phase commissioning kick-off meeting with the Contractors, the Owner's Representative and the Design Team. The CxP will present the preliminary Commissioning Plan, discuss the commissioning process in detail and identify specific commissioning related responsibilities. Milestones will be discussed,

including submission of contractor start-up and testing forms, preliminary O&M manuals, training agendas and other approved submittals needed to complete the plan.

B. The CxP will review applicable submittals related to commissioned systems and provide comments to the commissioning team regarding compliance with the OPR/BOD, the design intent, O&M requirements, and functional performance testing.

C. The Contractor shall submit Start-up and Test Forms to the CxP for review for all systems within the commissioning scope of work. Based on these forms and the approved submittals, the CxP will develop the System Readiness Checklist (SRC) forms for each commissioned system. These forms summarize specific aspects of the installation of each system that the Contractor must verify prior to conducting functional performance testing. The SRC forms will be submitted to the GC and subcontractors for review and comments and subsequently compiled into the System Readiness Manual.

D. The Contractor shall submit a System Readiness Manual to the CxP. This document is organized into sections with one section per commissioned system, each of which includes the SRC for that system followed by Manufacturer- and/or installation subcontractor-provided installation checklists, detailed start-up procedures, TAB forms and other project specific test forms. The CxP will review the completed System Readiness Manual as a pre-requisite for proceeding to functional testing.

E. The CxP will develop final equipment and system Functional Performance Test (FPT) procedures and forms with input from the Contractor, the Owner and the Design Team as outlined in this Section 019113. These test procedures are submitted to the Contractor and installation subcontractors for review and comment.

F. The CxP will update the Commissioning Plan with information pertaining to equipment specific documentation and testing.

G. Commissioning status meetings will be scheduled to occur regularly during the construction and closeout phases to monitor progress and to help facilitate the commissioning process. Contractor representatives for commissioned systems shall be required to attend these meetings. Meetings will generally be scheduled to occur with scheduled construction or management meetings.

H. The CxP will perform periodic site visits during construction and, for each visit, identify potential issues in a Site Observation Report. The Contractor shall review these site reports and resolve the issues.

I. The contractors shall perform the required start-up and testing of equipment and systems in accordance with the Construction Documents, industry standard guidelines, and the guidelines of the equipment and systems manufacturers. The CxP may witness selected equipment start-up and testing activities and shall be notified in advance of all such activities.

J. The Contractor shall complete and compile all system readiness documentation (SRCs, start-up and testing forms, TAB report, etc) into the System Readiness Manual and submit it to the CxP for review and approval. The CxP will review the System Readiness Manual for completeness as well as content and identify any issues, including a review of all unresolved Commissioning Issues & Resolutions Log items that could impact Functional Performance Testing. The Contractor shall make any required corrections and resubmit the System Readiness Manual. Functional Performance Testing may only begin after acceptance of the System Readiness Manual by the CxP.

K. The FPTs are executed by the installation subcontractors under direction of the CxC and are witnessed by the CxP. The FPTs may be achieved by any combination of manual testing and analysis of performance trends monitored via the BMS trending capabilities.

L. Issues noted during the functional performance tests will be documented by the CxP. When easily corrected, issues will be resolved at the time of discovery. The appropriate contractor will resolve all other issues at a later time. Issues will be tracked by issue number, date identified, responsible party, resolution status and most recent activity date. The contractor shall be responsible for reporting, in writing, to the CxP when issues have been resolved so that the CxP can confirm the resolution.

M. The construction phase commissioning process will be complete when all noted issues have been corrected, proved to comply with the Construction Documents or otherwise resolved to the satisfaction of the Owner.

1.7 CLOSEOUT PHASE COMMISSIONING PROCESS OVERVIEW

A. Training on operation and maintenance of related systems and equipment shall be scheduled after commissioning is satisfactorily completed, O&M manuals have been accepted and delivered to the Owner and systems are verified to be complete and functional. Each Contractor is responsible for providing a topical outline of all subjects to be covered in the training session(s), the expected length of time for the training session(s) and a brief resume listing the qualifications of the proposed training presenters. Training will be coordinated with the Owner.

B. Upon request, the Contractor is responsible for providing the CxP with copies of all TAB reports, as-built drawings and O&M manuals relevant to the systems commissioned. The CxP will review this material for compliance with the Construction Documents and will note and report all issues for resolution by the responsible party.

C. Upon completion of all commissioning activities, the CxP will prepare and submit to the Owner the Final Commissioning Report which details the commissioning process and all commissioning activities that were conducted during the process. The Commissioning Report will contain final versions of all documents developed during the commissioning process, including the final Commissioning Plan, completed System Readiness Manual, Functional Performance Testing documentation and the final Commissioning Issues & Resolutions Log.

1.8 BACK-CHARGING

A. The Contractor is responsible for scheduling and coordinating commissioning activities. The Contractor shall reimburse the Owner for the cost of commissioning activities that must be repeated because of a lack of preparation or coordination by the Contractor. Reimbursable costs include CxP fees for services billed at the CxP's standard hourly rates, mileage billed at the current IRS rate, and the cost of any rented test equipment. Activities subject to back-charging include:

1. Repeated back-checking: Commissioning issues are documented in the Commissioning Issues & Resolutions Log. The Contractor shall submit a brief written statement describing when and how each issue has been resolved, which shall be added to the Commissioning Issues & Resolutions Log maintained by the CxP. The CxP will back-check these issues on a one-time-per-issue basis to confirm they have been resolved. If the back-checked issues that have not been resolved as reported, the associated cost of the unsuccessful back-check shall be subject to back-charging.
2. Repeated TAB Backcheck: As specified in this section, the Contractor demonstrates a sampling of measurements from the balanced systems. Where

discrepancies from the TAB report are found in excess of 20% of the sample, the CxP will recommend rejection of the TAB report and rebalancing of the system. The cost of repeated TAB backchecking shall be subject to back-charging.

3. Repeated witnessing of start-up demonstrations: As specified in this section, the CxC shall coordinate the scheduling of any start-up activities to be witnessed by the CxP. The cost of witnessing repeated start-up activities due to lack of preparation or coordination by the Contractor shall be subject to back-charging.
4. Repeated review of System Readiness Manual Documentation: Once the Contractor has submitted the completed System Readiness Manual forms, the CxP will review the manual for selected systems. Discrepancies discovered will be reported to the contractors for correction and resubmission. The cost of repeated System Readiness Manual reviews shall be subject to back-charging.
5. Repeated witnessing of FPT demonstrations and/or expanded demonstration sampling: As specified in this section, the Contractor demonstrates the functional performance tests after they have verified that performing the FPTs will yield the documented acceptable results. The cost of witnessing demonstrations that do not demonstrate specified acceptance criteria shall be subject to back-charging.

PART 2 - PRODUCTS

2.1 SYSTEM READINESS CHECKLISTS

A. The Contractor shall maintain and complete copies of the System Readiness Checklist forms which will be provided by the CxP. Checklist forms and supporting documents shall be signed by the Contractor and submitted to the CxP upon completion.

B. Completion of these items shall not release the Contractor from their responsibility to complete other specified requirements of the Construction Documents.

2.2 START-UP PROCEDURES AND FORMS

A. Contractor and/or Manufacturer start-up procedures and checklists for equipment within the commissioning scope of work shall be submitted for review. Minimum start-up procedures are specified in the specifications for systems and equipment within the commissioning scope of work. Procedures shall also include all installation and start-up procedures and checklists that are provided by the equipment or system manufacturer. The accepted start-up documentation shall be completed by the Contractor and submitted to the CxP for review and inclusion within the Final Commissioning Report.

2.3 TEST INSTRUMENTATION

A. The contractor shall provide the commissioning test equipment.

B. The test equipment shall be provided in sufficient quantities to execute functional testing in an expedient fashion.

C. The test equipment shall be suitable for testing and calibration with accuracy and tolerances necessary to demonstrate that system performance is in accordance with the Basis of Design.

D. Equipment used for functional testing of sensors and gauges shall be certified to an accuracy of 10% of the smallest tolerance to be measured. For example, if a temperature gauge is required to be ± 2 degrees F, the calibration device must have a minimum accuracy of ± 0.2 degrees F.

E. Instrumentation used for functional testing of system performance must have a minimum repeatability and accuracy of ± 1.0% of the acceptance criteria being measured. For

example, if a supply temperature of 50 degrees F is being verified, the repeatability and accuracy of the test instrument must be at least ± 0.5 degrees F.

F. The test equipment shall have a calibration certification per the equipment manufacturer's interval level or within one year if not specified.

PART 3 - EXECUTION

3.1 DOCUMENTATION

A. All checklists, start-up documentation, test forms and other commissioning related documentation required by contract shall be completed and submitted to the CxP.

B. When the Contractor is unable to comply with an item as listed on the checklist or form, the Contractor shall immediately notify the CxP in writing as to the reason(s) for non-compliance.

3.2 COMMISSIONING MEETINGS

A. The CxP will conduct a commissioning kick-off meeting, usually within 60 days of the commencement of construction. All team members involved in the commissioning process shall attend the kick-off meeting.

B. Other meetings may be required for direct coordination and prompt resolution of commissioning issues. The CxC coordinates these meetings and the CxP chairs and provides notes. Commissioning coordination meetings with the CxP will be held on an as needed basis. The CxC, the Owner/Owner's Representative, the CxP and all subcontractors listed as members of the Commissioning Team shall attend these meetings. The attendance of other commissioning team members, such as Design Team and key equipment suppliers, may be required if necessary to efficiently address the meeting's agenda.

3.3 COMMISSIONING ISSUES & RESOLUTIONS LOG

A. Issues identified during the commissioning process, including during site observations, system readiness review, and functional testing, will be logged in the Commissioning Issues & Resolutions Log. The CxP will maintain the master log. For each issue, the CxP will make a recommendation regarding who they believe is in the best position to provide the resolution. However, it is the GC's responsibility to manage issue resolution, including the determination of how the issue will be resolved and who will do the work.

B. Each issue in the list will be classified with a "status" of either "*resolved*", "*unresolved*", "*resolved-unverified*" or *"noted"*. "*Resolved*" issues are closed, having been addressed by the team and verified as corrected by the CxP or having been accepted by the Owner. "*Resolved-unverified*" issues have been reported as resolved by the applicable party but are not yet verified by the CxP as resolved. "*Unresolved*" issues have not been reported as addressed by the applicable party. "*Noted*" issues are those identified for record only for owner and/or project team reference, and will not be tracked for resolution or closure by the CxP.

C. When a commissioning issue is resolved, the Contractor shall submit an updated list with a written response describing when and how the issue is resolved. The CxP or an applicable member of the Design Team shall then back-check the resolution of said issue. The CxP scope of work includes one back-check of issues that the Contractor reports as resolved. Back-charging applies to additional back-checking required due to lack of preparation by contractor.

3.4 SYSTEM READINESS PROCESS

A. Contractor's Start-Up & Testing Activities:

1. In preparation for system readiness, the contractor performs work in accordance with the construction documents for the pre-functional start-up and testing of equipment and systems.
2. The CxC coordinates the installation subcontractors to verify and document that:
   a. Equipment is installed and placed into operation in accordance with the manufacturers' requirements and Construction Documents.
   b. Equipment is accessible for maintenance, operation and testing.
   c. Piping and duct systems have been cleaned, flushed, and tested in accordance with the Construction Documents.
   d. Instrumentation and flow control devices are provided with sensors properly located/calibrated.
   e. Equipment start-up is performed in accordance with the Construction Documents, the equipment manufacturer's recommendations, and good industry practices
   f. TAB is performed in accordance with the Construction Documents.
   g. Controls system, including graphics and trends, is set up in accordance with the Construction Documents and commissioning process.

B. CxP Scope of Work

1. The CxP shall receive a minimum of 10 working days advanced notice for any activity to be witnessed and the CxC shall coordinate with the contractors and suppliers accordingly. If the CxP is not notified in advance of a scheduled start-up or testing activity, the start-up or testing shall be rescheduled and repeated to the satisfaction of the CxP. When scheduled start-up activities are not executed because of lack of preparation or coordination by the Contractor, the Contractor will be subject to back-charges in accordance with the Construction Documents
2. The CxP's scope of work pertaining to these activities will consist of the following:
   a. Review the contractor's start-up, testing and TAB plans. Review completed documentation and include in the final commissioning report.
   b. For piping systems, review the contractor's pressure testing and flushing plans for compliance with the specifications. Review completed documentation and include in the final commissioning report.
   c. Witness the TAB contractor's demonstration of 20% of TAB measurements and settings.
   d. For start-up of major equipment:
      i. The CxP will meet with the start-up tech to discuss the start-up plan, and obtain a clearer understanding of the equipment functionality and sequences of operation.
      ii. During start-up activities, noted issues, observations or questions by the CxP will be reviewed with the start-up technician.
      iii. The start-up tech shall demonstrate to the CxP any acceptance criteria included in the pre-functional tests.
      iv. At the conclusion of the start-up activities, a report will be generated by the CxP identifying any observations or identified issues.
      v. Start-up reports will be included in the final commissioning report.

3.5 SYSTEM READINESS DOCUMENTATION

A. For each system within the commissioning scope of work, the CxP will create System Readiness Checklists for the Contractor which are used to document that the equipment has been installed and placed into operation in accordance with the project requirements and is ready for functional testing.

B. The Contractor shall compile a System Readiness Manual, which shall include the following for each system within the commissioning scope of work:

1. System Readiness Checklists, provided by CxP and to be completed by the Contractor.
2. Start-up and testing procedures and data forms for all equipment and systems within the commissioning scope of work, in accordance with the project specifications.
3. TAB forms and reports, where applicable.
4. Piping and duct testing reports, where applicable.
5. Water treatment reports, where applicable.
6. See specifications Sections 220800, 230800 and 260800 for any further requirements for specific systems.

C. As the systems are installed and equipment is started up, the Contractor shall complete the forms provided in the System Readiness Manual.

D. The Contractor shall submit the completed System Readiness Manual prior to Functional Performance Testing. When it is necessary to begin functional testing on a system (or systems) before the readiness of other systems can be documented, it may be acceptable to provide preliminary submittals of the System Readiness Manual for which checklists and forms have been completed only for the system(s) that are ready for testing.

E. The CxP will review all completed System Readiness Checklists, start-up forms and supporting documentation from installation and start-up activities provided in the System Readiness Manual to confirm all required documents are present and complete. The CxP will review the System Readiness Manual content in detail to identify any potential issues or discrepancies with system requirements, including a review of all unresolved Cx Issues & Resolutions Log items that could impact functional testing.

F. Approval of completed System Readiness Manual by the CxP is required prior to Functional Performance Testing of equipment and system. Whenever the results of the CxP's review are not acceptable, the contractors shall make corrections and resubmit the System Readiness Manual in accordance with the commissioning specifications. The cost of repeated System Readiness Manual reviews is not in the CxP's scope of work and is subject to Back-charging.

3.6 FUNCTIONAL PERFORMANCE TESTING

A. Functional Performance Testing of commissioned systems shall begin after all critical issues discovered during the system readiness review process have been corrected.

B. The procedure for developing and performing the FPTs shall be as follows:

1. The Contractor shall provide the equipment and commissioning submittals as specified in the Construction Documents.
2. The CxP will draft the FPT procedures based on the contractor's submittals as approved by the Design Team. The draft procedures will be submitted to the Commissioning Team for review.
3. Each contractor and equipment supplier that is specified as an FPT participant in the FPT Summary Tables in Sections 220800, 230800 and 260800 shall participate in the development and performance of the associated FPTs. Each FPT participant shall provide written comments on the associated FPT procedures regarding each of the following issues:
   a. Verify that the procedures can be performed without compromising the safety of the participants.

b. Verify that the procedures can be performed without compromising the warranties of equipment, components and systems.
c. Verify that the procedures are appropriate for the equipment, components and systems as provided.
d. At the contractor's option, make recommendations to incorporate the FPTs into the contractor's in-house start-up and QC testing process.

4. The CxP will complete the working drafts of the FPT procedures.
5. Subcontractors and suppliers shall provide the personnel, expertise and test equipment to operate and maintain the systems during testing.
6. The Contractor shall test all systems within the commissioning scope of work, using the FPT procedures until the acceptable results specified in the FPT procedure are verified and documented. If necessary to obtain acceptable results, the Contractor may consult with the CxP to acquire clarification and resolve issues. The CxP will be available for on-site assistance of this nature.
7. The Contractor shall submit documentation that verifies that the acceptable results specified in the FPT procedures have been verified and that they are ready to demonstrate the FPTs with acceptable results. Acceptable documentation consists of completed FPT record forms which document acceptable FPT results or indication on the Systems Readiness Checklists that the Contractor's pre-functional testing has verified that functional performance testing of the equipment and associated system demonstrates the acceptable results specified in Sections 220800, 230800 and 260800.
8. After the CxP has accepted the Contractor's documentation of acceptable results, the FPT shall be conducted and demonstrated to the CxP. If acceptable results are not demonstrated for a FPT, the Contractor shall resolve the issue(s) and the demonstration shall be repeated.
9. The Contractor shall verify and document acceptable FPT results for all equipment components and systems. The FPTs may be demonstrated for a sample of the systems (known as "demonstration sampling"), provided that they comply with all of the following criteria.
    a. There are many of the systems with similar components that have identical sequences of operation which are implemented using identical control software programming.
    b. The components and systems to be included in the Demonstration Samples will be chosen by the CxP at the time of demonstration.
    c. The sample size will be in accordance with the Functional Performance Test (FPT) Demonstration Sampling Tables in Sections 220800, 230800 and 260800.
    d. Acceptable results must be demonstrated for the entire sample. If the FPT results are not acceptable due to a lack of preparation or coordination by the Contractor for any system or component sampled, the FPT shall be demonstrated for all of the systems and components for which it was written. Whenever the demonstrated results are not acceptable, the contractors shall make corrections and the FPT shall be demonstrated again. The cost of back-checking FPTs with unacceptable results is not included in the CxP's scope of work. Back-charging applies to additional back-checking required due to lack of preparation by contractor.
10. The CxC is responsible for scheduling and coordinating functional testing activities. The Contractor shall demonstrate the FPTs after they have verified that performing the FPTs will yield the documented acceptable results. The contractor is subject to back-charging, as specified herein, if acceptable results are not demonstrated because of work that should have been verified during pre-demonstration testing prior to the submittal of the System Readiness Manual. Acceptable results must be obtained during a single demonstration. No more than two delays of less than 15 minutes each are acceptable for each test.

C. In addition to conducting the functional tests developed by the CxP, the Contractor shall be required to complete all start-up and testing procedures as specified elsewhere in the Construction Documents. Despite any overlap or similarities between the commissioning FPTs and California required Title 24 Acceptance Test forms, it is the responsibility of the Contractor's certified Acceptance Test Technicians (ATTs) to complete all Title 24 Acceptance Testing (i.e. all applicable NRCA forms). Completion of California Title 24 Acceptance Tests is not within the CxP's scope.

D. Where the CxP requires BMS trending, the CxP will provide a points list within the FPT form that may include both hardware (input/output) and software (virtual) points and appropriate trending intervals.

1. The Contractor and installation subcontractors shall provide trend data to the CxP in electronic format.
2. The CxP will analyze and review the trend data and associated system performance.
3. The Commissioning Issues & Resolutions Log will be updated with all issues uncovered through analysis of the trend data.
4. The contractors shall address and resolve all issues identified. Confirmation of issue resolution may require the gathering of additional trend data to be provided to the CxP.

3.7 DEFICIENCIES AND COMMISSIONING ISSUES CORRECTION

A. During the Pre-functional Test Phase, all deficiencies and commissioning issues will be documented on the inspection and test forms in use and will additionally be documented by the CxP on the Commissioning Issues & Resolutions Log.

B. Issues entered into the Commissioning Issues & Resolutions Log shall be resolved by the contractor in a timely manner. The Contractor shall submit a brief written statement of when and how each issue has been resolved.

C. The CxP will record completion on the Commissioning Issues & Resolutions Log and the CxC shall reschedule testing with the CxP and installation subcontractor. Testing shall be repeated until passing performance is achieved or the Owner accepts the noted issue.

D. When there is a dispute regarding a Commissioning Issue, whether it is a question of validity or responsibility, additional parties may be brought into the discussion as appropriate. The CxP will have the final interpretive authority and the Owner will have the final approval authority.

E. The CxP may recommend solutions to deficiencies and commissioning issues. However, the burden of responsibility to solve, correct and perform required re-tests is with the Contractor, installation subcontractors and the Design Professional(s).

F. Re-testing:

1. For all Commissioning Issues identified during Functional Performance Testing, re-testing is required to confirm the resolution of the issue and to complete the FPT.
2. The CxP will witness one re-test for each equipment or system. A minimum notice of 48 hours is requested for scheduling any re-testing, though the CxP will work to accommodate a shorter timeframe if feasible.
3. Any required re-testing shall not be considered a justified reason for a claim of delay or for a time extension.

3.8 SCHEDULING OF FUNCTIONAL PERFORMANCE TEST (FPT) DEMONSTRATIONS

A. The procedures for developing, performing and demonstrating the FPTs are specified in Sections 220800, 230800 and 260800.

B. The following durations for FPT demonstration periods are preliminary estimates based on typical systems and sequences of operation, and a single successful demonstration for each FPT procedure with no delays. These estimates do not include the contractors pre-demonstration testing to verify that the systems will perform in accordance with the acceptance criteria. Revised estimates will be provided after project specific FPTs are drafted following the approval of all pertinent submittals, including the BMS controls submittal.

1. DHW Plumbing Systems: 3 working days
2. HVAC Systems: 8 hours for each hydronic system (CHW, HHW), 6 hours for each large air handler system, 8 hours for VAV systems, and 3 hours for each smaller unitary system
3. Lighting Controls Systems: 5 working days
4. Renewable Energy Systems: 5 working days

3.9 SYSTEMS ACCEPTANCE

A. Equipment and systems shall not be accepted by the Owner until all commissioning activities are complete, the performance period standards have been met and the project closeout requirements have been satisfied as listed in the next section.

3.10 PROJECT CLOSEOUT

A. Training on operation and maintenance of related systems and equipment shall only be scheduled to commence after functional testing is satisfactorily completed, O&M manuals have been delivered and approved and systems are verified to be complete and functional. Each Contractor is responsible for providing a topical outline of all subjects to be covered in the training session(s), the expected length of time for the training session(s) and a brief resume listing the qualifications of the proposed training presenters. The CxC is responsible for developing the training plan with input from the contractor and directing any efforts to record the training sessions by video or other means. The CxC is responsible for coordinating training with the Owner and CxP and for verifying execution of the training plan.

B. Upon request, the Contractor is responsible for providing the CxP with copies of all balancing reports, as-built drawings and O&M manuals relevant to the systems commissioned. The CxP will review this material for compliance with the Construction Documents and will note and report all issues for resolution by the responsible party.

C. Upon completion of all commissioning activities, the CxP will prepare and submit to the Owner the Final Commissioning Report which details the commissioning process and all completed commissioning activities and recommends acceptance to the Owner. The CxC will support this effort by coordinating the contractor provided documentation.

D. The CxP will prepare and submit to the Owner a Monitoring-Based Commissioning Plan which details a process for tracking facility operation and correcting issues that arise post-turnover. The CxC will support the creation of this plan by coordinating the contractor provided documentation and information.

E. The CxP will also prepare and submit to the Owner a Systems Manual which contains and/or summarizes the design, construction, commissioning, and operational

requirements of the facility. The CxC will support this effort by coordinating the contractor provided documentation and information.

3.11 DEFERRED AND SEASONAL TESTING

A. Deferred or Seasonal testing requirements are specified in Sections 220800, 230800 and 260800.

B. The Contractor shall provide labor and material for seasonal testing and make corrections to any Contractor related issues discovered.

END OF SECTION

SECTION 02 41 00

DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Selective demolition, dismantling, cutting and alterations as indicated, specified, and necessary for the completion of Work.

B. Removing demolished materials from site and protection of work to remain.

C. “This project is required to achieve LEED certification. The green building parameters required for this affect all aspects of construction”.

PART 2 - PRODUCTS

Not used

PART 3 - EXECUTION

3.1 GENERAL

A. Protection:

1. Do not begin demolition until temporary partitions, barricades, warning signs and other forms of protection are installed.
2. Protect existing improvements that are not to be removed from injury or damage resulting from the Contractor's operation. Replace damaged improvements in kind.
3. During demolition provide safeguards, including warning signs and lights, barricades, and the like, for protection of the public, Contractor's employees and existing improvements to remain.

B. Noise control:

1. Exercise caution and care to prevent generation of unnecessary noise.
2. Keep noise levels to the minimum possible.
3. Discontinue noise producing operations, when requested by the State Representative and reschedule at a mutually acceptable time.

C. Dust control: Control dust at all times.

1. Provide dust-tight partitions to prevent dust escaping into other parts of the building where demolition is not in progress.
2. Assume liability for claims related to flying dust caused by this work.

D. Water control:

1. Control the use of water to prevent damage to the existing facility and improvements to remain.
2. Assume liability for claims related to water seepage and leakage caused by this work.

E. Security: Coordinate security with State Representative.

1. Take necessary precautions to keep trespassers out of demolition areas.
2. Properly secure demolition areas from entry when demolition is not in progress but do not block required exit ways.

F. Safety: If at any time the safety of existing construction appears to be endangered, take immediate measures to support such endangered construction; cease operations and immediately notify the State Representative.

3.2 DEMOLITION

A. Existing conditions: Intent of Drawings is to show existing conditions with information developed from field surveys and to generally show the extent and type of demolition required.

1. Make a detailed survey of existing conditions prior to commencing demolition, and report discrepancies or conflicts between Drawings and actual conditions in writing to the State for clarifications and instructions.
2. Do not proceed where such conflicts or discrepancies occur prior to receipt of the instructions from the State.

B. Contractor shall be fully responsible for the adequacy and installation of temporary shoring and bracing systems used during demolition.

C. Demolition shall be performed by skilled and properly equipped personnel.

D. Remove existing construction only to the extent necessary for the proper installation of new construction and junction with existing materials. Cut back finished surfaces to straight, plumb or level lines as required.

E. If unanticipated conditions which conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict.

1. Submit report to the State in written, accurate detail.
2. Pending receipt of directive from the State, rearrange demolition-schedule as necessary to continue overall job progress without delay.

F. Where openings are cut oversize or in improper location, replace to excess removed material, to the State's satisfaction, at no additional cost.

G. Coordinate demolition to assure the proper sequence, limits, methods and time of performance. Schedule demolition so as to impose a minimum of hardship on the present operation of the facilities and the performance of the work.

H. Whenever possible use small hand or small power tools designed for sawing or grinding; whenever possible avoid the use of tools with a hammering and chopping motion. Cut through finished surfaces from the exposed or finished side into concealed surfaces.

I. In general remove materials as follows:

1. Modular materials: Remove to a natural breaking point in whole units to a joint line with no damaged or defective unit remaining where joining new construction. After removing flooring materials, clean substrates of old cement and adhesive.

2. Gypsum board: Remove to a joint line on a support.

J. Materials not mentioned to be removed that interfere with new construction, except where structural integrity of the assembly is at risk, shall be cut to clean cut lines to provide for proper interface with new construction, or patching and repair, as required.

3.3 SALVAGE

A. Title to materials:

1. Except where indicated or specified otherwise, materials and equipment removed shall become the property of the Contractor and shall be removed from the site.

2. The State will not be responsible for the condition or loss of, or damage to, such property after notice to proceed.

3. Material and equipment shall not be viewed or sold on the site.

3.4 PATCHING

A. Patch materials to remain when damaged by demolition. Finish material and appearance of the patch or repair shall match the existing contiguous materials and finishes in all respects, as approved by the State.

3.5 CLEAN-UP/DISPOSAL

A. Debris, waste, and removed materials, other than items to be salvaged, are Contractor's property for legal disposal off the site.

B. Continuously clean-up and remove these items and do not allow to accumulate in the building and on the site.

END OF SECTION 02 41 00

SECTION 02 41 19

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

1.2 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.3 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at project site.

1.4 INFORMATIONAL SUBMITTALS

A. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.

B. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.

C. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations.

1.5 CLOSEOUT SUBMITTALS

A. Inventory of items that have been removed and salvaged.

1.6 FIELD CONDITIONS

A. Conditions existing at time of inspection for bidding purpose will be maintained by the State as far as practical.

1. Before selective demolition, the State will remove the following items:

a. Existing modular furniture.

B. Notify the State of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

C. Storage or sale of removed items or materials on-site is not permitted.

D. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

E. Arrange selective demolition schedule so as not to interfere with the State's operations.

F. Hazardous Materials: Present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.
2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
3. The State will provide material safety data sheets for suspected hazardous materials that are known to be present in buildings and structures to be selectively demolished because of building operations or processes performed there.

1.7 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSP A10.6 and NFPA 241.

C. Sustainable Design Requirements for Building Reuse:

1. Do not demolish existing construction beyond indicated limits.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Inventory and record the condition of items to be removed and salvaged.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
1. Arrange to shut off utilities with utility companies.
2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.

a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
c. Equipment to Be Removed: Disconnect and cap services and remove equipment.

d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to the State.
f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.3 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

C. Remove temporary barricades and protections where hazards no longer exist.

3.4 SELECTIVE DEMOLITION

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
4. Maintain fire watch during and for at least 3 hours after flame-cutting operations.
5. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
6. Dispose of demolished items and materials promptly.

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

C. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to the State.
4. Transport items to the State's storage area as designated by the State.
5. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the State, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

E. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings. Do not use methods requiring solvent-based adhesive strippers.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

3.7 CLEANING

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction and recycle or dispose of them.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn demolished materials.

C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 02 41 19

SECTION 02 05 00

SITE REMEDIATION

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 WORK INCLUDED

A. The Work of this Section includes all labor, materials, equipment and services necessary to complete all clearing and grubbing together with the removal and disposal of items, as shown on the drawings and as specified herein, complete.

1. Remove all trees, plants and site materials that have been designated for demolition, after receiving approval from the State's Representative.

1.3 RELATED WORK

A. Tree Protection and Pruning. Section 32 01 90

B. Landscape Irrigation. Section 32 84 00

C. Landscape Planting. Section 32 93 00

D. Operation and Maintenance. Section 32 01 00

1.4 JOB CONDITIONS

A. Condition of Premises: Accept the premises as found and clear the Project site as specified.

B. Protection:

1. Existing Vegetation: Protect from damage individual trees, groups of trees, shrubbery, lawns and other vegetation designated to remain. Replace at Contractor's expense items damaged or destroyed with like items in sizes and quantity of the damaged or destroyed material. Assessment of material value shall be established by a Certified Arborist.

2. Protect existing utilities shown to remain.

3. Provide barricades and guards as required to protect trees or existing improvements.

4. Existing irrigation lines watering areas outside the limit of work line.

PART 2 - PRODUCTS

Not used

PART 3 - PRODUCTS

3.1 CLEARING AND GRUBBING

A. Verify all trees and shrubs to be removed with the State's Representative prior to starting any demolition work.

B. Clearing: Fell trees, dispose of the trees and other vegetation designated for remove together with the downed timber, snags, brush and rubbish, occurring within the construction limits. All limbs, branches, and roots damaged during construction, together with those required to be trimmed, shall be neatly cut next to the bole of the tree or main branch or root under the direction of a certified Arborist.

C. Grubbing: Remove and dispose of all stumps above grade, all matted roots and all roots larger than 3 inches in diameter to a depth of 12".

D. Removal: All cleared and grubbed plants and construction debris shall be promptly removed completely away from the Project site. Do not store or permit materials to accumulate on the Project site.

1. Do not burn materials or debris on the premises.

2. Remove all debris from the Project site to a legal dumping area.

3.2 TREE AND TREE STUMP REMOVAL

A. Trees and tree stumps designated for removal shall be removed to 2 feet below finish grade minimum.

END OF SECTION

HAZARDOUS MATERIAL ABATEMENT

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

This section covers the furnishing of all labor, materials, facilities, equipment, services, employee training, permits, agreements, waste transport and disposal necessary to perform the work required for hazardous material removal in accordance with these specifications, EPA, SDAPCD, OSHA, NIOSH, state of California regulations, and any other applicable federal, state and local government regulations. Whenever there is a conflict or overlap of the above references, the most stringent provisions are applicable.

1.2 AUTHORITY TO STOP WORK:

The consultant, acting as an agent for the owner, has the authority to stop the abatement work any time he determines that conditions are not within the specifications and applicable regulations. The stoppage of work shall continue until conditions have been corrected to the satisfaction of the consultant. Standby time required to resolve violations shall be at the hazardous material abatement contractor's expense. Stop work orders may be issued for, but shall not be limited to the following:

- Excessive airborne fibers inside and outside work area.
- Breaks in barriers.
- Loss of negative air where applicable (0.02 inches of water-minimum negative pressure to be maintained).
- Any other situation (outside the work area) where the consultant establishes that the following limits have been exceeded:

Non-Work Area Limits: 0.1 f/cc Personal Exposure Limit,
8-hour TWA PEL - 0.1 f/cc,

(When the PEL is reached, stop work and cleanup procedures shall be initiated to reduce asbestos levels to below 0.1 f/cc in non-work areas. This PEL would happen in the event of contamination from the work area.)

1.4 JOB SUPERVISION:

A. The hazardous material removal contractor shall provide an on-site supervisor and at least one foreman for each work area while hazardous material removal work is in progress. The supervisor and foreman should be competent persons as defined by 29 CFR 1926.58 and must be experienced in hazardous material removal work, knowledgeable of all EPA, OSHA and local regulations. He shall be capable of skillfully executing all work promptly, efficiently and in compliance with all of the requirements within this specification.

B. Proof of qualifications and hazardous material removal job references will be required for both the supervisor and foreman.

C. The owner, owner's representatives, or consultant reserves the right to have any supervisory personnel removed if they do not demonstrate the requisite experience and/or skills to safely direct the work, and adequately protect their employees, and the owner.

D. The hazardous material removal contractor shall instruct, train, and provide required protective devices, to all workers of other trades who must enter any work area before it is certified clean. The instruction shall include: proper use and fitting of respiratory protective devices and protective clothing; entry and exit procedures for all work areas; hazards and asbestos exposure; work procedures; and other safety requirements contained in the specification. Proof of such instructions for all subcontractor workers, and workers of other trades employed by the hazardous material removal contractor, shall be supplied prior to being allowed into the work area.

1.5 PRE-CONSTRUCTION MEETING:

After the contract has been executed and submission of the submittal required in Section 1.2, the consultant shall arrange for a pre-construction meeting to be attended by a representative of the owner, the consultant, and the hazardous material abatement contractor. At this conference, the hazardous material abatement contractor shall identify his supervisor(s), foreman(s), and present three (3) bound copies in detail of the submittal items described in Section 1.2 clearly labeled as identified in that section.

A. The parties shall also discuss and reach agreement on the following items:

- Contractor listing of existing site conditions (i.e., damage).
- Contractor and supporting vendor access and parking.
- Coordinate contractor access routes to the work area, including approved doors, stairways, corridors, and elevators.
- Availability of building utility services such as power, water supplies, and drains.
- Determination of equipment and other movable items to be removed from the work areas by the contractor, and the location of temporary storage space.
- Location, coverage, and use of isolation barriers and decontamination facilities.
- Emergency response procedures.

1.6 AVAILABILITY OF TRAINED PERSONNEL:

There shall be a sufficient number of trained and qualified workers, foremen and superintendents to accomplish the work within the required schedule. Since the owner's work activities cannot start prior to the successful decontamination of the work area, it is imperative that a sufficient number of trained personnel be engaged throughout the abatement process. No untrained or unqualified person shall be employed to speed up completion of the abatement work.

1.7 NOTIFICATIONS, PERMITS, WARNING SIGNS, LABELS, AND POSTERS:

A. The contractor shall provide the required written pre-notification to EPA, APCD, CAL/OSHA, and any other regional, state or local authority having jurisdiction over the project. Copies of the pre-notifications shall be delivered to the consultant before any removal work begins. The hazardous material removal contractor must secure all other permits required for the work; including disposal of all hazardous material containing waste in an EPA approved landfill.

B. The hazardous material removal contractor shall provide the necessary follow-up notices that may be required, obtain all permits and pay all governmental taxes, fees and all other costs in connection with his work. He shall file all necessary plans, prepare all documents and obtain all necessary approvals of any governmental departments having jurisdiction.

C. The hazardous material removal contractor shall include in the work, without extra compensation, all labor, materials, and service apparatus, to comply with all applicable laws, ordinances, rules and regulations.

D. All materials and work shall comply with all applicable specifications of the NBFU, FM, NEC, UL, local utility companies and the Board of Health, with recommendation of the fire insurance rating organization having over riding jurisdiction, with state and national building codes, and contract requirement in excess of the applicable codes, rules, or regulations, the contract provisions shall be given precedence, unless special permission is granted by the consultant.

E. The hazardous material removal contractor shall comply with the requirement of the following regulations, and maintain a copy of each of these at the work site:

1. U.S. Department of Labor, OSHA Asbestos Regulations (29 CFR 1926.58) 28 CFR 1910.134(b).

2. U.S. EPA National Emission Standard for Asbestos (40 CFR 61, Subpart M)

3. APCD Rule 1206

4. NESHAPS Labeling Requirements

5. Title17, California Code of Regulations, Division 1, Chapter 8

F. The hazardous material removal contractor shall erect OSHA-specified warning signs around the workspace and at every point of potential entry from the outside including the entrance to the decontamination facility's clean room. The signs shall conform to OSHA requirements with the words "Danger, hazardous material Hazard, Do Not Enter" as applicable. The warnings signs shall be a bright color so that they can be easily noticed. The size of the sign and its lettering shall be no less than OSHA requirements.

G. The hazardous material removal contractor shall also provide EPA and DOT-required labels as well as NESHAPS labeling requirements for all plastic bags and drums utilized to transport hazardous material contaminated material from the work areas to the EPA approved disposal landfill.

H. The hazardous material abatement contractor shall provide any other signage, labels, warnings and posted instructions that are necessary to protect, inform and warn workers and visitors of the hazard from hazardous material exposure. The hazardous material removal contractor shall post in a prominent and convenient place (i.e. the clean room of the decontamination facility) for worker's use a copy of the latest applicable regulations of OSHA, EPA, and NIOSH; and a copy of these specifications.

1.8 PROTECTION OF PERSON AND PROPERTY:

A. General Safety Requirements

1. The hazardous material removal contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with his work. The hazardous material removal contractor shall take all reasonable precautions for the safety of and shall provide all reasonable protection to prevent damage, injury or loss to all his employees and other persons who may be affected thereby. He shall also be responsible to protect all work, materials and equipment to be incorporated therein, and other property at the project site and adjacent thereto. The hazardous material removal contractor shall give all notices and comply with all applicable laws, ordinances, rules, regulations and orders of any public authority bearing on the safety of persons and property and there protection from damage, injury or loss. The hazardous material removal contractor shall promptly remedy all damage or loss to any property caused in whole or in part by the hazardous material removal contractor, sub-contractor, sub-subcontractor, or anyone directly or indirectly employed by them, or by anyone for whose acts they may be liable, and not attributable to the fault or negligence of the hazardous material removal contractor. The hazardous material removal contractor shall be responsible for the protection of any finished work from damage or defacement by his operation.

2. Life Safety Systems: The hazardous material removal contractor shall assess and control the real or potential impact of his actions upon the owner's life safety systems (e.g., smoke detectors, sprinkler systems, etc.). Coordination between the owner and the owner's representatives must be established prior to any actions on the part of the hazardous material removal contractor. Any work plan is subject to modification by the owner or owner's representatives at anytime based on the owner's assessment of risks to the function of the life safety systems associated with the hazardous material removal contractor's actions.

B. The hazardous material removal contractor shall establish an effective safety program in accordance with the requirements set forth in **OSHA Part 1926- Safety and Health Regulations for Construction; Subparts A through Z.**

C. A "pre-construction safety conference" shall be held prior to any work at the convenience of the Owner. The purpose of this meeting will be to discuss and evaluate the hazardous material removal contractor's proposed safety program.

1.9 ELECTRICAL:

A. Safety Requirements:

1. Any electrical work shall be performed by a licensed electrician in compliance with the most recent edition of the National Electric Code, unless otherwise provided by applicable OSHA regulations.

2. The non-current carrying-metal parts of fixed, portable and plug-connected equipment shall be grounded. Portable tools and appliances are to be protected by an approved system of double insulation need not be grounded. All light and power circuits in hazardous material removal areas shall be ground fault protected.

3. Extension cords shall be the 3-wire type, shall be protected from damage, and shall not be fastened with staples, hung from nails, or suspended from wire; splices shall have soldered wire connections with insulation equal to the cable. Worn or frayed cords shall not be used.

4. Safe lighting equipment shall be provided with a preference for floodlights rather than the indiscriminate use of unprotected lamps strung on temporary wiring. Exposed bulbs shall be guarded to prevent accidental contact. Temporary wiring shall be properly insulated and substantially supported. Circuits shall be properly designed and fused. All temporary lighting inside of the hazardous material removal areas shall be waterproofed.

5. Receptacles for attachment plugs shall be approved, concealed contact type. Where different voltages, frequencies, or types of current are supplied, receptacles shall be of such design that attachment plugs are not interchangeable.

6. Each disconnecting means for motors and appliances and each service feeder or branch circuit at the point where it originates shall be legibly marked to indicate its purpose.

7. The removal contractor shall coordinator all power requirements including Ground Fault Interrupted (GFI) panel design and extension cord requirements, with the owner or owner's representative.

1.10 SITE SECURITY:

A. Requirements: All hazardous material abatement personnel will be required to have a government issued ID card and an original or facsimile of a social security card to gain entrance to the facility.

1.11 SCAFFOLDING, RIGGING AND HOISTING:

A. Unless otherwise specified, the hazardous material removal contractor shall provide all scaffolding, rigging, hoisting, and services necessary for accomplishing the removal. The hazardous material removal contractor shall remove all equipment from the premises when the equipment is no longer required.

1.12 EMERGENCY PRECAUTIONS:

A. Emergency planning and procedures documents (three (3) copies) shall be provided by the owner or owner's representative prior to any abatement initiation.

B. Emergency procedures shall be in written form and prominently posted. The hazardous material removal contractor shall ensure that all persons entering the work area read these procedures and understand the project site layout, location of emergency exits and emergency procedures.

C. Emergency planning shall include consideration of fire, explosion, electrical hazards, slips, trips and falls, confined spaces, and heat related injury. Written procedures shall be developed and the hazardous material removal contractor shall provide employee training in all related procedures.

D. Employees shall be trained in evacuation procedures in the event of work place emergencies.

1. For non-life-threatening situations, employees who are injured or otherwise incapacitated shall decontaminate following normal procedures with assistance from a fellow worker (if necessary) before exiting the work place to obtain proper medical treatment.
2. For life-threatening injury or illness, worker decontamination shall take least priority. After measures to stabilize the injured worker are completed remove him from the work area and secure proper medical treatment.

    a. Telephone numbers of all emergency response personnel shall be prominently posted in the clean room and equipment rooms.

1.13 FIRE PROTECTION:

A. All plastic, spray-on strippable coatings and structural materials used in the hazardous material abatement process shall be UL approved and certified as fire retardant or noncombustible.

B. Wood shall be pressure impregnable and certified as fire retardant.

C. Material Safety Data Sheets (MSDS) for fire retardant materials shall be made available upon request.

D. All combustible rubbish and debris, including properly bagged hazardous material waste shall be properly disposed of at the end of each working day.

E. A minimum of one (1) 4A/60BC dry-chemical extinguisher shall be maintained at each of the following locations:

1. At each corner of the work area. Where no clear corners exist, four (4) extinguishers shall be placed around the exterior wall of the work area so that they are approximately 25 percent of the total distance apart.

    a. Exception: Where the total abatement containment area is less than 1,000 square feet, two (2) 4A/60BC extinguishers shall be provided. All extinguishers shall be clearly identified with red tape.

2. The hazardous material removal contractor shall ensure that all on-site personnel are aware of the locations and are properly trained in the use of all extinguishers and other fire/life safety equipment.

F. All existing fire detection, alarm systems, connections and sand pipes shall remain in place, active and unobstructed. The project environmental consultant must approve any alteration to any equipment in writing.

1.14 RESPIRATORY PROTECTION:

A. The hazardous material removal contractor shall provide all workers, foremen and superintendents personally issued and marked respiratory protective equipment approved by NIOSH and MSHA. When respirators with disposable filters are employed, the hazardous material removal contractor shall provide sufficient filters for replacement as necessary for the workers or inspectors. All used filters shall be disposed of as contaminated waste.

B. The hazardous material removal contractor shall instruct and train each worker involved in hazardous material abatement or maintenance and repair of hazardous material - containing materials, in proper respiratory use. The hazardous material removal contractor shall require that each worker always wear a respirator properly fitted in the work area from the start of any operation, which may cause any airborne asbestos fibers until the work area is completely decontaminated. The hazardous material removal contractor shall use respiratory protection appropriate for the fiber/dust levels encountered in the work place or as required for other toxic or oxygen-deficient situations encountered.

C. PAPR's shall be used as long as 0.5 f/cc or 40 mg/cc is not exceeded within the work area. If exceeded, all removal work inside work area shall stop and corrective actions (cleaning) will be required until fiber levels are reduced to less than 0.5 f/cc or 40 mg/cc.

D. Unless otherwise permitted, respiratory protection as specified herein shall be worn at all times, including preparation of the work areas, loading and unloading of waste containers in the work area or at the transport truck, and cleaning of the work area.

E. Facial hairs such as beards, sideburns and mustaches which interfere with the seal of air purifying type respirators are prohibited. Workers with eye glasses shall not be permitted to work.

F. Respiratory protection maintenance and decontamination procedures shall meet the following requirements:

1. Respirators shall be inspected and decontaminated on a daily shift basis in accordance with OSHA 29 CFR 1910.124(b).

2. HEPA-filters for negative pressure air filtering respirators shall be changed after each shower.

3. Respirators shall be the last piece of protection equipment to be removed. All workers must wear respirators into the shower when going through the decontamination procedures as stated herein.

4. Airline respirators with HEPA-filtered disconnects shall be disconnected in the equipment room and worn into the shower. Powered air-purifying respirator face pieces shall be worn into the shower. Filter/power pack assemblies shall be decontaminated in accordance with manufacturer's recommendations.

5. Respirators shall be stored in a dry place in such a manner that the face piece and exhalation valves will not be distorted.

6. Organic solvents shall not be used for the washing of respirators.

7 Whenever respirator design permits, workers shall perform a positive and negative air pressure fit test each time a respirator is worn. Powered air-purifying respirators shall be tested for adequate air flow (using the method specified by the manufacturer) every four (4) hours of use and each time the worker enter or exits the removal area. Written logs of these tests shall be maintained by the hazardous material removal contractor.

8. The hazardous material removal contractor shall furnish to the consultant written documentation that each worker is medically approved to wear respirators and has been properly trained in their use, inspection, care, maintenance, and fit testing pursuant to the hazardous material removal contractor's written respiratory protection plan (RPP).

9. Breathing air supply systems shall conform to the USEPA NIOSH Document No. EPA-560-OPTS-86-0001 (April 1986) entitled "A Guide to respiratory protection for the asbestos abatement industry". Except to the extent that more stringent requirements are written directly into the contract documents, the following regulations and standards have the same force and effect (and are made a part of the contract documents by reference) as if copies were directly written into the contract documents, or as if published copies were bound herewith. Where there is a conflict in requirements set forth in these regulations and standards, the more stringent requirements must be met in OSHA U.S. Department of Labor Occupational Safety and Health Administration, Safety and Health Standards 29 CFR1910, Section 1001 and Section 1910.134, 29 CFR 1926. CSA Canadian Standard Association, Rexdal, Ontario, Standard Z180.1-1978, "Compressed Breathing Air."

1.15 PROTECTIVE CLOTHING:

A. The hazardous material removal contractor shall provide all workers, foremen, superintendents, authorized visitors and inspectors protective disposal clothing consisting of full-body coveralls, head covers, globes, 18-inch high boot-type covers or reusable footwear, and eye protection in accordance with 29 CFR 1926.58(3)(g)(ii)(e).

B. The hazardous material removal contractor shall provide hard hats and safety shoes as required by job conditions and safety regulations.

C. Reusable footwear, hard-hats, and eye protection devices shall be left in the "contaminated equipment room" until the end of the hazardous material abatement activities, at which

time they shall be disposed of as hazardous material contaminated waste or transferred to another work area by methods approved by the consultant.

D. All disposal protective clothing shall be discarded and disposed of as hazardous material waste every time the wearer exits from the workspace to the outside through the decontamination facilities.

1.16 ENCLOSURES, SHOWERS AND TOILETS (DECONTAMINATION FACILITIES:

A. All worker decontamination enclosure systems shall be provided at all locations where workers will enter or exit the removal area. At a minimum, one system at a single location is required.

B. Worker decontamination enclosure systems constructed at the project site shall utilize 6-mil black or opaque polyethylene sheeting, or other approved materials for privacy.

C. The personnel decontamination unit shall not be located inside the removal area unless otherwise authorized by the project environmental consultant.

D. Alternate methods of providing decontamination facilities may be submitted to the project environmental consultant for approval. The hazardous material removal contractor shall not proceed with any such method without written authorization.

E. The worker decontamination enclosure system shall consist of at least a clean room and a wash station.

F. The clean room shall be adequately sized to accommodate the work crew. Space for storing respirators shall be provided in this area. Clean work clothes; clean disposable clothing, replacement filters for respirators, towels and other necessary items shall be provided in adequate supply. A location for posting notices shall also be provided in this area.

G. The equipment room/ storage area shall be used for storage of all equipment and tools. All equipment and tools must be decontaminated using a HEPA-filtered vacuum and/or wet cleaning techniques prior to storage in the equipment room. Replacement filters (in sealed containers until used) for filtration equipment, extra tools, containers or surfactant and other materials and equipment that may be required during the abatement may also be stored here as needed. A drum lined with a labeled 6-mil polyethylene bag for the collection of disposable clothing shall be located in this room. Contaminated footwear shall be stored in this area for reuse the following workday.

1.17 PERSONNEL PROTECTION AND DECONTAMINATION

A. The hazardous material removal contractor shall provide all personnel throughout the hazardous material abatement process with the specified protective clothing and respiratory protection. The hazardous material removal contractor shall ensure that all personnel entering and leaving the workspace follow the entrance and exit procedures:

1. Entering from the outside: All personnel shall change from street clothes into clean protective clothing and equipment, then proceed through the wash station into the

equipment/storage area, pick necessary equipment and tools and enter the removal area.

2. Exiting from the Work Area: All personnel shall dispose of all protective clothing into plastic bags labeled for hazardous material waste. The workers shall then enter the wash station still wearing their respirator and wash thoroughly, remove the respirator and wash and wipe the respirator thoroughly to decontaminate. After drying, proceed to the clean room and store the decontaminated respirator in the assigned space and dress into street clothes.

3. The hazardous material removal contractor shall post written procedures in the workplace and train all personnel on the procedures for the evacuation of an injured worker. Provide air to a seriously injured worker without delay for decontamination. Make provisions to minimize exposure of rescue workers and to minimize spreading of contamination during evacuations and fire procedures.

4. The hazardous material removal contractor shall instruct all employees and workers in the proper care of their personally issued respiratory equipment, including daily maintenance, sanitizing procedures, etc.

5. All respiratory equipment shall be inspected by the hazardous material removal contractor's project supervisory personnel at the beginning of each work period, including breaks and lunch periods. Written records of these inspections shall be maintained and provided to the consultant. During preparation work and prior to actual removal, the hazardous material removal contractor may use half-face HEPA respirators. During removal and cleaning of hazardous material materials PAPR's will be required.

1.18 hazardous material **WASTE DISPOSAL PROCEDURES:**

A. It is the responsibility of the removal contractor to determine current waste handling, transportation, and disposal regulations for the work site and for each waste disposal landfill. The hazardous material removal contractor must comply fully with all U.S. Department of Transportation, EPA, state and local regulations.

B. Definition: Waste is defined as all hazardous material contaminated or potentially contaminated materials and other items which have not been completely cleaned or sealed to the satisfaction of the consultant while inside the work area and must be removed from the job site. hazardous material wastes may include building materials, insulation, disposable clothing, protective equipment, plastic sheeting, tape, exhaust systems or vacuum filters, contractor equipment, or other materials designated by state, local authorities or the consultant which have been potentially contaminated with hazardous material and have not been fully cleaned inside the removal area by vacuuming followed by thorough washing.

C. All waste material shall be promptly placed in 6-mil polyethylene bags as it is generated. A sufficient number of waste bags shall be located in the immediate work area, and in the equipment (dirty) room of the worker decontamination facility. The hazardous material removal contractor shall count the bags and estimate the total volume leaving the work area, and maintain a written record of such (waste manifest).

D. Warning labels, having waterproof print and permanent adhesive, in compliance with OSHA, EPA, NESHAPS and DOT requirements shall be affixed to or printed on the sides of all waste bags or transfer containers. All waste bags must have the generator's name and address including area where waste was generated.

E. A fine water spray shall be used to keep the waste in the containers thoroughly wet at all times. When a waste bag is full, it shall be securely sealed with tape or other secure fastener.

F. The following procedures shall be followed whenever containers or equipment are removed from the work area:

1. All combustible rubbish and debris, including properly bagged hazardous material waste shall be properly disposed of at the end of each working day.

2. The clean room shall be considered a holding area only during the period of active waste transfer for the purpose of the loading of carts or drums. Storage of waste in carts or drums in the clean room is prohibited.

3. Waste removal shall not occur during worker shift changes or when the workers are washing or changing.

4. Workers are to be stationed in each room of the decontamination facility to transfer the containers and equipment to or from adjacent sections. The workers in the clean room or holding area shall enter from uncontaminated areas with appropriate personal protective equipment; or prior to the start of the waste transfer, the workers shall exit the work area, fully decontaminated, and subsequently don clean personal protective equipment.

5. All external surfaces of contaminated containers and equipment shall be cleaned by wet cleaning and HEPA-vacuuming in the work area before moving such items into the decontamination facility.

6. The containers of waste and the equipment shall be removed by workers stationed in the washroom during waste removal operations.

7. Once in the washroom, external surfaces of contaminated containers and equipment shall be cleaned a second time utilizing wet cleaning methods.

8. The cleaned waste containers and equipment shall be placed in uncontaminated leak-tight plastic bags (or 6-mil sheeting if physical characteristics necessitate and permit). Air volume shall be minimized, and the bags or sheeting shall be sealed. Items that may puncture or tear the plastic bags or sheeting shall be placed in a hard wall container such as a drum, and then sealed.

9. The clean re-containerized items shall be moved into the airlock for subsequent transfer to the holding area. The washroom workers shall not enter the work area until waste removal is completed.

10. Re-containerized items and cleaned equipment shall be removed to the holding area by workers who have entered from uncontaminated areas with appropriate personal protective equipment.

11. The re-containerized items of waste and clean-bagged equipment shall be placed in open top, watertight plastic carts or drums. These carts or drums shall be held in the holding area pending removal from the work area. The carts or drums shall be HEPA-vacuumed and wet-cleaned immediately following the removal of the containers of waste from them, and the location of where they are emptied shall also be HEPA-vacuumed.

12. The exit from the waste decontamination facility shall be monitored and secured at all times to prevent unauthorized entry.

13. The carts and drums may be temporarily stored in a holding area at the work site outside the workplace until a transport vehicle arrives, but such storage areas must be pre-approved by the owner.

G. Waste Container Storage: Sealed waste bags may be temporarily stored in a pre-designated and approved outside area, until a truckload quantity is obtained. The temporary storage area shall be identified and posted with signs, and waste containers shall be covered with polyethylene sheeting or otherwise protected from further contamination.

H. Waste Removal Scheduling: All waste containers shall be decontaminated and removed from the work area before final cleanup is started and isolation barriers are taken down. Once a truckload of waste containers has accumulated, the Contractor shall arrange for transportation to the disposal site. Waste shall not be stored in the work area or waste decontamination facilities. Outside bag storage must be monitored and secured at all times to prevent tampering. Storage must be in secure areas.

I. Waste Transportation and Disposal Regulations: It is the responsibility of the hazardous material removal contractor to determine and insure that he is complying with: 1) the current waste handling regulations applicable to each work site; and 2) the current regulations for transporting and disposing of waste at each ultimate disposal landfill. The hazardous material removal contractor must comply fully with these regulations and with all U.S. Department of Transportation, EPA, federal state and local requirements.

1. The hazardous material removal contractor (or his subcontractor) at no additional cost shall maintain a valid solid waste transportation registration issued by the California Department of Health Services Toxic Substance Division; and obtain, complete, and fully comply with any other local hazardous waste manifesting requirements.

2. Transportation methods shall comply with the provisions of EPA Title 40, Part 61, Subpart M, Title 22 of the California Administrative Code, Division 4 Environmental Health, Chapter 30, Minimum Standards for Management of Hazardous and Extremely Hazardous Wastes, and with any hazardous waste regulations for temporary storage, transport, and disposal if such codes are enforced in states where the waste shall be stored, transported or disposed of.

J. Waste Container Removal and Disposal Procedure:

1. The costs for waste packaging, transportation, and approved landfill disposal (plus all related recordkeeping) shall be included in the hazardous material removal contractor's prices.

2. The hazardous material removal contractor shall package, label, and remove all hazardous material waste as specified in the above sections. Packaging shall be accomplished in a manner that minimizes waste volume, but insures waste containers shall not tear or break.

3. The hazardous material removal contractor shall provide legal transportation of hazardous material wastes to the disposal landfill. The hazardous material removal contractor shall verify actual delivery, receipt, and disposal of each load of waste at the designated landfill.

1.19 SUBMITTALS:

The hazardous material removal contractor shall furnish the following items clearly identified as stated:

A. Three copies shall be submitted to the project environmental consultant. Submittals are to be approved before any abatement activities can begin (at or before the pre-construction meeting):

1. Submittal No. 1: A detailed listing of all materials, tools, equipment, and expendable supplies that are to be used during the project. For each listed item, provide (as appropriate) the manufacturer's name, catalog number or model, a description of its function and location of use, and actual sample or photocopy of manufacturer's brochure. The listing shall include at a minimum: spray encapsulants, wetting agents, spray adhesives (including MSDS) and equipment, HEPA-vacuums, HEPA-filtered exhaust fans, respirators, protective clothing, waste containers, protective fireproof plastic coverings, sealing tapes, materials and compounds, temporary power and electric equipment, shower water pumps and filters, encapsulating equipment, and materials for constructing decontamination facilities and barriers.

2. Submittal No. 2: A written "site security plan" describing in general and specifically the location of warning signs. The labeling of waste containers, emergency means of ingress/egress from areas, security for prevention of unauthorized entry into the area, log book forms for recording entries to the work areas, accident prevention and notification policy, emergency fire and accident response procedures (including decontamination procedures), and personnel responsible for these items. The "site security plan" shall also describe equipment and methods the hazardous material removal contractor will use to efficiently communicate between personnel inside and outside work areas.

3. Submittal No. 3: Copies of all notifications as directed by the owner, owner's representative or environmental consultant. Notifications by the hazardous material removal contractor shall be limited to only those parties the hazardous material removal contractor is required to notify by law.

4. Submittal No. 4: Detailed work schedules which list all the work areas: the dates of proposed work, the work shift times, the projected work accomplishments during that shift, and the number of workers (and the projected supervisor/foreman). The name and summary of the experience of all proposed principals, supervisors and foremen, and all other employees, which may be used during the contract period (minimum of one qualified supervisor and foreman is required).

5. Submittal No. 5: Signed documentation of training and education for all proposed workers

6. Submittal No. 6: List of all sub-contractors proposed for this project, with their specialty and qualifications.

7. Submittal No. 7: Proposed waste hauler and copies of applicable licenses, including State of California registration number.

8. Submittal No. 8: Proposed landfill for disposal of waste materials and letter from landfill authorizing hauler to dispose of hazardous waste.

9. Submittal No. 9: A copy of the Contractor's State of California Licenses, Department of Industrial Relations, Division of Occupation Safety and Health, Certificate of Registration for Asbestos-Related Work.

10. Submittal No. 10: A copy of the Contractor's notification to the Division of Occupational Safety and Health in compliance with Title 8 of the California Code of Regulations, Section 341.9.

1.20 SUBMITTALS DURING THE WORK:

Submit at least three (3) copies of the following items to the project environmental consultant

A. Security and safety logs showing names of person entering the workspaces, social security number, date and time of entry and exit, record of any accident, emergency evacuation, and any other safety and health incident. These logs shall be provided to the project environmental consultant on a daily basis.

B. Disposal certificates. Copies (reproductions) shall be submitted at the completion of the job to the consultant, owner's representative and the original certificates submitted to the owner. Manifests shall indicate the location where the hazardous material waste was located prior to removal.

C. HEPA unit static pressure differential readings daily.

D. Monitoring results as conducted by the hazardous material removal contractor shall be submitted on a daily basis to the consultant.

E. The hazardous material removal contractor shall provide written inspection reports on all respiratory equipment to the consultant on a daily basis.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS:

A. The hazardous material removal contractor shall deliver all materials and equipment to the site in the original containers bearing the name of the manufacturer, and details for proper storage and usage.

B. All materials or equipment delivered to the site shall be unloaded, temporarily stored, and transferred to the work area in a manner, which shall not interfere with operations of the owner.

C. Unloading and temporary storage sites, and transfer routes, must be approved in advance by the consultant and the owner.

D. Damaged or deteriorated materials may not be used and must be promptly removed from the premises. Materials, which become contaminated, with hazardous material - containing material shall be packaged as hazardous material containing and legally transported and disposed of in an approved, secure hazardous material landfill.

2.2 MATERIALS, TOOLS AND EQUIPMENT:

A. All materials, tools and equipment must comply at a minimum, with this specification, and relevant federal, state, and local codes.

1. Plastic Sheeting and Bags - Shall be polyethylene or equivalent with a thickness of at least 6 mil for all applications. Fire retardant polyethylene shall be used throughout the duration of the project. Waste disposal bags shall be of 6-mil thickness with appropriate warning labels.

2. Encapsulants and Surfactant - Shall be 50% polyethyleneoxyethylene ester and 50% polyethyleneoxyethylexelent ether or equivalent, mixed in the proportion of one ounce surfactant per five gallons of water. The material must be odorless, non-flammable, nontoxic, non-irritating, and non-carcinogenic. It shall be applied as a mist using a low-pressure airless sprayer recommended by the surfactant manufacturer.

3. Tape and Glue - Shall be capable of sealing plastic to finished surfaces without damage when removed. The bonding strength and resulting seal integrity must not be affected by mist or water, encapsulating agent, or any other materials to be used in the work area.

4. Warning Signs and Labels - Shall comply with 29 CFR 1926.58(s), and all other federal, state, local codes and regulations.

5. Transportation - Transportation methods shall comply with the provisions of EPA Title 40, Part 61, Subparts A and B, and with any hazardous or special waste regulations for temporary storage, transport, and disposal if such codes are enforced in states or cities where the waste will be generated, stored, transported or disposed of. All containers shall be labeled in accordance with OSHA Regulation 29 CFR 1926.58K(2), NESHAPS, and 49 CFR Parts 171 and 172, Hazardous Substances: Final Rule.

6. Respiratory Protection Devices - Shall be NIOSH and MSHA approved, and shall comply with all provisions of 29 CFR 1926.58. Fit testing procedures must comply with 29 CFR 1926.58 Appendix C.

7. Electrical Equipment - Shall be Underwriters Laboratory listed and approved, and shall have ground fault circuit interrupt protection which has been installed by a licensed electrician.

8. Ladders or Scaffolds - Shall be OSHA approved and be of sufficient dimensions and quantities so that all work surfaces can be easily and safely accessed by the workers, and other inspectors. Scaffold joints and ends shall be sealed with tape to prevent incursion of asbestos fibers.

9. Hand Power Tools - Shall be equipped with HEPA-filtered local exhaust ventilation if used to drill, cut into, or otherwise disturb ACM.

10. Brushes - All brushes shall have nylon bristles. Wire brushes are excluded from use due to their potential to shred asbestos fibers into small fibers. Wire brushes may be used on pipe joint applications upon prior written approval by the consultant.

PART 3 - REMOVAL PROCEDURES

3.1 PRE-HAZARDOUE MATERIAL ABATEMENT PREPARATIONS:

The hazardous material removal contractor shall prepare the work area as described in this section. Preparation work shall be performed according to the following general sequence of steps and procedures to insure that proper containment and protection systems are installed prior to any work which could generate airborne asbestos fibers:

A. Remove and relocate any non-fixed items (not removed by the owner) to storage areas designated by the owner.

B. Isolate, clean by HEPA vacuuming and washing, and seal airtight with plastic and tape all HVAC system diffuses, grills, and registers in or servicing the work area.

C. Carefully clean all surfaces in the work area, which may be contaminated with any dust or debris by using wet methods and a vacuum equipped with a HEPA filter.

D. Cover any window or other opening with double-layered polyethylene sheeting. All walls to remain shall also be protected from damage during the work and erect or install decontamination facility.

E. Isolate all electrical systems as directed by the owner, and provide temporary power and lighting as required for the work area and affected non work areas.

F. Obtain Consultant's written approval of all preparation work before starting removal of hazardous material material.

3.2 ISOLATION OF ELECTRICAL SYSTEMS AND INSTALLATION OF TEMPORARY POWER AND LIGHTING:

A. The scope of the required electrical isolation and protection work includes isolation and protection of electrical equipment that is in the area from which hazardous material must be removed, and could therefore possibly become a hazard through contact or water spray short-circuiting. Shutdown of electrical circuits shall include providing labor to monitor, inspect, and service temporary power circuits, lighting, and equipment as required by local codes and regulations shall be provided by the owner. The owner shall provide the "Lock Out" system on all electrical panels or equipment that will be shutoff during the removal process.

B. Temporary lighting shall be provided by the hazardous material removal contractor in the work area where hazardous material removal is performed.

C. All materials and workmanship shall conform to the latest editions of the following codes, standards, and specifications:

1. National Electrical Code (NEC) - most recent edition
2. National Bureau of Standards, Handbook H30, National Electrical Safety Code
3. State and Local codes, and all other authorities having jurisdiction
4. Underwriter Laboratories (UL)
5. Nation board of Fire Underwriters
6. OSHA
7. Factory Manual

D. Temporary lighting and power systems shall exceed all OSHA, state, and local regulations; temporary lighting levels shall exceed OSHA requirements and provide surface lighting for nighttime work.

E. All hazardous material abatement contractor costs associated with the installation of temporary power and lighting must be included.

F. The non-current carrying metal parts of fixed, portable and plug connected equipment shall be grounded. Portable tools and appliances protected by an approved system of double insulation need not be grounded. All lighting and power circuits in the hazardous material removal area shall be ground fault protected.

G. Extension cords shall be the 3 wire type; shall be protected from damage; and shall not be fastened with staples, hung from nails, or suspended from wires. Splices shall have soldered wire connections with insulation equal to the cable. Worn or frayed cords shall not be used.

H. Safe lighting equipment shall be provided with waterproof floodlights. Exposed bulbs shall be guarded to prevent accidental contact. Temporary wiring shall be properly insulated and substantially supported. Circuits shall be properly designed and fused. All temporary lighting inside the hazardous material removal area shall be weather-proofed.

I. Receptacles for attachment plugs shall be the approved, concealed contact type. Where different voltages, frequencies, or types of current are supplied receptacles shall be of such design that attachment plugs are not interchangeable.

J. Each disconnecting means for motor and appliances and each service federal or branch circuit at the point where it originates, shall be legibly marked to indicate its purpose.

3.3 INSTALLATION OF DECONTAMINATION SYSTEM:

A. Worker decontamination enclosure systems shall be provided at all locations where workers will enter or exit the work area. At a minimum, one system at a single location is required.

B. Worker decontamination enclosure systems constructed at the project site shall utilize 6-mil black or opaque polyethylene sheeting, or other approved materials for privacy.

C. The personnel decontamination unit shall not be located inside the work area unless otherwise authorized by the project environmental consultant.

D. Alternate methods of providing decontamination facilities may be submitted to the project environmental consultant for approval. Do not proceed with any such method(s) without written authorization.

E. The worker decontamination enclosure system shall consist of at least a clean room, a wash station, and an equipment/storage area, each separated from the other and from the work area.

F. Clean room shall be sized to adequately accommodate the work crew. Space for storing respirators shall be provided in this area. Clean work clothes, clean disposable clothing, replacement filters for respirators, towels and other necessary items shall be provided in adequate supply in the clean room. A location for posting notices shall also be provided in the area.

G. The wash station shall contain one or more areas to decontaminate workers and personal protective equipment. The wash station shall be constructed to ensure against leakage of any kind. An adequate supply of soap, shampoo and towels shall be supplied by hazardous material abatement contractor and available at all times. Waste water shall be drained, collected and filtered through a system with at least 0.5-1.0 micron particle size collection capability.

H. The equipment/storage area shall be used for storage of equipment and tools at the end of a shift after they have been decontaminated using a HEPA-filtered vacuum and/or wet cleaning techniques as appropriate. Replacement filters (in sealed containers until used) for filtration equipment, extra tools, containers or surfactant, other materials and equipment that may be required during the abatement may also be stored here as needed. A drum lined with a labeled 6-mil polyethylene bag for collection of disposable clothing shall be located in this room. Contaminated footwear shall be stored in this area for reuse the following workday.

3.4 ISOLATION OF HAZARDOUS MATERIAL CONTAINMENT WORK AREAS

A. Work area Isolation and Protection for Hazardous Material -Containing Materials:

1. The hazardous material abatement contractor shall isolate the work area for the duration of work by completely closing and sealing all openings and doorways

into the work area including, but not limited to, heating and ventilation ducts, doorways, windows, floors and ceiling penetrations, and lighting. Isolation/sealing shall be accomplished by using two (2) layers of 6 mil plastic sheeting taped securely in place, or by caulking, including the construction as noted in 3 below. The work area shall be protected and sealed airtight to the extent possible, and be subject to the approval of the consultant.

2. Emergency and fire exits shall be maintained.

3. Shutdown and isolate any heating, cooling and ventilating air systems to prevent contamination and fiber dispersal to other areas of the property.

4. Thoroughly pre-clean all dust or debris from any fixed objects, floors, walls, or other equipment within the work area using HEPA vacuuming equipment and wet washing. Do not use dry brooms, brushes, mops or non-HEPA vacuum cleaners for any pre-cleaning work. Seal all seams, joints, covers or casings with tape, and enclose fixed objects or equipment with a minimum of two layers of 6 mil plastic sheeting secured and sealed airtight with duct tape.

5. Cover floor and walls with a minimum two (2) independent layers of 6 mil plastic sheeting, turning each layer of floor polyethylene up the wall a minimum of 16" and fasten them securely to the wall. Cover walls with two (2) layers of 6 mil plastic sheets extending to floor, overlapping the two (2) floor sheets by not less than 12" excluding the turn-up. All joints in plastic sheets shall be taped and glued in a manner to prohibit air movement, and to prevent passage of water or other liquids. The bottom layer of floor polyethylene shall be securely fastened to the floor to prevent creases or slippage that would pose a hazard to workers. Any floor drains or other openings shall be sealed individually with two (2) layers of 6 mil sheeting and tape, and then covered by the remaining two (2) layers of polyethylene. Pits, pumps and other openings shall be covered so as to prevent a tripping hazard and then covered with two (2) layers of 6- mil sheeting.

6. The Contractor shall post warning signs in English and Spanish meeting the requirements of OSHA 29 CFR 1926.58(k)(1) and (k)(2)(ii) at the outside doorway to the Decontamination Facility which shall be the only non-emergency entrance into the work area. The consultant may also request that the Contractor post additional warning signs around the work area or at other potential entrances or exposure points in accordance with California Proposition 65. Warning signs shall be readily visible to any person attempting to enter the work area.

7. All waste will be disposed and packaged as specified in Section 1.18.

3.5 APPROVAL OF WORK AREA:

After the hazardous material removal work area has been prepared as specified above, the hazardous material removal contractor shall request a formal site inspection by the consultant. No removal or disturbance of hazardous material -containing materials shall occur until the consultant has inspected and approved the site preparation work in writing.

3.6 hazardous material *REMOVAL PROCEDURES:*

A. This section covers the removal of hazardous material -containing material as specified in the documents or as directed by the consultant.

B. Amended water (wetting agent) mixed and carefully applied using an airless sprayer as specified by the manufacturer, shall continuously be used to control the release of asbestos fibers from the material prior to and during removal. The amended water shall be applied in sufficient quantity to fully saturate the material before it is removed. Wetting shall commence up to 24 hours before removal work to ensure effectiveness.

C. Removal Methods:

1. No hazardous material removal work shall begin until the work area has been prepared and approved by the consultant as summarized in preceding section. Removal workers shall wear a negative pressure air purifying respirators and protective clothing as previously described throughout all removal, cleanup and waste handling operations.

2. Small test patches of waste materials shall be wetted, and then removed and examined by the consultant to determine degree of saturation prior to removing the bulk of the material. With prior approval, the hazardous material abatement contractor may use removal encapsulants instead of amended water; applied per manufacturer and federal guidelines.

3. After large areas of the waste materials have been fully wetted and tested, the materials shall be carefully removed in small sections by using hand scrapers or other suitable tools.

4. As the material is removed, it shall be promptly wetted and packed into impermeable, labeled 6 mil polyethylene disposal bags. When each bag is full, the packaged material shall be sprayed with amended water, sealed (using duct tape or other fastener as approved by the consultant), and transported to a temporary storage area inside the work area.

5. The hazardous material abatement contractor shall repeatedly spray the waste materials to prevent them from drying out.

6. Once the majority of the waste is removed, the hazardous material abatement contractor shall scrub the substrate surface with a nylon brush or equivalent, and a water spray, and then thoroughly wash it to remove all remaining material.

7. After obtaining written approval of the cleaning from the consultant, the hazardous material abatement contractor shall then seal all substrate surfaces from which waste material was removed with at least one (1) coat of an approved penetrating encapsulant.

8. The hazardous material abatement contractor shall minimize contamination on the work floor, the exterior of disposal containers, and all other surfaces within the work area. At the end of each shift, all surfaces shall be cleaned of all materials and then HEPA vacuumed or wet mopped.

9. The decontamination facility shall be wet cleaned (a minimum of two times) using wet cleaning methods upon completion of any waste removal.

10. The decontamination facility shall be wet cleaned and HEPA vacuumed, as appropriate, after each shift change and meal break.

11. Excessive water accumulation or flooding in work area shall require work to stop until the water is collected and disposed of properly.

3.7 APPROVAL OF HAZARDOUS MATERIAL REMOVAL WORK:

A. Upon completion of removal work, but prior to commencing encapsulation or post-abatement cleaning of the work area, the hazardous material abatement contractor shall request the consultant to conduct an inspection and approval of the removal work.

B. All hazardous material materials, gross debris, waste bags and equipment shall be removed from the work area prior to this approval.

3.8 FINAL INSPECTION:

The consultant will perform a final visual inspection of the work area.

3.9 MONITORING, TESTING AND INSPECTION:

A. The performance and execution of the work shall be closely and continuously monitored by the owner's consultant. The monitoring work shall be performed both inside the work area and the surrounding areas (upwind, downwind and under the work area inside the building) to ensure full compliance with these specifications and all other applicable regulations. Ambient air samples will be collected and analyzed by the owner's consultant. The hazardous material removal contractor shall provide full cooperation and support to the consultant and technicians throughout the work. Monitoring and inspections shall include air samples in the workspace, periodic personal samples at breathing levels on a number of workers, air samples in the areas surrounding the work areas, checking the Contractor's standard operating procedures, engineering controls, respiratory protection equipment, packing, packaging, transporting and disposal of hazardous material , decontamination facilities and procedures, and any other aspects of the abatement process that may impact the health and safety of the people and the pollution of the environment.

B. The owner shall bear all cost in connection with the laboratory work required in Paragraph A above. However, the costs of all subsequent laboratory analysis taken because the limits specified were exceeded on the initial tests shall be borne by the hazardous material removal contractor. The hazardous material removal contractor shall also conduct and bear the cost of personal air samples for OSHA compliance.

C. The hazardous material removal contractor shall receive copies of all laboratory reports presenting the results of the consultant's air monitoring and inspection program. All information shall be recorded in the hazardous material removal contractor's air monitoring log.

3.10 AIR MONITORING BY CONTRACTOR:

A. The hazardous material removal contractor shall be responsible for personal air monitoring to document compliance of his workers with OSHA regulations using the methods as reiterated below.

B. The sampling person and analysis laboratory performing this work shall be an independent party not financially or managerially connected to the hazardous material removal contractor.

C. The laboratory shall be successfully participating in the AIHA/NIOSH Proficiency Analytical Testing (PAT) program.

D. Air sampling materials and equipment requirements are as follows:

1. Sampling for analysis by phase contract microscopy shall employ cellulose ester collection filters with 0.8 micron pore size or less. Cassettes shall be loaded with filters under clean laboratory conditions. A 0.5 micron pore size cellulose ester backing filter shall be placed behind the collecting filter, followed by the cellulose support pad and the cassette base. An electrically conductive cowl shall be used in conjunction with the sampling train.

2. The filter assembly shall be upstream of all other components in the sampling train. An air flow measuring device (when used) shall be downstream of the filter and the pump assembly, or integral with the pump assembly.

3. Sampling pumps shall supply constant flow.

4. An air flow measuring/metering device shall be used, and shall be high quality rotometer, mass flow, dry gas meter or critical orifice. Measuring devices shall have a range of at least 1.5 times the desired flow rate and be readable to at least + or -5% of the desired flow rate. They shall be calibrated against standards of higher accuracy before and after sampling. The calibrations shall be recorded.

E. Numbers and frequencies of personal air sampling shall be as required by OSHA regulations but not less than (1) sample per eight (8) hour work shift during times of hazardous material removal work.

F. Results of sample analysis shall be provided to the consultant within twenty-four (24) hours of collection.

G. All other air sampling for compliance with the Specifications shall be performed by the owner's consultant at no cost to the hazardous material removal contractor except where the hazardous material removal contractor fails specified tests

H. The hazardous material removal contractor shall use a pre-approved "chain of custody" form for all personal air samples he collects.

I. Personal sampling shall be performed pursuant to NIOSH Method 7400.

J. Representative personal air monitoring will be conducted during all aspects of the project to determine if any employee exceeds the Personal Exposure Limit (PEL) Limit of 50 ug/m^3.

3.11 FINAL INSPECTION AND TESTING:

A. After a minimum of two (2) cleanings of the workspace, and if a high degree of cleanliness has been achieved, the hazardous material removal contractor shall notify the consultant that the workspace is ready for inspection and final testing. The owner's consultant with the assistance of his technician and the hazardous material removal contractor shall then visually inspect the workspace for the detection of any visible hazardous material dust or contamination.

B. After achieving the level of cleanliness and decontamination as specified herein and as confirmed by the final testing and checking, the consultant shall thoroughly inspect the space jointly with the hazardous material removal contractor to determine whether any damage has been done on the finishes, equipment or any other part of the work space.

DEFINITIONS

Where applicable or stated, terms shall have the following definitions:

A. All terms not defined herein have the meaning given in the applicable publications and regulations.

B. Abatement Activities shall mean all activities from the initiation of work area preparation through successful clearance air monitoring performed at the conclusion of an hazardous material project.

C. Air Lock shall mean a confined space designed to control air movement between two areas. It is composed of sealed spaces with curtained doorways at its portals.

D. Ambient Air Monitoring shall mean measurement or determination of airborne asbestos fiber concentrations outside but in the general vicinity of the work site.

E. Amended Water or Wetting Agent shall mean water to which an approved surfactant has been added in proportion of at least one (1) ounce surfactant to five (5) gallons water.

F. Asbestos-Containing Materials (ACM) shall mean any insulation, fireproofing, plaster, ceiling or floor tiles, and any other building materials containing a detectable amount of asbestos.

G. Asbestos-Contaminated Objects shall mean any objects which may be contaminated by asbestos or asbestos-containing material as determined by the consultant.

H. Hazardous Material Disposal shall mean the removal of containerized asbestos, asbestos-containing material, asbestos-containing waste material and asbestos-contaminated objects form the regulated area to the final EPA approved disposal site.

I. Authorized Visitors any visitor authorized by the consultant or any representative of a regulatory agency or other agency having jurisdiction over the project.

J. Barriers or Containment Barriers shall mean walls, tunnels, or enclosures erected to separate any section of an abatement area from adjoining spaces. Where indicated on drawings, barriers shall be constructed of 2'x 4's, 10" o.c. with minimum 1/2" plywood walls, and all seams in plywood and edges shall be sealed airtight with caulking. The inside (work) side of all such barriers shall be covered with two (2) layers of 6-mil polyethylene sheeting. Tunnels to maintain public access through a work area shall also be defined as part of the barriers. All lumber, plywood and polyethylene shall be flame retardant and shall bear manufacturer's label.

K. Baseline or Background Air Monitoring shall mean a measurement or determination of airborne asbestos fiber concentrations inside the workplace and outside a building prior to starting abatement activities.

L. Certified Clean shall mean that a work area has no visible signs of fibrous materials or other contamination, and does not have levels of airborne fiber above the defined air clearance criteria.

M. Clean or Decontaminate shall mean to make a surface free of all visible and optically-detectable fibers by thoroughly HEPA-vacuuming and wet washing with sponges and mops.

N. Contractor shall mean the hazardous material abatement contractor.

O. Curtained Doorway or Entrance shall mean a portal which limits air movement between two areas, constructed by placing two overlapping sheets of plastic over an existing or temporary doorway, by securing each along the top of the doorway, by securing the vertical edge of one sheet along one vertical side of the doorway, and by securing the vertical edge of the other sheet along the opposite vertical side of the doorway.

P. Decontamination Facility (DF) or Area shall mean a series of connected rooms or spaces including clean and wash station, and contaminated dirty (equipment) room, each separated; and used for the decontamination of all workers, and their personal protective equipment leaving an hazardous material removal work area, as well as for access to such work areas. All decontamination facilities shall be a "structural" (i.e. capable of supporting workers standing above).

Q. Disposal Site shall be an EPA approved landfill.

R. Disturb shall mean to alter, change, or stir, such as but not limited to the removal, encapsulation, enclosure or repair of hazardous material -containing or hazardous material contaminated material.

S. Encapsulation shall mean procedures necessary to coat or saturate material with an approved encapsulant liquid to control the possible release of fibers into the ambient air. "Encapsulant" (Sealant) shall mean liquid material which can be applied to other solid material which reduces the possible release of fibers from the material either by creating a membrane over the surface (bridging encapsulant) or by penetrating into the material and binding its components together (penetrating encapsulant).

T. Fiber and acicular single crystal or a similarly elongated polyethylene crystalline aggregate which displays some resemblance to organic fibers by having such properties as flexibility, high aspect ratio, silky luster, axial lineation, and other, and which has attained its shape primarily through growth rather than cleavage.

U. Final Cleaning shall mean that no three dimensional material is visible to the naked eye.

V. Fixed Items shall mean equipment, furniture, radiators, or other objects which cannot be removed from the work area, plus walls and floors.

W. Furnished or Supply shall mean purchase, deliver to, and off-load at the job site, all ready to be installed, including where appropriate, all necessary interim storage and protection.

X. HEPA-Filtered Exhaust Units or Fans shall mean a fan equipped with a High Efficiency Particulate Air (HEPA) filter, greater than 99.97 percent efficient by 0.3 micron DOP test, and complying with ANSI z9.2 (1979), Local Exhaust Ventilation. It shall be used to create a pressure in a work area (reduced with respect to surrounding areas) in order to prevent the escape of asbestos fibers. It shall also be used to reduce and control the airborne concentration of asbestos fibers.

Y. HEPA-Filtered Vacuum shall be a vacuum cleaner specifically designed for and equipped with HEPA-filtration.

Z. Install shall mean set in place completely ready for normal use or service, including all necessary mounting facilities, connections and testing.

AA. Isolation Barriers shall mean the construction of partitions, the placement of solid materials, and the plasticizing of apertures to seal off the workplace from surrounding areas and to contain hazardous material fibers in the work area.

BB. Lockout shall mean the safe, approved means for shutting down HVAC equipment, electrical panels or breakers and water so that they cannot be inadvertently turned back on.

CC. Log shall mean an official record of all activities that occurred during the project and it shall identify the building owner, agent, contractor, workers, floor number, date, work area, and other relevant information to the project.

DD. Major Abatement shall mean the removal of ACM under contained conditions utilizing full isolation and negative pressure ventilation systems.

EE. Minor Abatement shall mean the removal of ACM utilizing "glove bag" methods or modified containment.

FF. Outside Air shall mean the air outside the buildings and structures.

GG. Outside/Ambient Air Samples shall mean samples collected outside of the containment area in the building and analyzed using the NIOSH 7400 Method.

HH. Protect Fixed Items shall mean to cover with solid enclosures and 6-mil polyethylene sheeting, and secure by taping or gluing waterproof and airtight.

II. Provide shall furnish (or supply) and install.

JJ. Regulated Area shall have the meaning set forth in 29 CFR 1926.52(b)

KK. Remove hazardous material shall mean to make a surface free of all visible fibrous materials or microscopically-detectable hazardous material fibers.

LL. Renovation shall mean an addition or alteration or a change or modification of building or the service equipment thereof that is not classified as an ordinary repair.

MM. Repair shall mean corrective action using specified work practices (e.g. glovebag, plastic tent procedures, etc.) to minimize the likelihood of fiber release from minimally damages area of ACM.

NN. Replacement Material shall mean any material approved by the owner used to replace ACM.

OO. Consultant shall mean the consulting industrial hygienists.

PP. Seal, or Block and Seal shall mean preparing a space or area such that there is no air movement or passage to and from the area. "Isolation barrier" shall mean the system of seals or other items which prevent air movement to and from any work area.

QQ. Shift shall mean a worker's or simultaneous group of workers' complete daily term of work.

RR. Surface Barriers, Protective Coverings or Polyethylene shall mean the plasticizing of walls, floors, and fixed objects within the work area to prevent contamination during subsequent abatement activities.

SS. Surfactant shall mean a chemical wetting agent added to water to improve penetration into asbestos-containing materials and thereby reduce the generation of airborne asbestos fibers.

TT. Work Area shall mean an area where hazardous material removal or other abatement procedures are being performed. A work area is considered a contaminated space between the time preparation begins and the time the area is certified clean by the consultant.

UU. Work Place shall mean the work area and the decontamination enclosure systems.

END OF SECTION

SECTION 03 20 00

CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel reinforcement bars.
2. Welded-wire reinforcement.

1.2 PREINSTALLATION MEETINGS

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Each type of steel reinforcement.
2. Epoxy repair coating.
3. Zinc repair material.
4. Bar supports.
5. Mechanical splice couplers.
6. Structural thermal break insulated connection system.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Environmental Product Declaration (EPD): For each product.

C. Shop Drawings: Comply with ACI SP-066:

1. Include placing drawings that detail fabrication, bending, and placement.
2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.
3. For structural thermal break insulated connection system, indicate general configuration, insulation dimensions, tension bars, compression pads, shear bars, and dimensions.

D. Construction Joint Layout: Indicate proposed construction joints required to build the structure.

1. Location of construction joints is subject to approval of the State.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1. Reinforcement To Be Welded: Welding procedure specification in accordance with AWS D1.4/D1.4M

B. Material Test Reports: For the following, from a qualified testing agency:

1. Steel Reinforcement:

a. For reinforcement to be welded, mill test analysis for chemical composition and carbon equivalent of the steel in accordance with ASTM A706/A706M.

2. Mechanical splice couplers.

C. Field quality-control reports.

D. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency engaged by the State, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.4/D 1.4M.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

1. Store reinforcement to avoid contact with earth.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content may be used for LEED credits.

B. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.

C. Low-Alloy Steel Reinforcing Bars: ASTM A706/A706M, deformed.

D. Headed-Steel Reinforcing Bars: ASTM A970/A970M.

2.2 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A615/A615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.

1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.
b. For epoxy-coated reinforcement, use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated wire bar supports.
c. For dual-coated reinforcement, use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated wire bar supports.
d. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.
e. For stainless steel reinforcement, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.

C. Mechanical Splice Couplers: ACI 318 Type 1, same material of reinforcing bar being spliced; tension-compression type.

D. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.

1. Finish: Galvanized.

E. Zinc Repair Material: ASTM A780/A780M.

2.3 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 - EXECUTION

3.1 PREPARATION

A. Protection of In-Place Conditions:

1. Do not cut or puncture vapor retarder.
2. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

3.2 INSTALLATION OF STEEL REINFORCEMENT

A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.

B. Accurately position, support, and secure reinforcement against displacement.

1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
2. Do not tack weld crossing reinforcing bars.

C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.

D. Provide concrete coverage in accordance with ACI 318.

E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

F. Splices: Lap splices as indicated.

1. Bars indicated to be continuous, and all vertical bars shall be lapped not less than 36 bar diameters at splices, or 24 inches, whichever is greater.
2. Stagger splices in accordance with ACI 318.
3. Mechanical Splice Couplers: Install in accordance with manufacturer's instructions.
4. Weld reinforcing bars in accordance with AWS D1.4/D 1.4M, where indicated.

3.3 JOINTS

A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by the State.

1. Place joints perpendicular to main reinforcement.
2. Continue reinforcement across construction joints unless otherwise indicated.
3. Do not continue reinforcement through sides of strip placements of floors and slabs.

B. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length, to prevent concrete bonding to one side of joint.

3.4 INSTALLATION TOLERANCES

A. Comply with ACI 117.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: State will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:

1. Steel-reinforcement placement.
2. Steel-reinforcement mechanical splice couplers.
3. Steel-reinforcement welding.

C. Manufacturer's Inspections: Engage manufacturer of structural thermal break insulated connection system to inspect completed installations prior to placement of concrete, and to provide written report that installation complies with manufacturer's written instructions.

END OF SECTION 03 20 00

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete manufacturer.
d. Concrete Subcontractor.
e. Special concrete finish Subcontractor.

2. Review the following:

a. Special inspection and testing and inspecting agency procedures for field quality control.
b. Construction joints, control joints, isolation joints, and joint-filler strips.
c. Semirigid joint fillers.
d. Vapor-retarder installation.
e. Anchor rod and anchorage device installation tolerances.
f. Cold and hot weather concreting procedures.
g. Concrete finishes and finishing.
h. Curing procedures.
i. Forms and form-removal limitations.
j. Shoring and reshoring procedures.

k. Methods for achieving specified floor and slab flatness and levelness.
l. Floor and slab flatness and levelness measurements.
m. Concrete repair procedures.
n. Concrete protection.
o. Initial curing and field curing of field test cylinders (ASTM C31/C31M.)
p. Protection of field cured field test cylinders.

1.4 ACTION SUBMITTALS

A. Product Data: For each of the following.

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Blended hydraulic cement.
5. Silica fume.
6. Performance-based hydraulic cement
7. Aggregates.
8. Admixtures:

a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.

9. Color pigments.
10. Fiber reinforcement.
11. Vapor retarders.
12. Floor and slab treatments.
13. Liquid floor treatments.
14. Curing materials.

a. Include documentation from color pigment manufacturer, indicating that proposed methods of curing are recommended by color pigment manufacturer.

15. Joint fillers.
16. Repair materials.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Environmental Product Declaration (EPD): For each product.
3. Laboratory Test Reports: For liquid floor treatments and curing and sealing compounds, indicating compliance with requirements for low-emitting materials.

C. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.

2. Minimum 28-day compressive strength.
3. Durability exposure class.
4. Maximum w/cm.
5. Calculated equilibrium unit weight, for lightweight concrete.
6. Slump limit.
7. Air content.
8. Nominal maximum aggregate size.
9. Steel-fiber reinforcement content.
10. Synthetic micro-fiber content.
11. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
12. Intended placement method.
13. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

D. Shop Drawings:

1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

a. Location of construction joints is subject to approval of the State.

E. Samples: For manufacturer's standard colors for color pigment.

F. Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including the following:

1. Concrete Class designation.
2. Location within Project.
3. Exposure Class designation.
4. Formed Surface Finish designation and final finish.
5. Final finish for floors.
6. Curing process.
7. Floor treatment if any.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For the following:

1. Installer: Include copies of applicable ACI certificates.
2. Ready-mixed concrete manufacturer.

B. Material Test Reports: For the following, from a qualified testing agency:

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Blended hydraulic cement.
5. Silica fume.
6. Performance-based hydraulic cement.

7. Aggregates.
8. Admixtures:

    a. Permeability-Reducing Admixture: Include independent test reports, indicating compliance with specified requirements, including dosage rate used in test.

C. Floor surface flatness and levelness measurements report, indicating compliance with specified tolerances.

D. Research Reports:

1. For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.
2. For sheet vapor retarder/termite barrier, showing compliance with ICC AC380.

E. Preconstruction Test Reports: For each mix design.

F. Field quality-control reports.

G. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

A. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: State will engage a qualified testing agency to perform preconstruction testing on each concrete mixture.

1. Include the following information in each test report:

    a. Admixture dosage rates.
    b. Slump.
    c. Air content.
    d. Seven-day compressive strength.
    e. 28-day compressive strength.
    f. Permeability.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94/C94M and ACI 301.

1.9 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1 and as follows.

1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
2. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
3. Do not use frozen materials or materials containing ice or snow.
4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.
5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:

1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

1.10 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to furnish replacement sheet vapor retarder/termite barrier material and accessories for sheet vapor retarder/ termite barrier and accessories that do not comply with requirements or that fail to resist penetration by termites within specified warranty period.

1. Warranty Period: 10 years from date of Acceptance of Work.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

A. Regional Materials: Concrete manufactured within 100 miles (160 km) of Project site from aggregates and cementitious materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project site may be used for LEED credit.

B. Source Limitations:

1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
3. Obtain aggregate from single source.

4. Obtain each type of admixture from single source from single manufacturer.

C. Cementitious Materials:

1. Portland Cement: ASTM C150/C150M, Type II, gray.
2. Fly Ash: ASTM C618, Class C or F.
3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.

D. Normal-Weight Aggregates: ASTM C33/C33M, Class 3M coarse aggregate or better, graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

E. Air-Entraining Admixture: ASTM C260/C260M.

F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
2. Retarding Admixture: ASTM C494/C494M, Type B.
3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.

G. Water and Water Used to Make Ice: ASTM C94/C94M, potable

2.3 VAPOR RETARDERS

A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A; not less than 15 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Barrier-Bac; Inteplast Group.
b. Fortifiber Building Systems Group.
c. ISI Building Products.
d. Poly-America, L.P.
e. Raven Industries, Inc.
f. Reef Industries, Inc.
g. Stego Industries, LLC.
h. Tex-Trude.
i. Trim-A-Slab.
j. W.R. Meadows, Inc.

2.4 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. BASF Corporation.
b. Euclid Chemical Company (The); an RPM company.
c. Sika Corporation.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.

1. Color:

a. Ambient Temperature Below 50 deg F: Black.
b. Ambient Temperature between 50 deg F and 85 deg F: Any color.
c. Ambient Temperature Above 85 deg F: White.

D. Curing Paper: Eight-feet-wide paper, consisting of two layers of fibered kraft paper laminated with double coating of asphalt.

E. Water: Potable or complying with ASTM C1602/C1602M.

2.5 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber or ASTM D1752, cork or self-expanding cork.

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 in accordance with ASTM D2240.

C. Bonding Agent: ASTM C1059/C1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

D. Epoxy Bonding Adhesive: ASTM C881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade and class to suit requirements, and as follows:

1. Types I and II, nonload bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.6 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand, as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested in accordance with ASTM C109/C109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested in accordance with ASTM C109/C109M.

2.7 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.

1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash or Other Pozzolans: 25 percent by mass.
2. Slag Cement: 50 percent by mass.
3. Silica Fume: 10 percent by mass.
4. Total of Fly Ash or Other Pozzolans, Slag Cement, and Silica Fume: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
5. Total of Fly Ash or Other Pozzolans and Silica Fume: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.

C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.

1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, and concrete with a w/cm below 0.50.

D. Color Pigment: Add color pigment to concrete mixture in accordance with manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.8 CONCRETE MIXTURES

A. Class A: Normal-weight concrete used for spread footings.

1. Exposure Class: ACI 318 F0 S0 W0 C1.
2. Minimum Compressive Strength: 3000 psi at 28 days.
3. Maximum w/cm: 0.52.

4. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.

B. Class B: Normal-weight concrete used for retaining walls.

1. Exposure Class: ACI 318 F0 S0 W0 C1.
2. Minimum Compressive Strength: 4000 psi at 28 days.
3. Maximum w/cm: 0.45.

4. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.

C. Class C: Normal-weight concrete used for interior slabs-on-ground.

1. Exposure Class: ACI 318 F0 S0 W0 C1.
2. Minimum Compressive Strength: 4000 psi at 28 days.
3. Maximum w/cm: 0.45.
4. Minimum Cementitious Materials Content: 470 lb/cu. yd..
5. Air Content:

    a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.

6. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.

2.9 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M, and furnish batch ticket information.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete in accordance with ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:

1. Daily access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.3 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.

3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.4 INSTALLATION OF VAPOR RETARDER

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.

1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
2. Face laps away from exposed direction of concrete pour.
3. Lap vapor retarder over footings and grade beams not less than 6 inches, sealing vapor retarder to concrete.
4. Lap joints 6 inches and seal with manufacturer's recommended tape.
5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
7. Protect vapor retarder during placement of reinforcement and concrete.

    a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides, and sealing to vapor retarder.

B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder in accordance with manufacturer's written instructions.

3.5 JOINTS

A. Construct joints true to line, with faces perpendicular to surface plane of concrete.

B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.

1. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by the State.
2. Place joints perpendicular to main reinforcement.

    a. Continue reinforcement across construction joints unless otherwise indicated.
    b. Do not continue reinforcement through sides of strip placements of floors and slabs.

3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
4. Locate joints for beams, slabs, joists, and girders at third points of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.

5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
6. Space vertical joints in walls as indicated. Unless otherwise indicated, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.
7. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
8. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.

D. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface, where joint sealants, specified in Section 07 92 00 "Joint Sealants," are indicated.
2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints:

1. Install dowel bars and support assemblies at joints where indicated.
2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.

F. Dowel Plates: Install dowel plates at joints where indicated.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.

1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.

B. Notify State and testing and inspection agencies 24 hours prior to commencement of concrete placement.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, but not to exceed the amount indicated on the concrete delivery ticket.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.

1. If a section cannot be placed continuously, provide construction joints as indicated.
2. Deposit concrete to avoid segregation.
3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.

a. Do not use vibrators to transport concrete inside forms.
b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Do not place concrete floors and slabs in a checkerboard sequence.
2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
3. Maintain reinforcement in position on chairs during concrete placement.
4. Screed slab surfaces with a straightedge and strike off to correct elevations.
5. Level concrete, cut high areas, and fill low areas.
6. Slope surfaces uniformly to drains where required.
7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
8. Do not further disturb slab surfaces before starting finishing operations.

3.7 FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:

1. ACI 301 Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.

    a. Patch voids larger than 1-1/2 inches wide or 1/2 inch deep.
    b. Remove projections larger than 1 inch.
    c. Tie holes do not require patching.
    d. Surface Tolerance: ACI 117 Class D.
    e. Apply to concrete surfaces not exposed to public view.

2. ACI 301Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.

    a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
    b. Remove projections larger than 1/4 inch.
    c. Patch tie holes.
    d. Surface Tolerance: ACI 117 Class B.
    e. Locations: Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

B. Related Unformed Surfaces:

1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a color and texture matching adjacent formed surfaces.
2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

A. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish:

1. While still plastic, texture concrete surface that has been screeded and bull-floated or darbied.
2. Use stiff brushes, brooms, or rakes to produce a profile depth of 1/4 inch in one direction.
3. Apply scratch finish to surfaces to receive mortar setting beds for bonded cementitious floor finishes.

C. Float Finish:

1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.

2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.
3. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish:

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
4. Do not add water to concrete surface.
5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
6. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
7. Finish surfaces to the following tolerances, in accordance with ASTM E1155, for a randomly trafficked floor surface:

    a. Slabs on Ground:

        1) Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch.
        2) Specified overall values of flatness, F_F 25; and of levelness, F_L 20; with minimum local values of flatness, F_F 17; and of levelness, F_L 15.

3.9 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling In:

1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases 6 inches high unless otherwise indicated on Drawings, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support.
3. Minimum Compressive Strength: 4000 psi at 28 days.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
6. Prior to pouring concrete, place and secure anchorage devices.

    a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
    b. Cast anchor-bolt insert into bases.
    c. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.10 CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h before and during finishing operations.

B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:

1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
3. If forms remain during curing period, moist cure after loosening forms.
4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:

    a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
    b. Continuous Sprinkling: Maintain concrete surface continuously wet.
    c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
    d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.

e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.

1) Recoat areas subject to heavy rainfall within three hours after initial application.
2) Maintain continuity of coating and repair damage during curing period.

C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:

1. Begin curing immediately after finishing concrete.
2. Interior Concrete Floors:

a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:

1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.

a) Lap edges and ends of absorptive cover not less than 12-inches.
b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.

2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.

a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
b) Cure for not less than seven days.

3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

a) Water.
b) Continuous water-fog spray.

b. Floors to Receive Penetrating Liquid Floor Treatments: Contractor has option of the following:

1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.

a) Lap edges and ends of absorptive cover not less than 12 inches.

b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.

2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.

a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
b) Cure for not less than seven days.

3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

a) Water.
b) Continuous water-fog spray.

c. Floors to Receive Polished Finish: Contractor has option of the following:

1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.

a) Lap edges and ends of absorptive cover not less than 12 inches.
b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.

2) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

a) Water.
b) Continuous water-fog spray.

d. Floors to Receive Chemical Stain:

1) As soon as concrete has sufficient set to permit application without marring concrete surface, install curing paper over entire area of floor.
2) Install curing paper square to building lines, without wrinkles, and in a single length without end joints.
3) Butt sides of curing paper tight; do not overlap sides of curing paper.
4) Leave curing paper in place for duration of curing period, but not less than 28 days.

e. Floors to Receive Urethane Flooring:

1) As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
2) Rewet absorptive cover, and cover immediately with polyethylene moisture-retaining cover with edges lapped 6 inches and sealed in place.
3) Secure polyethylene moisture-retaining cover in place to prohibit air from circulating under polyethylene moisture-retaining cover.
4) Leave absorptive cover and polyethylene moisture-retaining cover in place for duration of curing period, but not less than 28 days.

f. Floors to Receive Curing and Sealing Compound:

1) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.
2) Recoat areas subjected to heavy rainfall within three hours after initial application.
3) Repeat process 24 hours later, and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

3.11 TOLERANCES

A. Conform to ACI 117.

3.12 APPLICATION OF LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment in accordance with manufacturer's written instructions.

1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
2. Do not apply to concrete that is less than seven days old.
3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing.
4. Rinse with water; remove excess material until surface is dry.
5. Apply a second coat in a similar manner if surface is rough or porous.

3.13 CONCRETE SURFACE REPAIRS

A. Defective Concrete:

1. Repair and patch defective areas when approved by State.
2. Remove and replace concrete that cannot be repaired and patched to State's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete.

    a. Limit cut depth to 3/4 inch.
    b. Make edges of cuts perpendicular to concrete surface.
    c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
    d. Fill and compact with patching mortar before bonding agent has dried.
    e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement, so that, when dry, patching mortar matches surrounding color.

    a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
    b. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance as determined by the Steate.

D. Repairing Unformed Surfaces:

1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.

    a. Correct low and high areas.
    b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

2. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
3. After concrete has cured at least 14 days, correct high areas by grinding.
4. Correct localized low areas during, or immediately after, completing surface-finishing operations by cutting out low areas and replacing with patching mortar.

    a. Finish repaired areas to blend into adjacent concrete.

5. Correct other low areas scheduled to remain exposed with repair topping.

a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations.
b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete.

a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch clearance all around.
b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.
c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
d. Place, compact, and finish to blend with adjacent finished concrete.
e. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar.

a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.
b. Dampen cleaned concrete surfaces and apply bonding agent.
c. Place patching mortar before bonding agent has dried.
d. Compact patching mortar and finish to match adjacent concrete.
e. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to State's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to State's approval.

3.14 FIELD QUALITY CONTROL

A. Special Inspections: State will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.

B. Testing Agency: State will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

1. Testing agency shall be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
2. Testing agency shall immediately report to State, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
3. Testing agency shall report results of tests and inspections, in writing, to the State, Contractor, and concrete manufacturer within 48 hours of inspections and tests.

a. Test reports shall include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:

1) Project name.
2) Name of testing agency.
3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
4) Name of concrete manufacturer.
5) Date and time of inspection, sampling, and field testing.
6) Date and time of concrete placement.
7) Location in Work of concrete represented by samples.
8) Date and time sample was obtained.
9) Truck and batch ticket numbers.
10) Design compressive strength at 28 days.
11) Concrete mixture designation, proportions, and materials.
12) Field test results.
13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
14) Type of fracture and compressive break strengths at seven days and 28 days.

C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.

D. Inspections:

1. Headed bolts and studs.
2. Verification of use of required design mixture.
3. Concrete placement, including conveying and depositing.
4. Curing procedures and maintenance of curing temperature.
5. Verification of concrete strength before removal of shores and forms from beams and slabs.
6. Batch Plant Inspections: On a random basis.

E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M shall be performed in accordance with the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.

a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C143/C143M:

    a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
    b. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete;.

    a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

4. Concrete Temperature: ASTM C1064/C1064M:

    a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.

5. Compression Test Specimens: ASTM C31/C31M:

    a. Cast and laboratory cure two sets of three 6-inch by 12-inch or 4-inch by 8-inch cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C39/C39M.

    a. Test one set of two laboratory-cured specimens at seven days and one set of two specimens at 28 days. Test one set of two specimens at 56 days if required.
    b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.
9. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by the State but will not be used as sole basis for approval or rejection of concrete.
10. Additional Tests:

    a. Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by the State.

b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by the State.

1) Acceptance criteria for concrete strength shall be in accordance with ACI 301 section 1.6.6.3.

11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

F. Measure floor and slab flatness and levelness in accordance with ASTM E1155 within 72 hours of completion of floor finishing and promptly report test results to State.

3.15 PROTECTION

A. Protect concrete surfaces as follows:

1. Protect from petroleum stains.
2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit vehicles from interior concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.
5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.
7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.
8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

END OF SECTION 03 30 00

SECTION 04 22 00

CONCRETE UNIT MASONRY

1.1 QUALITY ASSURANCE

A. Sample panels for exposed masonry assemblies Mockups of typical wall areas.

1.2 SUSTAINABILITY REQUIREMENTS

A. Sourcing:
   1. Regional materials.

1.3 PERFORMANCE REQUIREMENTS

A. Net-Area Compressive Strengths of Structural Unit Masonry: 2,000 psi.

B. Determine net-area compressive strength of masonry by unit-strength method.

1.4 MATERIALS

A. Concrete Masonry Units (CMUs):
   1. Units made with integral water repellent for exposed units and where indicated.
   2. CMUs: Lightweight.
   3. Insulated CMUs.
   4. Color: As selected by the State from full range of colors.

B. Masonry Lintels: Precast units matching CMUs or prefabricated or built-in-place CMU lintels.

C. Reinforcing Steel: Uncoated-steel reinforcing bars.

D. Masonry-Joint Reinforcement:
   1. Exterior Walls: Hot-dip galvanized, carbon steel.

E. Ties and Anchors: Galvanized steel.
   1. Adjustable anchors for connecting to structural steel framing.
   2. Adjustable anchors for connecting to concrete.
   3. Partition top anchors.
   4. Rigid anchors.

F. Reinforcing bar positioners.

G. Masonry-Cell Fill: lightweight aggregate.

H. Mortar:
   1. Portland cement-lime masonry cement or mortar cement mortar unless otherwise indicated.
   2. Portland cement-lime masonry cement or mortar cement for exterior masonry.
   3. Portland cement-lime masonry cement or mortar cement for reinforced masonry.
   4. Pigmented Colored-aggregate mortar for exposed mortar joints.

1.5 FIELD QUALITY CONTROL

A. Testing Agency: Engaged by the State.

B. Inspections: Special inspections according to Level B in TMS 402/ACI 530/ASCE 5.

END OF SECTION 04 22 00

SECTION 05 12 00

STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural steel.
2. Shrinkage-resistant grout.

1.2 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated and as described in ANSI/AISC 303.

B. Seismic-Load-Resisting System: Elements of structural-steel frame designated as "SLRS" or along grid lines designated as "SLRS", including columns, beams, and braces and their connections.

C. Protected Zone: Structural members or portions of structural members indicated as "protected zone." Connections of structural and nonstructural elements to protected zones are limited.

D. Demand-Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the seismic-load-resisting system and which are indicated as "demand critical" or "seismic critical."

1.3 COORDINATION

A. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Structural-steel materials.
2. High-strength, bolt-nut-washer assemblies.
3. Anchor rods.
4. Threaded rods.
5. Forged-steel hardware.
6. Galvanized-steel primer.

7. Etching cleaner.
8. Galvanized repair paint.
9. Shrinkage-resistant grout.
10. Shear stud connectors.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Environmental Product Declaration: For each product.
3. Health Product Declaration: For each product.
4. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.

C. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment Drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
5. Identify members and connections of the seismic-load-resisting system.
6. Indicate locations and dimensions of protected zones.
7. Identify demand-critical welds.
8. Identify members not to be shop primed.

D. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide in accordance with AWS D1.1/D1.1M for each welded joint qualified by testing, including the following:

1. Power source (constant current or constant voltage).
2. Electrode manufacturer and trade name, for demand-critical welds.
3. Least anticipated service temperature: 20 degrees F.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator conducting work associated with DCW welding.

B. Welding certificates.

C. Mill test reports for structural-steel materials, including chemical and physical properties.

D. Product Test Reports: For the following:

1. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
2. Direct-tension indicators.
3. Tension-control, high-strength, bolt-nut-washer assemblies.

E. Survey of existing conditions.

F. Source quality-control reports.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.

1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided State's testing and inspecting agency observes repackaging and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F3125/F3125M, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content may be used for LEED credit.

B. W-Shapes: ASTM A992/A992M.

C. Channels, Angles: ASTM A36/A36M.

D. Plate and Bar: ASTM A36/A36M.

E. Plate and Bar to receive DCW weld: ASTM A992/A992M.

F. Cold-Formed Hollow Structural Sections: ASTM A500/A500M, Grade B structural tubing.

G. Steel Pipe: ASTM A53/A53M, Type E or Type S, Grade B.

1. Finish: Black except where indicated to be galvanized.

H. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS AND CONNECTORS

A. High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.

1. Direct-Tension Indicators: ASTM F959/F959M, Type 325-1, compressible-washer type with plain finish.

B. Zinc-Coated High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.

1. Finish: Hot-dip or mechanically deposited zinc coating.
2. Direct-Tension Indicators: ASTM F959/F959M, Type 325-1, compressible-washer type with mechanically deposited zinc coating finish.

C. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F3125/F3125M, Grade F1852, Type 1, round head assemblies, consisting of steel structural bolts with splined ends; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.

1. Finish: Plain.

D. Shear Stud Connectors: ASTM A108, AISI C-1015 through C-1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

2.3 RODS

A. Headed Anchor Rods: ASTM F1554, Grade 55, weldable, straight.

1. Nuts: ASTM A563 hex carbon steel.
2. Plate Washers: ASTM A36/A36M carbon steel.
3. Washers: ASTM F436, Type 1, hardened carbon steel.
4. Finish: Plain.

B. Threaded Rods: ASTM A36/A36M.

1. Nuts: ASTM A63 hex carbon steel.
2. Washers: ASTM A36/A36M carbon steel.
3. Finish: Plain or Hot-dip zinc coating, ASTM A153/A153M, Class C Mechanically deposited zinc coating, ASTM B695, Class 50 as noted.

2.4 PRIMER

A. Steel Primer:
   1. SSPC-Paint 23, latex primer.
   2. Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

B. Galvanized-Steel Primer: MPI#26.

   1. Etching Cleaner: MPI#25, for galvanized steel.
   2. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.

2.5 SHRINKAGE-RESISTANT GROUT

A. Metallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.

B. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.6 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.

   1. Camber structural-steel members where indicated.
   2. Fabricate beams with rolling camber up.
   3. Identify high-strength structural steel in accordance with ASTM A6/A6M and maintain markings until structural-steel framing has been erected.
   4. Mark and match-mark materials for field assembly.
   5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

   1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted in accordance with SSPC-SP 2.

F. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using automatic end welding of headed-stud shear connectors in accordance with AWS D1.1/D1.1M and manufacturer's written instructions.

2.7 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.

1. Joint Type: Pretensioned unless noted Slip critical..

B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

2.8 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel in accordance with ASTM A123/A123M.

1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.

2.9 SOURCE QUALITY CONTROL

A. Testing Agency: State will engage a qualified testing agency to perform shop tests and inspections.

1. Allow testing agency access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
2. Bolted Connections: Inspect shop-bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
3. Welded Connections: Visually inspect shop-welded connections in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

a. Liquid Penetrant Inspection: ASTM E165/E165M.

b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
c. Ultrasonic Inspection: ASTM E164.
d. Radiographic Inspection: ASTM E94/E94M.

4. In addition to visual inspection, test and inspect shop-welded shear stud connectors in accordance with requirements in AWS D1.1/D1.1M for stud welding and as follows:

a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear stud connector.
b. Conduct tests in accordance with requirements in AWS D1.1/D1.1M on additional shear stud connectors if weld fracture occurs on shear stud connectors already tested.

5. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

1. Do not remove temporary shoring supporting composite deck construction and structural-steel framing until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.

B. Baseplates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of baseplate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates, so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for grouting.

C. Maintain erection tolerances of structural steel within ANSI/AISC 303.

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure. Slope roof framing members to slopes indicated.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.

1. Joint Type: Pretensioned unless noted Slip critical.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.

C. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using end welding of headed-stud shear connectors in accordance with AWS D1.1/D1.1M and manufacturer's written instructions.

3.5 REPAIR

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing, and repair galvanizing to comply with ASTM A780/A780M.

B. Touchup Priming: Cleaning and touchup priming are specified in Section 09 96 00 "High-Performance Coatings."

3.6 FIELD QUALITY CONTROL

A. Special Inspections: State will engage a special inspector to perform the following special inspections:

1. Verify structural-steel materials and inspect steel frame joint details.
2. Verify weld materials and inspect welds.
3. Verify connection materials and inspect high-strength bolted connections.

B. Testing Agency: State will engage a qualified testing agency to perform tests and inspections.

1. Bolted Connections: Inspect bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
2. Welded Connections: Visually inspect field welds in accordance with AWS D1.1/D1.1M.

    a. In addition to visual inspection, test and inspect field welds in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

        1) Liquid Penetrant Inspection: ASTM E165/E165M.
        2) Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
        3) Ultrasonic Inspection: ASTM E164.
        4) Radiographic Inspection: ASTM E94/E94M.

3. Shear Stud Connectors: In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
b. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

END OF SECTION 05 12 00

SECTION 05 12 13

ARCHITECTURALLY EXPOSED STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes architecturally exposed structural-steel (AESS).

1. Requirements in Section 051200 "Structural Steel Framing" also apply to AESS.

1.2 DEFINITIONS

A. AESS: Structural steel designated as "architecturally exposed structural steel" or "AESS" in the Contract Documents.

B. Category 1 AESS: AESS that is within 96 inches vertically and 36 inches horizontally of a walking surface and that is visible to a person standing on that walking surface or is designated as "Category 1 architecturally exposed structural steel" or "AESS-1" in the Contract Documents.

C. Category 2 AESS: AESS that is within 20 feet vertically and horizontally of a walking surface and that is visible to a person standing on that walking surface or is designated as "Category 2 architecturally exposed structural steel" or "AESS-2" in the Contract Documents.

D. Category 3 AESS: AESS that is not defined as Category 1 or Category 2 or that is designated as "Category 3 architecturally exposed structural steel" or "AESS-3" in the Contract Documents or that is indicated to receive intumescent mastic fireproofing.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

B. Shop Drawings: Show fabrication of AESS components. Shop Drawings for structural steel may be used for AESS provided items of AESS are specifically identified and requirements below are met for AESS.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment Drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain. Indicate grinding, finish, and profile of welds.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections. Indicate orientation of bolt heads.
5. Indicate exposed surfaces and edges and surface preparation being used.
6. Indicate special tolerances and erection requirements.

C. Samples: Submit Samples of AESS to set quality standards for exposed welds for Category 1 AESS.

1. Two steel plates, 3/8 by 8 by 4 inches, with long edges joined by a groove weld and with weld ground smooth.
2. Steel plate, 3/8 by 8 by 8 inches, with one end of a short length of rectangular steel tube, 4 by 6 by 3/8 inches, welded to plate with a continuous fillet weld and with weld ground smooth and blended.
3. Round steel tube or pipe, minimum 8 inches in diameter, with end of another round steel tube or pipe, approximately 4 inches in diameter, welded to its side at a 45-degree angle with a continuous fillet weld and with weld ground smooth and blended.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer fabricator.

B. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD, or is accredited by the IAS Fabricator Inspection Program for Structural Steel (AC 172).

B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category ACSE Category CSE.

C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P1 Endorsement P2 Endorsement P3 or SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."

D. Mockups: Build mockups of AESS to set quality standards for fabrication and installation.

1. Build mockup of typical portion of AESS as shown on Drawings.
2. Coordinate painting requirements with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
3. Coordinate high-performance coatings requirements with Section 099600 "High-Performance Coatings."
4. Coordinate intumescent mastic fireproofing requirements with Section 078123 "Intumescent Mastic Fireproofing."
5. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Use special care in handling to prevent twisting, warping, nicking, and other damage. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.9 FIELD CONDITIONS

A. Field Measurements: Where AESS is indicated to fit against other construction, verify actual dimensions by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 BOLTS, CONNECTORS, AND ANCHORS

A. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, round-head assemblies, consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.

1. Finish: Plain.

B. Corrosion-Resisting (Weathering Steel), Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 3, round-head assemblies, consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.

2.2 FILLER

A. Filler: Polyester filler intended for use in repairing dents in automobile bodies.

2.3 PRIMER

A. Primer: Comply with Section 099113 "Exterior Painting," Section 099123 "Interior Painting," and Section 099600 "High-Performance Coatings."

B. Primer: SSPC-Paint 25, Type I Type II, zinc oxide, alkyd, linseed oil primer.

C. Primer: SSPC-Paint 25 BCS, Type I Type II, zinc oxide, alkyd, linseed oil primer.

D. Primer: SSPC-Paint 23, latex primer.

E. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

F. Etching Cleaner for Galvanized Metal: MPI#25.

G. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20 ASTM A 780/A 780M.

H. Shop Primer for Galvanized Steel: MPI#26, cementitious galvanized metal primer MPI#80, vinyl wash primer MPI#134, water-based galvanized metal primer.

2.4 FABRICATION

A. Shop fabricate and assemble AESS to the maximum extent possible. Locate field joints at concealed locations if possible. Detail assemblies to minimize handling and to expedite erection.

B. In addition to special care used to handle and fabricate AESS, comply with the following:

1. Fabricate with exposed surfaces smooth, square, and free of surface blemishes including pitting, rust, scale, and roughness.
2. Grind sheared, punched, and flame-cut edges of Category 1 AESS to remove burrs and provide smooth surfaces and edges.
3. Fabricate Category 1 AESS with exposed surfaces free of mill marks, including rolled trade names and stamped or raised identification.

4. Fabricate Category 1 and Category 2 AESS with exposed surfaces free of seams to maximum extent possible.
5. Remove blemishes by filling or grinding or by welding and grinding, before cleaning, treating, and shop priming.
6. Fabricate with piece marks fully hidden in the completed structure or made with media that permits full removal after erection.
7. Fabricate Category 1 AESS to the tolerances specified in AISC 303 for steel that is designated AESS.
8. Fabricate Category 2 and Category 3 AESS to the tolerances specified in AISC 303 for steel that is not designated AESS.
9. Seal-weld open ends of hollow structural sections with 3/8-inch closure plates for Category 1 AESS.

C. Curved Members: Fabricate indicated members to curved shape by rolling to final shape in fabrication shop.

1. Distortion of webs, stems, outstanding flanges, and legs of angles shall not be visible from a distance of 20 feet under any lighting conditions.
2. Tolerances for walls of hollow steel sections after rolling shall be approximately 1/2 inch.

D. Coping, Blocking, and Joint Gaps: Maintain uniform gaps of 1/8 inch with a tolerance of 1/32 inch for Category 1 AESS.

E. Bolt Holes: Cut, drill,or punch standard bolt holes perpendicular to metal surfaces.

F. Cleaning Corrosion-Resisting Structural Steel: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.5 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work, and comply with the following:

1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding specified tolerances.
2. Use weld sizes, fabrication sequence, and equipment for AESS that limit distortions to allowable tolerances.
3. Provide continuous, sealed welds at angle to gusset-plate connections and similar locations where Category 1 AESS is exposed to weather.
4. Provide continuous welds of uniform size and profile where Category 1 AESS is welded.
5. Grind butt and groove welds flush to adjacent surfaces within tolerance of plus 1/16 inch, minus zero inch for Category 1 and Category 2 AESS.
6. Make butt and groove welds flush to adjacent surfaces within tolerance of plus 1/16 inch, minus zero inch for Category 1 and Category 2 AESS. Do not grind unless required for clearances or for fitting other components, or unless directed to correct unacceptable work.
7. Remove backing bars or runoff tabs; back-gouge and grind steel smooth for Category 1 and Category 2 AESS.
8. At locations where welding on the far side of an exposed connection of Category 1 and Category 2 AESS occurs, grind distortions and marking of the steel to a smooth profile aligned with adjacent material.
9. Make fillet welds for Category 1 and Category 2 AESS oversize and grind to uniform profile with smooth face and transition.
10. Make fillet welds for Category 1 and Category 2 AESS of uniform size and profile with exposed face smooth and slightly concave. Do not grind unless directed to correct unacceptable work.

2.6 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.

1. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
2. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

2.7 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials.

5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

1. SSPC-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 14/NACE No. 8, "Industrial Blast Cleaning."
5. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."
6. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
7. SSPC-SP 10/NACE No. 2, "Near-White Blast Cleaning."
8. SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning."
9. SSPC-SP 8, "Pickling."

C. Preparing Galvanized Steel for Shop Priming: After galvanizing, thoroughly clean steel of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

D. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Examine AESS for twists, kinks, warping, gouges, and other imperfections before erecting.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep AESS secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

1. If possible, locate welded tabs for attaching temporary bracing and safety cabling where they will be concealed from view in the completed Work.
2. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

A. Set AESS accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

1. Erect Category 1 AESS to the tolerances specified in AISC 303 for steel that is designated AESS.
2. Erect Category 2 and Category 3 AESS to the tolerances specified in AISC 303 for steel that is not designated AESS.

B. Do not use thermal cutting during erection.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.
2. Orient bolt heads in same direction for each connection and to maximum extent possible in same direction for similar connections.

B. Weld Connections: Comply with requirements in "Weld Connections" Paragraph in "Shop Connections" Article.

1. Remove backing bars or runoff tabs; back-gouge and grind steel smooth for Category 1 and Category 2 AESS.
2. Remove erection bolts in Category 1 and Category 2 AESS, fill holes, and grind smooth.
3. Fill weld access holes in Category 1 and Category 2 AESS and grind smooth.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect AESS as specified in Section 051200 "Structural Steel Framing." The testing agency is not responsible for enforcing requirements relating to aesthetic effect.

B. Architect will observe AESS in place to determine acceptability relating to aesthetic effect.

3.6 REPAIRS AND PROTECTION

A. Remove welded tabs that were used for attaching temporary bracing and safety cabling and that are exposed to view in the completed Work. Grind steel smooth.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

C. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

D. Touchup Painting: Cleaning and touchup painting are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

E. Touchup Priming: Cleaning and touchup priming are specified in Section 099600 "High-Performance Coatings."

END OF SECTION 05 12 13

SECTION 05 50 00

METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Miscellaneous steel trim.
   2. Downspout guards.
   3. Decorative stainless steel perforated sheet metal for suspended cloud.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of project.

B. Sustainable Design Submittals:

   1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
   2. Environmental product declaration.
   3. Environmental Product Declaration (EPD): For each product.

C. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

D. Samples: For each type and finish of extruded nosing and tread.

PART 2 - PRODUCTS

2.1 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

C. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

D. Stainless Steel Bars and Shapes: ASTM A276/A276M, Type 304.

E. Perforated Stainless Steel Mesh: ASTM A240.

F. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from plate complying with ASTM A36/A36M or ASTM A283/A283M, Grade C or D.

G. Rolled-Stainless Steel Floor Plate: ASTM A793.

H. Abrasive-Surface Floor Plate: Steel plate with abrasive granules rolled into surface or with abrasive material metallically bonded to steel.

I. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.

J. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.

K. Zinc-Coated Steel Wire Rope: ASTM A741.

1. Wire Rope Fittings: Hot-dip galvanized-steel connectors with capability to sustain, without failure, a load equal to minimum breaking strength of wire rope with which they are used.

L. Stainless Steel Wire Rope: Wire rope manufactured from stainless steel wire complying with ASTM A492, Type 316.

1. Wire Rope Fittings: Stainless steel connectors, Type 316, with capability to sustain, without failure, a load equal to minimum breaking strength of wire rope with which they are used.

M. Steel Prestressing Strand: ASTM A416/A416M, Grade 270 (Grade 1860), low-relaxation, seven-wire, with 0.9-lb/sq. ft. (4.39-kg/sq. m) zinc coating.

1. Steel Prestressing Strand Fittings: Hot-dip galvanized-steel anchors and connectors with capability to sustain, without failure, a load equal to minimum breaking strength of steel prestressing strand with which they are used.

N. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

1. Size of Channels: 1-5/8 by 1-5/8 inches (41 by 41 mm).
2. Material: Galvanized steel, ASTM A653/A653M,, with G90 (Z275) coating; 0.079-inch (2-mm) nominal thickness.

O. Cast Iron: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.

P. Aluminum Extrusions: ASTM B221 (ASTM B221M), Alloy 6063-T6.

Q. Aluminum-Alloy Rolled Tread Plate: ASTM B632/B632M, Alloy 6061-T6.

R. Aluminum Castings: ASTM B26/B26M, Alloy 443.0-F.

S. Bronze Extrusions: ASTM B455, Alloy UNS No. C38500 (extruded architectural bronze).

T. Bronze Castings: ASTM B584, Alloy UNS No. C83600 (leaded red brass) or UNS No. C84400 (leaded semired brass).

U. Nickel Silver Castings: ASTM B584, Alloy UNS No. C97600 (20 percent leaded nickel bronze).

2.2 FASTENERS

A. General: Unless otherwise indicated, provide stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

1. Provide stainless steel fasteners for fastening stainless steel.
2. Provide bronze fasteners for fastening bronze.

B. Cast-in-Place Anchors in Concrete: Either threaded or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329/F2329M.

C. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless steel bolts, ASTM F593 (ASTM F738M), and nuts, ASTM F594 (ASTM F836M).

D. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches (41 by 22 mm) by length indicated with anchor straps or studs not less than 3 inches (75 mm) long at not more than 8 inches (200 mm) o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B633, Class Fe/Zn 5, as needed for fastening to inserts.

2.3 MISCELLANEOUS MATERIALS

A. Shop Primers: Provide primers that comply with paint specifications contained herein.

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

C. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

D. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

E. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

G. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

H. Concrete: Comply with requirements in Section 03 30 00 "Cast-in-Place Concrete" for normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa).

2.4 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c.

2.5 MISCELLANEOUS FRAMING AND SUPPORTS

A. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

B. Fabricate steel girders for wood frame construction from continuous steel shapes of sizes indicated.

1. Where wood nailers are attached to girders with bolts or lag screws, drill or punch holes at 24 inches (600 mm) o.c.

C. Fabricate steel pipe columns for supporting wood frame construction from steel pipe with steel baseplates and top plates as indicated. Drill or punch baseplates and top plates for anchor and connection bolts and weld to pipe with fillet welds all around. Make welds the same size as pipe wall thickness unless otherwise indicated.

2.6 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize exterior miscellaneous steel trim.

D. Prime exterior miscellaneous steel trim with zinc-rich primer.

2.7 DOWNSPOUT GUARDS

A. Fabricate downspout guards from 3/8-inch- (9.5-mm-) thick by 12-inch- (300-mm-) wide, steel plate, bent to fit flat against the wall or column at both ends and to fit around pipe with 2-inch (50-mm) clearance between pipe and pipe guard. Drill each end for two 3/4-inch (19-mm) anchor bolts.

B. Galvanize and prime steel downspout guards.

C. Prime steel downspout guards with zinc-rich primer.

2.8 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.9 GENERAL FINISH REQUIREMENTS

A. Finish metal fabrications after assembly.

2.10 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Shop prime iron and steel items unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Shop prime with universal shop primer unless indicated.

C. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:

1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

3. Items Indicated to Receive Primers Specified in Section 09 96 00 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
4. Other Steel Items: SSPC-SP 3, "Power Tool Cleaning."
5. Galvanized-Steel Items: SSPC-SP 16, "Brush-off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals."

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

A. Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for ceiling hung toilet partitions securely to, and rigidly brace from, building structure.

C. Anchor shelf angles securely to existing construction with expansion anchors.

D. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

3.3 REPAIRS

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 05 50 00

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 - GENERAL

1.2 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Framing with timber.
3. Framing with engineered wood products.
4. Shear wall panels.
5. Rooftop equipment bases and support curbs.
6. Wood blocking, cants, and nailers.
7. Wood furring.
8. Wood sleepers.
9. Plywood backing panels. B. Related Requirements:

1.3 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.

B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.

C. Exposed Framing: Framing not concealed by other construction.

D. OSB: Oriented strand board.

E. Timber: Lumber of 5 inches nominal size or greater in least dimension.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.

4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

B. Sustainable Design Submittals:

1. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
2. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
3. Chain-of-Custody Qualification Data: For manufacturer and vendor.
4. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
5. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.

C. Fastener Patterns: Full-size templates for fasteners in exposed framing.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Engineered wood products.
3. Shear panels.
4. Power-driven fasteners.
5. Post-installed anchors.
6. Metal framing anchors.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

B. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

C. Vendor Qualifications: A vendor that is certified for chain of custody by an FSCaccredited certification body.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Regional Materials: The following wood products shall be manufactured within 500 miles (800 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

1. Dimension lumber, except treated materials.
2. Laminated-veneer lumber.
3. Parallel-strand lumber.
4. Prefabricated wood I-joists.
5. Rim boards.

B. Regional Materials: The following wood products shall be manufactured within 500 miles (800 km) of Project site.

1. Dimension lumber, except treated materials.
2. Laminated-veneer lumber.
3. Parallel-strand lumber.
4. Prefabricated wood I-joists.
5. Rim boards.

C. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. Dress lumber, S4S, unless otherwise indicated.

D. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

E. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

1. Allowable design stresses, as published by manufacturer, shall meet, or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

1. For exposed lumber indicated to receive a stained or natural finish, omit marking and provide certificates of treatment compliance issued by inspection agency. D.

Application: Treat items indicated, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, studs, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 DIMENSION LUMBER FRAMING

A. Non-Load-Bearing Interior Partitions: Construction or No. 2 grade.

1. Application: Non load bearing Interior partitions.
2. Species:

a. Douglas fir-larch; WCLIB or WWPA. B.

Load-Bearing Partitions: No. 1 grade.

1. Application: Exterior walls and interior load-bearing partitions.
2. Species:

a. Douglas fir-larch; WCLIB or WWPA.

C. Ceiling Joists: Construction or No. 2 grade.

1. Species:

a. Douglas fir-larch; WCLIB or WWPA.

D. Joists, Rafters, and Other Framing Not Listed Above: No. 1 grade. Top Plates at load bearing walls No.1 & Better or Select Structural. 1. Species:

a. Douglas fir-larch; WCLIB or WWPA.

E. Exposed Framing: Hand-select material for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain, and wane.

1. Species and Grade: Redwood; No. 1 grade; RIS.

2.4 TIMBER FRAMING

A. Comply with the following requirements, according to grading rules of grading agency indicated:

1. Species and Grade: Douglas fir-larch, Douglas fir-larch (north): No. 1 grade; WCLIB, or WWPA.
2. Maximum Moisture Content: 19 percent.

2.5 ENGINEERED WOOD PRODUCTS

A. Composite Wood Products: Products shall be made without urea formaldehyde.

B. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Source Limitations: Obtain each type of engineered wood product from single source from a single manufacturer.

D. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.

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. Weyerhaeuser Company.

2. Extreme Fiber Stress in Bending, Edgewise: 2600 psi.
3. Modulus of Elasticity, Edgewise: 1,900,000 psi.

E. Parallel-Strand Lumber: Structural composite lumber made from wood strand elements with grain primarily parallel to member lengths, evaluated and monitored according to

ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.

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. Weyerhaeuser Company.

2. Extreme Fiber Stress in Bending, Edgewise: 2900 psi.
3. Modulus of Elasticity, Edgewise: 2,000,000 psi.

F. Wood I-Joists: Prefabricated units, I-shaped in cross section, made with solid or structural composite lumber flanges and wood-based structural panel webs, let into and bonded to flanges. Comply with material requirements of and with structural capacities established and monitored according to ASTM D 5055.

1. Manufacturers: Subject to compliance with requirements, provide products to meet or exceed the product used as basis of design. Manufacturers can include but are not limited to the following:

   a. RedBuilt Engineered Wood Products.
   b. Weyerhaeuser Company.

2. Web Material: Either OSB or plywood, complying with DOC PS 1 or DOC PS 2, Exposure 1.
3. Structural Properties: Depths and design values not less than those indicated.
4. Comply with APA PRI-400. Factory mark I-joists with APA-EWS trademark indicating nominal joist depth, joist class, span ratings, mill identification, and compliance with APA-EWS standard.

G. Laminated Strand Lumber: Product designed to be used as a load-bearing rim member and to brace wood I-joists at bearing ends, complying with research or evaluation report for I-joists.

1. Material: Product made from any combination solid lumber, wood strands, and veneers.
2. Thickness: 1 ½ or 1-3/4 inches as specified.
3. Allowable closest nail spacing: 16d common 6”cc; 10d common 4”cc; 8d common 3”cc; nailed on the narrow face per row. Minimum 2 rows required.
4. Comply with APA PRR-401, rim board grade. Factory mark rim boards with APAEWS trademark indicating thickness, grade, and compliance with APA-EWS standard.

2.6 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.

2. Nailers.
3. Rooftop equipment bases and support curbs.

4. Cants.
5. Furring.

B. Dimension Lumber Items: Construction or No. 2 grade lumber of the following species:

1. Douglas fir-larch; WCLIB or WWPA.

C. Concealed Boards: 19 percent maximum moisture content and the following species and grades:

1. Douglas fir-larch; Construction or No. 2 Common grade; WCLIB, or WWPA.

D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.7 FASTENERS

A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M or Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308 as appropriate for the substrate.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.8 METAL FRAMING ANCHORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following: Basis of design was Simpsons Strong Tie:

1. KC Metals Products, Inc.
2. Simpson Strong-Tie Co., Inc.

3. USP Structural Connectors.

B. Allowable design loads, as published by manufacturer, shall meet or exceed those of basis-of-design products. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.

C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.

1. Use for interior locations unless otherwise indicated.

D. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.

1. Use for wood-preservative-treated lumber and where indicated.

E. Stainless-Steel Sheet: ASTM A 666, Type 316.

1. Use for exterior locations and where indicated.

2.9 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.

B. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

C. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.

D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.

E. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole, uno.

F. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.

G. Do not splice structural members between supports unless otherwise indicated.

H. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

I. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.
3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.

J. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

K. Comply with AWPA M4 for applying field treatment to cut surfaces of preservativetreated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

L. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

M. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
2. ICC-ES evaluation report for fastener.

N. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

O. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.

1. Comply with approved fastener patterns where applicable.
2. Use common nails unless otherwise indicated. Drive nails snug but do not countersink nail heads.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal-size furring horizontally and vertically at 24 inches o.c.

C. Furring to Receive Gypsum Board Plaster Lath: Install 1-by-2-inch nominal-size furring vertically at 16 inches o.c.

3.4 WALL AND PARTITION FRAMING INSTALLATION

A. General: Provide single bottom plate and double top plates using members of 2-inch nominal thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions. Fasten plates to supporting construction unless otherwise indicated.

1. For exterior walls, provide 2-by-6-inch nominal-size wood studs spaced 16 inches o.c. unless otherwise indicated.
2. For interior partitions and walls, provide 2-by-6-inch nominal-or 2-by-4-inch nominal-size wood studs spaced 16 inches o.c. unless otherwise indicated.
3. Provide continuous horizontal blocking at midheight of partitions more than 96 inches high, using members of 2-inch nominal thickness and of same width as wall or partitions.

B. Construct corners and intersections with three or more studs.

3.5 FLOOR JOIST FRAMING INSTALLATION

A. General: Install floor joists with crown edge up and support ends of each member with not less than 1-1/2 inches of bearing on wood or metal, or 3 inches on masonry. Attach floor joists as follows:

1. Where supported on wood members, by flange nailing each side to plates and using metal framing anchors.
2. Where framed into wood supporting members, by using wood ledgers as indicated or, if not indicated, by using metal joist hangers.

B. Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than one-third depth of joist; do not locate closer than 2 inches from top or bottom.

C. Provide solid blocking of 2-inch nominal thickness by depth of joist at ends of joists unless nailed to header or band.

D. Provide solid blocking between joists under jamb studs for openings.

E. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.

1. Provide triple joists separated as above, under partitions receiving ceramic tile and similar heavy finishes or fixtures.

F. Provide bridging of type indicated below, by truss manufacturer at manufacturers recommended spacing or a minimum of one per span.

1. Steel bridging installed to comply with bridging manufacturer's written instructions.

3.6 CEILING JOIST AND RAFTER FRAMING INSTALLATION

A. Ceiling Joists: Install with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.

1. Where ceiling joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail to ends of rafters and to top plate, and nail to first joist or anchor with framing anchors or metal straps. Provide 1-by-8-inch nominal-size or 2-by-4-inch nominal-size stringers spaced 48 inches o.c. crosswise over main ceiling joists.

B. Rafters: Notch to fit exterior wall plates and toe nail or use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.

1. At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against valley rafters.
2. At hips, provide hip rafter of size indicated or, if not indicated, twice the thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against hip rafter.

C. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions if any.

3.7 TIMBER FRAMING INSTALLATION

Install timber beams with crown edge up and provide not less than 4 inches of bearing on supports. Provide continuous members unless otherwise indicated; tie together over supports as indicated if not continuous.

B. Install wood posts using metal anchors indicated.

C. Treat ends of timber beams and posts exposed to weather by dipping in water-repellent preservative for 15 minutes.

3.8 PROTECTION

A. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 10 00

SECTION 06 10 53

MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Framing with dimensional lumber.
2. Wood blocking and nailers.

1.2 DEFINITIONS

A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NHLA: National Hardwood Lumber Association.
3. NLGA: National Lumber Grades Authority.
4. SPIB: The Southern Pine Inspection Bureau.
5. WCLIB: West Coast Lumber Inspection Bureau.
6. WWPA: Western Wood Products Association.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Preservative-treated wood.
2. Power-driven fasteners.
3. Powder-actuated fasteners.
4. Expansion anchors.
5. Metal framing anchors.

1.5 DELIVERY, STORAGE AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
3. Provide dressed lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 19 percent for 2-inch nominal thickness or less unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete.

E. Fire-retardant lumber: Chemically treated and pressure impregnated as defined in Section 2303.2 CBC. Lumber shall be stamped by an approved agency at the factory and shall bear identification indicating the fire performance rating thereof.

2.3 DIMENSION LUMBER FRAMING

A. No. 2 grade Douglas fir-larch; WCLIB or WWPA.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers: All nailers shall match thickness of required insulation.
3. Rooftop equipment bases and support curbs.

B. For items of dimension lumber size, provide Construction, Stud or No. 2 grade lumber of any species.

C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.5 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1.

F. Bolts: Steel bolts complying with ASTM A 307, Grade; with ASTM A 563 hex nuts and, where indicated, flat washers.

G. Screws for Fastening to Metal Framing: length as recommended by screw manufacturer for material being fastened.

H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

I. Epoxy Anchors: Stainless steel anchor bolts, Alloy Group 1, ASTM F 593 and nuts, ASTM F 594. Injectable epoxy to be Hilti HIT-RE 500, or equal.

2.6 METAL FRAMING ANCHORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Cleveland Steel Specialty Co.
2. KC Metals Products, Inc.
3. Phoenix Metal Products, Inc.
4. Simpson Strong-Tie Co., Inc.
5. USP Structural Connectors.
6. Or equal.

B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.

1. Use for interior locations unless otherwise indicated.

C. Hot-Dip Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.

1. Use for wood-preservative-treated lumber and where indicated.

D. Stainless-Steel Sheet: ASTM A 666.

1. Use for exterior locations and where indicated.

2.7 MISCELLANEOUS MATERIALS

A. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

1. Adhesives shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesives 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."

B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spun-bonded polyolefin to produce an overall thickness of not less than 0.025 inch.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

C. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

D. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

E. Do not splice structural members between supports unless otherwise indicated.

F. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. CABO NES NER-272 for power-driven fasteners.
2. CBC Table 2304.9.1, "Fastening Schedule".

G. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD BLOCKING AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

END OF SECTION 06 10 53

SECTION 06 16 00

SHEATHING

PART 1 - GENERAL

1.2 SUMMARY

A. Section Includes:

1. Wall sheathing.
2. Roof sheathing.
3. Parapet sheathing.
4. Plywood Subflooring.

B. Related Requirements:

1. Section 06 10 00 "Rough Carpentry" for plywood backing panels.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
4. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.4 INFORMATIONAL SUBMITTALS

Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated plywood.
2. Fire-retardant-treated plywood.
3. Foam-plastic sheathing.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

B. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

C. Vendor Qualifications: A vendor that is certified for chain of custody by an FSCaccredited certification body.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: As tested according to ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 WOOD PANEL PRODUCTS

A. Emissions: Products shall meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Certified Wood: The following wood products shall be certified as "FSC Pure" according to FSC STD-01-001 and FSC STD-40-004.

1. Plywood.
2. Oriented strand board.

C. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

D. Factory mark panels to indicate compliance with applicable standard.

2.3 PRESERVATIVE-TREATED PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior

construction not in contact with ground, and Use Category UC4a for items in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

C. Application: Treat items indicated and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.4 WALL SHEATHING

A. Plywood Sheathing: DOC PS 1, Exterior, Structural I sheathing.

1. Span Rating: Not less than 24/0.
2. Nominal Thickness: Not less than 1/2 inch.

B. Oriented-Strand-Board Sheathing: DOC PS 2, Exposure 1, Structural I sheathing.

1. Span Rating: Not less than 24/0.
2. Nominal Thickness: Not less than 1/2 inch.

2.5 ROOF SHEATHING

A. Plywood Sheathing: DOC PS 1, Exterior, Structural I sheathing.

1. Span Rating: Not less than 32/16.
2. Nominal Thickness: Not less than 5/8 inch.

B. Oriented-Strand-Board Sheathing: DOC PS 2, Exposure 1, Structural I sheathing.

1. Span Rating: Not less than 32/16.
2. Nominal Thickness: Not less than 5/8 inch.

2.6 PARAPET SHEATHING

A. Plywood Sheathing: DOC PS 1, Exterior, Structural I sheathing.

1. Span Rating: Not less than 24/0.
2. Nominal Thickness: Not less than 1/2 inch.

B. Oriented-Strand-Board Sheathing: DOC PS 2, Exposure 1, Structural I sheathing.

1. Span Rating: Not less than 24/0.
2. Nominal Thickness: Not less than 1/2 inch.

2.7 PLYWOOD SUBFLOOR

Plywood Subfloor: DOC PS 1, Structural 1, Exposure 1, sheathing

1. Span Rating: Not less than 48.
2. Nominal Thickness: Not less than 1-1/8 inch.
3. Edge Detail: Tongue and groove.
4. Surface Finish: Fully sanded face.

2.8 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For roof parapet and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M or Type 304 stainless steel. B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Screws for Fastening Sheathing to Wood Framing: ASTM C 1002.

E. Screws for Fastening Composite Nail Base Insulated Roof Sheathing to Metal Roof Deck: Steel drill screws, in type and length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117. Provide washers or plates if recommended by sheathing manufacturer.

2.9 MISCELLANEOUS MATERIALS

A. Adhesives for Field Gluing Panels to Wood Framing: Formulation complying with ASTM D 3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. 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. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in the ICC's International Residential Code for One- and Two-Family Dwellings.

3. ICC-ES evaluation report for fastener.

D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate wall parapet and roof 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.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Plywood Subfloor:

a. Glue and nail to wood framing.
b. Space panels 1/8 inch apart at edges and ends.

2. Wall and Roof Sheathing:

a. Nail to wood framing.
b. Space panels 1/8 inch apart at edges and ends.

END OF SECTION 06 16 00

SECTION 06 20 23

INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior wood trim.

1.2 DEFINITIONS

A. MDF: Medium-density fiberboard.

B. MDO: Plywood with a medium-density overlay on the face.

C. PVC: Polyvinyl chloride.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.

1. Include data for wood-preservative treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained. Include chemical-treatment manufacturer's written instructions for finishing treated material.
2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced before shipment to Project site to levels specified.

B. Sustainable Design Submittals:

1. Environmental Product Declaration (EPD): For each product.
2. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
3. Chain-of-Custody Qualification Data: For manufacturer and vendor.
4. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
5. Product Data: For installation adhesives, indicating VOC content.
6. Laboratory Test Reports: For installation adhesives, indicating compliance with requirements for low-emitting materials.

C. Samples: For each exposed product and for each color and texture specified.

D. Samples for Initial Selection: For each type of product involving selection of colors, profiles, or textures.

E. Samples for Verification:

1. For each species and cut of lumber and panel products with nonfactory-applied finish, with half of exposed surface finished; 50 sq. in. (300 sq. cm) for lumber and 8 by 10 inches (200 by 250 mm) for panels.
2. For foam-plastic moldings, with half of exposed surface finished; 50 sq. in. (300 sq. cm).
3. For each finish system and color of lumber and panel products with factory-applied finish, 50 sq. in. (300 sq. cm) for lumber and 8 by 10 inches (200 by 250 mm) for panels.

1.4 QUALITY ASSURANCE

A. Certified Wood: Provide an invoice including vendor's chain-of-custody number, product cost, and entity being invoiced.

B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation.

1. Protect materials from weather by covering with waterproof sheeting, securely anchored.
2. Provide for air circulation around stacks and under coverings.

B. Deliver interior finish carpentry materials only when environmental conditions comply with requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions comply with requirements specified for installation areas.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet-work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Regional Materials: Manufacture the following wood products within 100 miles (160 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project site.

1. Interior trim.
2. Fire-rated interior door and sidelight frames.

B. Certified Wood: Certify the following wood products as "FSC Pure" in accordance with FSC STD-01-001 and FSC STD-40-004.

1. Interior trim.
2. Fire-rated interior door and sidelight frames.

C. Composite Wood Products: Verify products are made using ultra-low-emitting formaldehyde resins, as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products," or are made with no added formaldehyde.

D. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with applicable rules of any rules-writing agency certified by the American Lumber Standard Committee's (ALSC) Board of Review. Grade lumber by an agency certified by the ALSC's Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by grading agency.

E. Softwood Plywood: DOC PS 1.

F. Hardboard: ANSI A135.4.

G. MDF: ANSI A208.2, Grade 130.

H. Particleboard: ANSI A208.1, Grade M-2.

I. Melamine-Faced Particleboard: Particleboard complying with ANSI A208.1, Grade M-2, finished on both faces with thermally fused, melamine-impregnated decorative paper and complying with NEMA LD 3, Grade VGL, for Test Methods 3.3, 3.4, 3.6, 3.8, and 3.10.

1. Color: As selected by the State from manufacturer's full range.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC1.

1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 18 percent, respectively.
2. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
3. For exposed items indicated to receive transparent finish, do not use chemical formulations that contain colorants or that bleed through or otherwise adversely affect finishes.
4. Do not use material that is warped or does not comply with requirements for untreated material.
5. Mark lumber with treatment-quality mark of an inspection agency approved by the ALSC's Board of Review.

    a. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.

6. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

    a. For exposed plywood indicated to receive a stained or natural finish, mark back of each piece.

7. Application: All interior lumber and plywood.

2.3 INTERIOR TRIM

A. Lumber Trim for Opaque Finish (Painted Finish):

1. Species and Grade: Eastern white pine; NeLMA or NLGA Premium or 2 Common.
2. Species and Grade: Idaho white, lodgepole, ponderosa, radiata, or sugar pine; NLGA or WWPA 2 Common (Sterling).
3. Species and Grade: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine; NeLMA, NLGA, or WWPA Premium or 2 Common (Sterling).
4. Species and Grade: White woods; WWPA 2 Common.
5. Species and Grade: Douglas fir-larch or Douglas fir south; NLGA, WCLIB, or WWPA Prime or D finish.
6. Species and Grade: Spruce-pine-fir; NeLMA, NLGA, WCLIB, or WWPA 2 Common.
7. Species and Grade: Alder, aspen, basswood, cottonwood, gum, magnolia, soft maple, sycamore, tupelo, or yellow poplar; NHLA.
8. Maximum Moisture Content: 19 percent with at least 85 percent of shipment at 12 percent or less.

9. Maximum Moisture Content: 13 percent.
10. Finger Jointing: Allowed.
11. Face Surface: Surfaced (smooth).
12. Optional Material: Primed MDF of same actual dimensions as lumber indicated may be used in lieu of lumber.

B. Moldings for Opaque Finish (Painted Finish): Made to patterns included in MMPA's "WM/Series Softwood Moulding Patterns."

1. Softwood Moldings: MMPA WM 4, P grade.

    a. Species: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine.
    b. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.

2. Hardwood Moldings: MMPA WM 4, P-grade.

    a. Species: Aspen, basswood, cottonwood, gum, magnolia, soft maple, tupelo, or yellow poplar.
    b. Maximum Moisture Content: 9 percent.

3. Finger Jointing: Allowed.
4. Optional Material: Primed MDF.
5. Base Pattern: WM 713, 9/16-by-3-1/4-inch (14-by-83-mm) ranch base.
6. Shoe-Mold Pattern: WM 129, 7/16-by-11/16-inch (11-by-17-mm) quarter-round shoe mold.
7. Casing Pattern: WM 366, 11/16-by-2-1/4-inch (17-by-57-mm) featheredge casing.
8. Mull-Casing Pattern: WM 983, 3/8-by-1-3/4-inch (9.5-by-44-mm) featheredge casing.

2.4 MISCELLANEOUS MATERIALS

A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.

B. Low-Emitting Materials: Adhesives shall comply with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.

1. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2. Verify adhesives have a VOC content of 30 g/L or less.

D. Paneling Adhesive: Comply with paneling manufacturer's written instructions for adhesives.

1. Verify adhesives have a VOC content of 50 g/L or less.
2. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

E. Multipurpose Construction Adhesive: Formulation, complying with ASTM D3498, that is recommended for indicated use by adhesive manufacturer.

1. Verify adhesives have a VOC content of 70 g/L or less.
2. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.5 FABRICATION

A. Back out or kerf backs of the following members, except those with ends exposed in finished work:

1. Interior standing and running trim, except shoe and crown molds.
2. Wood-board paneling.

B. Ease edges of lumber less than 1 inch (25 mm) in nominal thickness to 1/16-inch (1.5-mm) radius and edges of lumber 1 inch (25 mm) or more in nominal thickness to 1/8-inch (3-mm) radius.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.

3.3 INSTALLATION, GENERAL

A. Do not use materials that are unsound; warped; improperly treated or finished; inadequately seasoned; too small to fabricate with proper jointing arrangements; or with defective surfaces, sizes, or patterns.

B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials.

1. Use concealed shims where necessary for alignment.
2. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
3. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
4. Install to tolerance of 1/8 inch in 96 inches (3 mm in 2438 mm) for level and plumb. Install adjoining interior finish carpentry with 1/32-inch (0.8-mm) maximum offset for flush installation and 1/16-inch (1.5-mm) maximum offset for reveal installation.
5. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

A. Install trim with minimum number of joints as is practical, using full-length pieces from maximum lengths of lumber available.

1. Do not use pieces less than 24 inches (610 mm) long, except where necessary.
2. Stagger joints in adjacent and related standing and running trim.
3. Miter at returns, miter at outside corners, and cope at inside corners to produce tight-fitting joints with full-surface contact throughout length of joint.
4. Use scarf joints for end-to-end joints.
5. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.
6. Match color and grain pattern of trim for transparent finish (stain or clear finish) across joints.
7. Install trim after gypsum-board joint finishing operations are completed.
8. Install without splitting; drill pilot holes before fastening where necessary to prevent splitting.
9. Fasten to prevent movement or warping.
10. Countersink fastener heads on exposed carpentry work and fill holes.

3.5 PANELING INSTALLATION

A. Plywood Paneling: Select and arrange panels on each wall to minimize noticeable variations in grain character and color between adjacent panels.

1. Leave 1/4-inch (6-mm) gap to be covered with trim at top, bottom, and openings.
2. Install with uniform tight joints between panels.
3. Attach panels to supports with manufacturer's recommended panel adhesive and fasteners.
4. Space fasteners and adhesive as recommended by panel manufacturer.
5. Conceal fasteners to greatest practical extent.
6. Arrange panels with grooves and joints over supports.

    a. Fasten to supports with nails of type and at spacing recommended by panel manufacturer.
    b. Use fasteners with prefinished heads matching groove color.

3.6 ADJUSTING

A. Replace interior finish carpentry that is damaged or does not comply with requirements.

1. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

B. Adjust joinery for uniform appearance.

3.7 CLEANING

A. Clean interior finish carpentry on exposed and semiexposed surfaces.

B. Restore damaged or soiled areas and touch up factory-applied finishes if any.

3.8 PROTECTION

A. Protect installed products from damage from weather and other causes during construction.

B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 06 20 23

SECTION 06 41 16

PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-faced architectural cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets that are not concealed within other construction.

1.2 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Environmental Product Declaration (EPD): For each product.
3. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
4. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
5. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For plastic-laminate-faced architectural cabinets.

1. Include plans, elevations, sections, and attachment details.
2. Show large-scale details.

3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
4. Show locations and sizes of cutouts and holes for items installed in plastic-laminate architectural cabinets.
5. Apply AWI Quality Certification Program label to Shop Drawings.

D. Samples: For each exposed product and for each color and texture specified, in manufacturer's or fabricator's standard size.

E. Samples for Initial Selection: For each type of exposed finish.

F. Samples for Verification: For the following:

1. Plastic Laminates: 8 by 10 inches, for each type, color, pattern, and surface finish required.

a. Provide one sample applied to core material with specified edge material applied to one edge.

2. Exposed Cabinet Hardware and Accessories: One full-size unit for each type and finish.

3. High Pressure Laminate Panels: 12 by 12 inches, for each color, pattern, and surface finish.

a. Provide edge banding on one edge.

4. Corner Pieces:

a. Cabinet-front frame joints between stiles and rails and at exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.

b. Miter joints for standing trim.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator and installer.

B. Product Certificates: For the following:

1. Composite wood and agrifiber products.
2. High-pressure decorative laminate.
3. Adhesives.

C. Quality Standard Compliance Certificates: AWI Quality Certification Program.

D. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

1. Shop Certification: AWI's Quality Certification Program accredited participant.

B. Installer Qualifications: AWI's Quality Certification Program accredited participant.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar finish operations that might damage architectural cabinets have been completed in installation areas. Store cabinets in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period. Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system in operating and maintaining temperature between 60 and 90 degF and relative humidity between 25 and 55 percent during the remainder of the construction period.

B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed/concealed by construction, and indicate measurements on Shop Drawings.

C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of cabinets indicated for construction, finishes, installation, and other requirements.

1. Provide inspections of fabrication and installation together with labels and certificates from AWI certification program indicating that woodwork complies with requirements of grades specified.
2. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.

B. Grade: Premium.

C. Regional Materials: Manufacture wood products within 100 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.

D. Certified Wood: Certify wood products as "FSC Pure" in accordance with FSC STD-01-001 and FSC STD-40-004.

E. Type of Construction: Frameless.

F. Door and Drawer-Front Style: Flush overlay.

1. Reveal Dimension: ½ inch.

G. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by quality standard.

1. Manufacturers: Subject to compliance with requirements,

a. Wilsonart LLC – Basis of design.
b. Abet Laminati Inc.
c. Formica Corporation.
d. Pionite; a Panolam Industries International, Inc. brand.

H. Laminate Cladding for Exposed Surfaces:

1. Horizontal Surfaces: Grade HGS.
2. Postformed Surfaces: Grade HGP.
3. Vertical Surfaces: Grade HGS.
4. Edges: Grade HGS.
5. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.

I. Materials for Semiexposed Surfaces:

1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade VGS.

    a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12 inch thick, matching laminate in color, pattern, and finish.
    b. Edges of Thermoset Decorative Panel Shelves: PVC or polyester edge banding.
    c. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade VGS.

2. Drawer Sides and Backs: Solid-hardwood lumber.
3. Drawer Bottoms: Hardwood plywood.

J. Dust Panels: 1/4-inch plywood or tempered hardboard above compartments and drawers unless located directly under tops.

K. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.

L. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

1. Join subfronts, backs, and sides with glued dovetail joints.

M. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
1. Color: “Asian Night” #7949

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.

1. Wood Moisture Content: 8 to 13 percent.

B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.

1. Recycled Content of MDF and Particleboard: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

C. Composite Wood Products: Verify products are made using ultra-low-emitting formaldehyde resins, as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products," or are made with no added formaldehyde.

1. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130.
2. Particleboard: ANSI A208.1, Grade M-2.
3. Straw-Based Particleboard: ANSI A208.1, Grade M-2, except for density.
4. Thermoset Decorative Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for Test Methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.3 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Accuride International.
    b. Blum, Julius & Co., Inc.
    c. Knape & Vogt Manufacturing Company.

B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 135 degrees of opening.

C. Back-Mounted Pulls: BHMA A156.9, B02011.

D. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.

E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.

F. Shelf Rests: BHMA A156.9, B04013; metal, two-pin type with shelf hold-down clip.

G. Drawer Slides: BHMA A156.9.

1. Grade 1 and Grade 2: Side mounted and extending under bottom edge of drawer.

    a. Type: Full extension.
    b. Material: Zinc-plated steel with polymer rollers.

2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
3. For drawers not more than 3 inches high and not more than 24 inches wide, provide Grade 2.
4. For drawers more than 3 inches high, but not more than 6 inches high and not more than 24 inches wide, provide Grade 1.

5. For drawers more than 6 inches high or more than 24 inches wide, provide Grade 1HD-100.
6. For trash bins not more than 20 inches high and 16 inches wide, provide Grade 1HD-100.

H. Drawer Locks: BHMA A156.11, E07041.

I. Door and Drawer Silencers: BHMA A156.16, L03011.

J. Grommets for Cable Passage: 1-1/4-inch OD, molded-plastic grommets and matching plastic caps with slot for wire passage.

1. Color: Black.

K. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
1. Satin Stainless Steel: BHMA 630.

L. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.4 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

D. Adhesive for Bonding Plastic Laminate: Contact cement.

1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.5 FABRICATION

A. Fabricate architectural cabinets to dimensions, profiles, and details indicated.

B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as

necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify the State seven days in advance of the dates and times architectural cabinet fabrication will be complete.
2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.

3.2 INSTALLATION

A. Grade: Install cabinets to comply with quality standard grade of item to be installed.

B. Assemble cabinets and complete fabrication at Project site to extent that it was not completed in the shop.

C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with wafer-head cabinet installation screws.

D. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches using concealed shims.

1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

3.3 FIELD QUALITY CONTROL

A. Inspections: Provide inspection of installed Work through AWI's Quality Certification Program certifying that workwork, including installation, complies with requirements of the Architectural Woodwork Standards for the specified grade.
   1. Inspection entity shall prepare and submit report of inspection.

3.4 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects. Where not possible to repair, replace architectural cabinets. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean cabinets on exposed and semiexposed surfaces.

END OF SECTION 06 41 16

SECTION 06 42 19

PLASTIC-LAMINATE-FACED WOOD PANELING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Plastic-laminate-faced wood paneling.

1.2 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that paneling can be installed as indicated.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Sustainable Design Submittals:
   1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
   2. Environmental Product Declaration (EPD): For each product.
   3. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
   4. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
   5. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
   6. Product Data: For installation adhesives, indicating VOC content.
   7. Laboratory Test Reports: For installation adhesives, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For plastic-laminate-faced wood paneling.
   1. Include plans, elevations, sections, and attachment details.
   2. Show details full size.
   3. Show locations and sizes of furring and blocking, including concealed blocking specified in other Sections.
   4. Apply AWI Quality Certification Program label to Shop Drawings.

D. Samples: For each exposed product and for each color and texture specified, in manufacturer's or fabricator's standard size.

E. Samples for Initial Selection: For each type of plastic laminate.

F. Samples for Verification: For each type of exposed laminate, 8 by 10 inches.
   1. Provide one Sample applied to core material and with specified edge material applied to one edge.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and fabricator.

B. Product Certificates: For each type of product.

C. Quality Standard Compliance Certificates: AWI Quality Certification Program.

D. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
   1. Shop Certification: AWI's Quality Certification Program accredited participant.

B. Installer Qualifications: AWI's Quality Certification Program accredited participant.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver paneling until painting and similar operations that might damage paneling have been completed in installation areas. Store paneling in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install paneling until building is enclosed, wet-work is complete, and HVAC system is operating and will maintain temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

B. Environmental Limitations: Do not deliver or install paneling until building is enclosed, wet-work is complete, and HVAC system is operating and will maintain temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.

C. Field Measurements: Where paneling is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Locate concealed framing, blocking, and reinforcements that support paneling by field measurements before being enclosed/concealed by construction and indicate measurements on Shop Drawings.

D. Established Dimensions: Where paneling is indicated to fit to other construction, establish dimensions for areas where woodwork is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 PANELING, GENERAL

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of plastic-laminate-faced wood paneling (decorative laminate surfacing) indicated for construction, finishes, installation, and other requirements.
   1. Provide inspections including installation together with labels and certificates from AWI certification program indicating that woodwork complies with requirements of grades specified.
   2. The Contract Documents contain requirements that are more stringent than the referenced woodwork quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.

B. Regional Materials: Manufacture wood products within 100 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.

2.2 PLASTIC-LAMINATE-FACED WOOD PANELING - LW 1

A. Grade: Premium.

B. Certified Wood: Certify wood products as "FSC Pure" in accordance with FSC STD-01-001 and FSC STD-40-004.

C. Plastic Laminate: High-pressure decorative laminate complying with NEMA LD 3 and the following requirements:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Abet Laminati Inc.
      b. Formica Corporation.
      c. Wilsonart Engineered Surfaces
   2. Faces: Grade SGF.
   3. Backs: Grade BKH.

4. Exposed Edges: Same as faces.

D. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed surfaces complying with the following requirements:
   1. As indicated by manufacturer's designations.
   2. As selected by the State from manufacturer's full range.

E. Panel Core: Particleboard or MDF.
   1. Thickness: 3/4 inch.

F. Exposed Panel Edges Exterior corners: Legs of metal channels forming reveals with snap on corner trim.

G. Panel Edges Interior Corner: Legs of metal channels forming reveals with snap on corner trim.

H. Panel Joints: Legs of metal channels forming reveals with snap on cover.

I. Adhesives for Bonding Plastic Laminate: As recommended by manufacturer.
   1. Adhesive for Bonding Edges: Adhesive specified above for faces.

J. Fire-Retardant-Treated Paneling: Panels shall consist of fire-retardant plastic laminate and fire-retardant particleboard or fire-retardant, medium-density fiberboard (MDF). Panels shall have a flame-spread index of 25 or less and a smoke-developed index of 450 or less per ASTM E84, and be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.

K. Assemble panels by gluing and concealed fastening.

2.3 MATERIALS

A. Materials, General: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.

B. Wood Moisture Content: 5 to 10 percent.

C. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.
   1. Recycled Content of MDF and Particleboard: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

D. Composite Wood Products: Verify products are made using ultra-low-emitting formaldehyde resins, as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products," or are made with no added formaldehyde.
   1. MDF: ANSI A208.2, Grade 130.
   2. Particleboard: ANSI A208.1, Grade M-2.
   3. Straw-Based Particleboard: ANSI A208.1, Grade M-2, except for density.

2.4 FIRE-RETARDANT-TREATED MATERIALS

A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
   1. Use treated materials that comply with requirements of referenced quality standard. Do not use materials that are warped, discolored, or otherwise defective.
   2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
   3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.

B. Fire-Retardant Particleboard: Made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E84.
   1. For panels 3/4 inch thick and less, comply with ANSI A208.1 for Grade M-2 except for the following minimum properties: modulus of rupture, 1600 psi; modulus of elasticity, 300,000 psi; internal bond, 80 psi; and screw-holding capacity on face and edge, 250 and 225 lbf, respectively.
   2. For panels 13/16 to 1-1/4 inches thick, comply with ANSI A208.1 for Grade M-1 except for the following minimum properties: modulus of rupture, 1300 psi; modulus of elasticity, 250,000 psi; linear expansion, 0.50 percent; and screw-holding capacity on face and edge, 250 and 175 lbf, respectively.

C. Fire-Retardant Fiberboard: MDF panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E84.

2.5 INSTALLATION MATERIALS

A. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls. Extruded aluminum Z clips- basis of design.

B. Installation Adhesive: Product recommended by panel fabricator for each substrate for secure anchorage.
   1. Verify adhesives have a VOC content of 70 g/L or less.
   2. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.6 FABRICATION

A. Complete fabrication, including assembly, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
   1. Notify the State seven days in advance of the dates and times paneling fabrication will be complete.

B. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition paneling to humidity conditions in installation areas.

B. Before installing paneling, examine shop-fabricated work for completion and complete work as required, including removal of packing and back priming.

3.2 INSTALLATION

A. Grade: Install paneling to comply with quality standard grade of paneling to be installed.

B. Install paneling level, plumb, true in line, and without distortion. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches. Install with no more than 1/16 inch in 96-inch vertical cup or bow and 1/8 inch in 96-inch horizontal variation from a true plane.
   1. For flush paneling with revealed joints, install with variations in reveal width, alignment of top and bottom edges, and flushness between adjacent panels not exceeding 1/32 inch.

C. Anchor paneling to supporting substrate with concealed panel-hanger clips. Do not use face fastening unless otherwise indicated.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective paneling, where possible, to eliminate defects. Where not possible to repair, replace paneling. Adjust for uniform appearance.

B. Clean paneling on exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 06 42 19

SECTION 07 01 50.19

PREPARATION FOR REROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Full tear-off of roof system at areas indicated.
2. Partial tear-off of roof areas indicated.
3. Re-cover preparation of roof areas indicated.
4. Removal of flashings and counter flashings.
5. Temporary roofing.

1.2 UNIT PRICES

A. Work of this Section is affected by insulation removal and replacement unit price roof sheathing removal and replacement unit price and parapet wall sheathing removal and replacement unit price.

1.3 DEFINITIONS

A. EPS: Molded (expanded) polystyrene.

B. Full Roof Tear-off: Removal of existing roofing system down to existing roof deck.

C. OSB: Oriented strand board.

D. Partial Roof Tear-off: Removal of selected components and accessories from existing roofing system.

E. Roofing Terminology: Definitions in ASTM D1079 and glossary of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to work of this Section.

F. Roof Re-Cover Preparation: Existing roofing system is to remain and be prepared for new roof installed over it.

1.4 PREINSTALLATION MEETINGS

A. Preliminary Roofing Conference: Before starting removal Work, conduct conference at Project site.

1. Meet with the State, testing and inspecting agency representative, roofing Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing tear-off, including, but not limited to, the following:

    a. Reroofing preparation, including roofing system manufacturer's written instructions.
    b. Temporary protection requirements for existing roofing system components that are to remain.
    c. Existing roof drains and roof drainage during each stage of reroofing, and roof-drain plugging and plug removal.
    d. Construction schedule and availability of materials, Installer's personnel, equipment, and facilities needed to avoid delays.
    e. Existing roof deck conditions requiring The state notification.
    f. Existing roof deck removal procedures and the state notifications.
    g. Condition and acceptance of existing roof deck and base flashing substrate for reuse.
    h. Structural loading limitations of roof deck during reroofing.
    i. Base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that affect reroofing.
    j. HVAC shutdown and sealing of air intakes.
    k. Shutdown of fire-suppression, -protection, and -alarm and -detection systems.
    l. Asbestos removal and discovery of asbestos-containing materials.
    m. Governing regulations and requirements for insurance and certificates if applicable.
    n. Existing conditions that may require The state notification before proceeding.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Temporary Roofing Submittal: Product data and description of temporary roofing system.

1. If temporary roof remains in place, include surface preparation requirements needed to receive permanent roof, and submit a letter from roofing manufacturer stating acceptance of the temporary roof and that its inclusion does not adversely affect the new roofing system's resistance to fire and wind.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1. Include certificate that Installer is approved by warrantor of existing roofing system.
2. Include certificate that Installer is licensed to perform asbestos abatement.

B. Field Test Reports:

1. Fastener pull-out test report.

C. Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces, that might be misconstrued as having been damaged by reroofing operations.

1. Submit before Work begins.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Approved by warrantor of existing roofing system to work on existing roofing .

B. Regulatory Requirements:

1. Comply with governing EPA notification regulations before beginning roofing removal.
2. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.8 FIELD CONDITIONS

A. Existing Roofing System: Built-up asphalt, TPO, Standing Seam Metal roofing.

B. The state will occupy portions of building immediately below reroofing area.

1. Conduct reroofing so the state operations are not disrupted.
2. Provide The state with not less than 72 hours' written notice of activities that may affect the state operations.
3. Coordinate work activities daily with The state so The state has adequate advance notice to place protective dust and water-leakage covers over sensitive equipment and furnishings, shut down HVAC and fire-alarm or -detection equipment if needed, and evacuate occupants from below work area.
4. Before working over structurally impaired areas of deck, notify the state to evacuate occupants from below affected area.

a. Verify that occupants below work area have been evacuated before proceeding with work over impaired deck area.

C. Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.

D. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

E. Conditions existing at time of inspection for bidding will be maintained by The state as far as practical.

1. A roof moisture survey of existing roofing system is available for Contractor's reference.
2. The results of an analysis of test cores from existing roofing system are available for Contractor's reference.

F. Limit construction loads on existing roof areas to remain, and existing roof areas scheduled to be reroofed to 200lbs for rooftop equipment wheel loads and 20psf for uniformly distributed loads.

G. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building.

1. Remove only as much roofing in one day as can be made watertight in the same day.

H. Hazardous Materials: It is not expected that hazardous materials, such as asbestos-containing materials, will be encountered in the Work.

1. Hazardous materials will be removed by The state before start of the Work.
2. Existing roof will be left no less watertight than before removal.
3. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify The state and The state.

a. Hazardous materials will be removed by The state under a separate contract.

I. Hazardous Materials: A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.
2. Do not disturb hazardous materials or items suspected of containing hazardous materials except according to procedures specified elsewhere in the Contract Documents.
3. Coordinate reroofing preparation with hazardous material remediation to prevent water from entering existing roofing system or building.

1.9 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during reroofing, by methods and with materials so as not to void existing roofing system warranty issued by.

1. Notify warrantor before proceeding with the Work.
2. Notify warrantor of existing roofing system on completion of reroofing, and obtain documentation verifying that existing roofing system has been inspected and warranty remains in effect.

a. Submit documentation at Project closeout.

PART 2 - PRODUCTS

2.1 TEMPORARY PROTECTION MATERIALS

A. EPS Insulation: ASTM C578.

B. Plywood: DOC PS 1, Grade CD, Exposure 1.

C. OSB: DOC PS 2, Exposure 1.

2.2 TEMPORARY ROOFING MATERIALS

A. Design and selection of materials for temporary roofing are Contractor's responsibilities.

B. Sheathing Paper: Red-rosin type, minimum 3 lb/100 sq. ft..

C. Base Sheet: ASTM D4601/D4601M, Type II, nonperforated, asphalt-impregnated and -coated, glass-fiber sheet.

D. Glass-Fiber Felts: ASTM D2178/D2178M, Type IV, asphalt-impregnated, glass-fiber felt.

E. Asphalt Primer: ASTM D41/D41M.

F. Roofing Asphalt: ASTM D312/D312M, Type III or IV.

G. Base Sheet Fasteners: Capped head, factory-coated steel fasteners, listed in FM Approvals' RoofNav.

2.3 INFILL AND REPLACEMENT MATERIALS

A. Use infill materials matching existing roofing system materials unless otherwise indicated.

1. Infill materials are specified in Section 07 54 23 "Thermoplastic-Polyolefin (TPO) Roofing" unless otherwise indicated.

B. Wood blocking, curbs, and nailers are specified in Section 06 10 53 "Rough Carpentry."

C. Plywood roof sheathing is specified in Section 06 16 00 "Sheathing."

D. Parapet Sheathing:

1. ASTM C1177/C1177M or ASTM C1278/C1278M water-resistant gypsum substrate; 5/8 inch thick.
2. Exterior fire-retardant-treated plywood wall sheathing, 19/32 inch thick, complying with Section 06 16 00 "Sheathing."

E. Fasteners: Factory-coated steel fasteners with metal or plastic plates listed in FM Approvals' RoofNav, and acceptable to new roofing system manufacturer.

2.4 AUXILIARY REROOFING MATERIALS

A. General: Use auxiliary reroofing preparation materials recommended by roofing system manufacturer for intended use and compatible with components of existing and new roofing system.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protection of In-Place Conditions:

1. Protect existing roofing system that is not to be reroofed.
2. Loosely lay 1-inch-minimum thick, EPS insulation over existing roofing in areas not to be reroofed.

    a. Loosely lay 15/32-inch plywood or OSB panels over EPS. Extend EPS past edges of plywood or OSB panels a minimum of 1 inch.

3. Limit traffic and material storage to areas of existing roofing that have been protected.
4. Maintain temporary protection and leave in place until replacement roofing has been completed. Remove temporary protection on completion of reroofing.
5. Comply with requirements of existing roof system manufacturer's warranty requirements.

B. Seal or isolate windows that may be exposed to airborne substances created in removal of existing materials.

C. Shut off rooftop utilities and service piping before beginning the Work.

D. Test existing roof drains to verify that they are not blocked or restricted.

1. Immediately notify The state of any blockages or restrictions.

E. Coordinate with The state to shut down air-intake equipment in the vicinity of the Work.

1. Cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.

F. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.

G. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday.

1. Prevent debris from entering or blocking roof drains and conductors.

a. Use roof-drain plugs specifically designed for this purpose.
b. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.

2. If roof drains are temporarily blocked or unserviceable due to roofing system removal or partial installation of new roofing system, provide alternative drainage method to remove water and eliminate ponding.

a. Do not permit water to enter into or under existing roofing system components that are to remain.

3.2 ROOF TEAR-OFF

A. Notify The state each day of extent of roof tear-off proposed for that day and obtain authorization to proceed.

B. Lower removed roofing materials to ground and onto lower roof levels, using dust-tight chutes or other acceptable means of removing materials from roof areas.

C. Remove aggregate ballast from roofing.

D. Remove loose aggregate from aggregate-surfaced, built-up bituminous roofing using a power broom.

E. Remove pavers and accessories from roofing.

1. Store and protect pavers and accessories for reuse in manner not to exceed structural loading limitations of roof deck.
2. Discard cracked pavers.

F. Remove ballast, protection mat, and EPS insulation from protected roofing membrane.

1. Discard EPS insulation that is damaged or exceeds 8 lb/cu. ft..
2. Store EPS insulation for reuse and protect it from physical damage.
3. Store ballast for reuse in manner not to exceed structural loading limitations of roof deck.

G. Full Roof Tear-off: Where indicated, remove existing roofing and other roofing system components down to the existing roof deck.

1. Remove substrate board vapor retarder roof insulation and cover board.
2. Remove base flashings and counter flashings.

3. Remove perimeter edge flashing and gravel stops.
4. Remove copings.
5. Remove expansion-joint covers.
6. Remove flashings at pipes, curbs, mechanical equipment, and other penetrations.
7. Remove roof drains indicated to be removed.
8. Remove wood blocking, curbs, and nailers.
9. Bitumen and felts that are firmly bonded to concrete decks are permitted to remain if felts are dry.

    a. Remove unadhered bitumen, unadhered felts, and wet felts.

10. Remove excess asphalt from steel deck.

    a. A maximum of 15 lb/100 sq. ft. of asphalt is permitted to remain on steel decks.

11. Remove fasteners from deck.

H. Partial Roof Tear-off: Remove existing roofing down to existing substrate and immediately check for presence of moisture.

1. Engage a qualified testing agency to perform the following test:

    a. Coordinate with The state testing agency to schedule times for tests and inspections immediately after removal.

2. Survey exposed substrate that is to remain using infrared color thermography according to ASTM C1153.

    a. Prepare survey report of initial scan indicating locations of entrapped moisture, if any, and area calculations of locations of entrapped moisture.

3. Survey exposed substrate that is to remain using electrical capacitance/impedance testing according to ASTM D7954/D7954M.

    a. Prepare survey report indicating locations of entrapped moisture, if any, and area calculations of locations of entrapped moisture.

4. Survey exposed substrate that is to remain using nuclear hydrogen detection testing according to SPRI/RCI NT-1.

    a. Prepare survey report indicating locations of entrapped moisture, if any, and area calculations of locations of entrapped moisture.

5. Remove wet or damp materials below existing roofing and above deck as directed by The state.

6. Inspect wood blocking, curbs, and nailers for deterioration and damage.

a. If wood blocking, curbs, or nailers have deteriorated, immediately notify The state.

7. Bitumen and felts that are firmly bonded to concrete decks are permitted to remain if felts are dry.

a. Remove unadhered bitumen, unadhered felts, and wet felts.

8. Remove excess asphalt from steel deck that is exposed by removal of wet or damp materials.

a. A maximum of 15 lb/100 sq. ft. of asphalt is permitted to remain on steel decks.

9. Remove fasteners from deck.

3.3 DECK PREPARATION

A. Inspect deck after tear-off of roofing system.

B. If broken or loose fasteners that secure deck panels to one another or to structure are observed, or if deck appears or feels inadequately attached, immediately notify the State.

1. Do not proceed with installation until directed by the State.

C. If deck surface is unsuitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify The state.

1. Do not proceed with installation until directed by the State.

D. Provide additional deck securement as indicated.

E. Replace plywood roof sheathing as indicated.

F. Replace plywood roof sheathing as directed by The state.

1. Roof sheathing replacement will be paid for by adjusting the Contract Sum according to unit prices included in the Contract Documents.

3.4 INFILL MATERIALS INSTALLATION

A. Immediately after roof tear-off, and inspection and repair, if needed, of deck, fill in tear-off areas to match existing roofing system construction.

1. Installation of infill materials is specified in Section 07 54 23 "Thermoplastic-Polyolefin (TPO) Roofing."
2. Installation of wood blocking, curbs, and nailers is specified in Section 06 10 53 "Miscellaneous Rough Carpentry."

B. Install new roofing patch over roof infill area.

1. If new roofing is installed the same day tear-off is made, roofing patch is not required.

3.5 TEMPORARY ROOFING

A. Install approved temporary roofing over area to be reroofed.

B. Install temporary roofing over area to be reroofed.

1. Install two glass-fiber felts, lapping each sheet 19 inches over preceding sheet.
2. Embed glass-fiber felt in a solid mopping of hot roofing asphalt applied within equiviscous temperature range.
3. Glaze-coat completed surface with hot roofing asphalt.

C. Remove temporary roofing before installing new roofing.

D. Prepare temporary roof to receive new roofing <Insert preparation method>.

1. Restore temporary roofing to watertight condition.
2. Obtain approval for temporary roof substrate from roofing manufacturer and The state before installing new roof.

3.6 ROOF RE-COVER PREPARATION

A. Remove blisters, ridges, buckles, mechanically attached roofing fastener buttons projecting above roofing, and other substrate irregularities from existing roofing that inhibit new recover boards from conforming to substrate.

1. Remove loose aggregate from aggregate-surfaced, built-up bituminous roofing with a power broom.
2. Scarify surface of sprayed polyurethane foam as necessary to achieve a sufficiently uniform plane to receive new recover boards.
3. Broom clean existing substrate.
4. Coordinate with The state inspector to schedule times for tests and inspections.
5. Verify that existing substrate is dry.

    a. Spot check substrates with an electrical capacitance moisture-detection meter.

6. Remove materials that are wet or damp.

    a. Removal will be paid for by adjusting the Contract Sum according to unit prices included in the Contract Documents.

B. Remove blisters, ridges, buckles, mechanically attached roofing fastener buttons projecting above roofing, and other substrate irregularities from existing roofing that inhibit new roofing from conforming to substrate.

1. Remove loose aggregate from aggregate-surfaced, built-up bituminous roofing with a power broom.
2. Shave surface of sprayed polyurethane foam as necessary to achieve a sufficiently uniform plane to receive new roofing.
3. Broom clean existing substrate.
4. Coordinate with The state inspector to schedule times for tests and inspections.
5. Verify that existing substrate is dry before proceeding with installation.

    a. Spot check substrates with an electrical capacitance moisture-detection meter.

6. Remove materials that are wet and damp.

    a. Removal will be paid for by adjusting the Contract Sum according to unit prices included in the Contract Documents.

C. Remove blisters and areas of roofing not fully adhered.

D. Remove mechanically attached roofing fastener buttons projecting above roofing and other substrate irregularities that inhibit new recover boards from conforming to substrate.

1. Remove loose aggregate from aggregate-surfaced, built-up bituminous roofing with a power broom.
2. Clean substrate of contaminants, such as dirt, debris, oil, and grease, that can affect adhesion of coated foamed roofing.
3. Power vacuum the existing roof surface.

    a. If recommended by foam manufacturer, prime dried surface at recommended rate with recommended primer.

4. Scarify surface of coated polyurethane roofing as necessary to achieve a suitable substrate for new roofing.
5. Provide additional uplift securement for existing roofing system with new screws and plates applied to each roof zone at the following densities:

    a. Field of roof, one fastener for each.
    b. Corners of roof, one fastener for each.
    c. Perimeters of roof, one fastener for each. Width of perimeter zone of roof is 4’-0”.

6. Verify that surface is dry by pressing litmus paper to surface areas most likely to retain moisture, such as shaded areas and low spots.

    a. If paper changes color, surface is too wet to apply foam.

7. Build up isolated low spots on existing roofing with sprayed foam specified in Section 07 57 00 "Coated Foamed Roofing" to prevent ponding.

3.7 BASE FLASHING REMOVAL

A. Remove existing base flashings.

1. Clean substrates of contaminants, such as asphalt, sheet materials, dirt, and debris.

B. Do not damage metal counterflashings that are to remain.

1. Replace metal counterflashings damaged during removal with counterflashings of same metal, weight or thickness, and finish as existing.

C. Inspect parapet sheathing, wood blocking, curbs, and nailers for deterioration and damage.

1. If parapet sheathing, wood blocking, curbs, or nailers have deteriorated, immediately notify The state.

D. Remove existing parapet sheathing and replace with new parapet sheathing to comply with Section 06 16 00 "Sheathing."

1. If parapet framing, wood blocking, curbs, or nailers have deteriorated, immediately notify The state.

E. When directed by The state, replace parapet framing, wood blocking, curbs, and nailers to comply with Section 06 10 53 "Miscellaneous Rough Carpentry."

3.8 FASTENER PULL-OUT TESTING

A. Perform fastener pull-out tests according to SPRI FX-1, and submit test report to The state and roofing manufacturer before installing new roofing system.

1. Obtain The state's approval to proceed with specified fastening pattern.

a. Roofing manufacturer may furnish revised fastening pattern commensurate with pull-out test results.

3.9 DISPOSAL

A. Collect demolished materials and place in containers.

1. Promptly dispose of demolished materials.
2. Do not allow demolished materials to accumulate on-site.
3. Storage or sale of demolished items or materials on-site is not permitted.

B. Transport and legally dispose of demolished materials off The state property.

END OF SECTION 07 01 50.19

SECTION 07 21 00

THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Polyisocyanurate foam-plastic board.
2. Glass-fiber blanket.
3. Mineral-wool blanket.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Product Data: For adhesives, indicating VOC content.
3. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
4. Laboratory Test Reports: For insulation, indicating compliance with requirements for low-emitting materials.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Research reports.

PART 2 - PRODUCTS

2.1 POLYISOCYANURATE FOAM-PLASTIC BOARD

A. Polyisocyanurate Board, Foil Faced: ASTM C1289, foil faced, Type I, Class 1 or 2.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Carlisle Coatings & Waterproofing Inc.
b. Dow Chemical Company (The).
c. Johns Manville; a Berkshire Hathaway company.
d. Or approved equal.

2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.2 GLASS-FIBER BLANKET

A. Verify insulation complies with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

C. Glass-Fiber Blanket, Unfaced: ASTM C665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E84; passing ASTM E136 for combustion characteristics.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CertainTeed Corporation; Saint-Gobain North America.
b. Johns Manville; a Berkshire Hathaway company.
c. Owens Corning.

2.3 ACCESSORIES

A. Insulation for Miscellaneous Voids:

1. Glass-Fiber Insulation: ASTM C764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E84.
2. Spray Polyurethane Foam Insulation: ASTM C1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84.

B. Insulation Anchors, Spindles, and Standoffs: As recommended by manufacturer.

C. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

1. Verify adhesives have a VOC content of **70** g/L or less.
2. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

D. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide ventilation between insulated attic spaces and vented eaves.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.2 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

A. Blanket 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. Attics: Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
5. 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.

B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft..
2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

END OF SECTION 07 21 00

SECTION 07 25 00

WEATHER BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Building paper.
2. Building wrap.
3. Flexible flashing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Product Data: For building paper and wrap, and flashing, indicating VOC content.
3. Laboratory Test Reports: For building paper and wrap, and flashing, indicating compliance with requirements for low-emitting materials.

1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For water-resistive barrier and flexible flashing, from ICC-ES.

PART 2 - PRODUCTS

2.1 WATER-RESISTIVE BARRIER

A. Building Paper: ASTM D226, Type 1 (No. 15 asphalt-saturated organic felt), unperforated.

B. Building Paper: Water-vapor-permeable, asphalt-saturated kraft building paper that complies with ICC-ES AC38, Grade D

C. Building Wrap: ASTM E1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E84; UV stabilized; and acceptable to authorities having jurisdiction.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Dow Chemical Company (The).
    b. DuPont de Nemours, Inc.
    c. Kingspan Insulation Limited.

2. Water-Vapor Permeance: Not less than 20 perms per ASTM E96/E96M, Desiccant Method (Procedure A).
3. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.

D. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

2.2 FLEXIBLE FLASHING

A. HDPP faced Butyl Rubber Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film to produce an overall thickness of not less than 0.022 inch.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Tremco ExoAir 110AT- Basis of design.
    b. GCP Applied Technologies Inc.
    c. Protecto Wrap Company.

2. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.

B. Butyl Rubber Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.040 inch.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Tremco.
    b. GCP Applied Technologies Inc.
    c. Protecto Wrap Company.

PART 3 - EXECUTION

3.1 WATER-RESISTIVE BARRIER INSTALLATION

A. Cover sheathing with water-resistive barrier 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 and warranty requirements.

1. Seal seams, edges, fasteners, and penetrations with tape.
2. Extend into jambs of openings and seal corners with tape.

3.2 FLEXIBLE FLASHING INSTALLATION

A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.

1. 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.
2. Lap flashing over water-resistive barrier at bottom and sides of openings.
3. Lap water-resistive barrier over flashing at heads of openings.

END OF SECTION 07 25 00

SECTION 07 54 19

POLYVINYL-CHLORIDE (PVC) ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Adhered polyvinyl chloride (PVC) roofing system.
2. Mechanically fastened, polyvinyl chloride (PVC) roofing system.
3. Substrate board.
4. Vapor retarder.
5. Roof insulation.
6. Cover board.
7. Walkways.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For insulation and roof system component fasteners, include copy of FM Approvals' RoofNav listing.

B. Sustainable Design Submittals:

1. Product Test Reports: For roof materials, documentation indicating that roof materials comply with Solar Reflectance Index requirements.
2. Product Data: For adhesives and sealants, indicating VOC content.
3. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.
4. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
5. Environmental Product Declaration: For each product.
6. Health Product Declaration: For each product.
7. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.

C. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:

1. Layout and thickness of insulation.

2. Base flashings and membrane terminations.
3. Flashing details at penetrations.
4. Tapered insulation thickness and slopes.
5. Roof plan showing orientation of steel roof deck and orientation of roof membrane, fastening spacings, and patterns for mechanically fastened roofing system.
6. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
7. Tie-in with air barrier.

D. Samples: For the following products:

1. Roof membrane and flashing, of color required.
2. Walkway pads or rolls, of color required.

E. Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer Certificates:

1. Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

a. Submit evidence of compliance with performance requirements.

2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.

B. Product Test Reports: For roof membrane and insulation, tests performed by independent qualified testing agency indicating compliance with specified requirements.

C. Research reports.

D. Field Test Reports:

1. Concrete internal relative humidity test reports.
2. Fastener-pullout test results and manufacturer's revised requirements for fastener patterns.

E. Field quality-control reports.

F. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

B. Certified statement from existing roof membrane manufacturer stating that existing roof warranty has not been affected by Work performed under this Section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

B. Manufacturer Qualifications: A qualified manufacturer that is UL listed for roofing system identical to that used for this project.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer’s name, project brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged container in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer’s written instructions for handling, storing, and protecting during installation.

1.8 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer’s written instructions and warranty requirements.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 20 years from date of Acceptance of Work.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.

B. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D3746, ASTM D4272/D4272M, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.

C. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.

D. Wind Uplift Resistance: Design roofing system to resist the following wind uplift pressures when tested according to FM Approvals 4474, UL 580, or UL 1897:

1. Zone 1 (Roof Area Field): 17.1 lbf/sq. ft.
2. Zone 2 (Roof Area Perimeter): 28.7 lbf/sq. ft**.**

    a. Location: From roof edge to 24 in inside roof edge.

3. Zone 3 (Roof Area Corners): 43.3 lbf/sq. ft.

    a. Location: 24 in. in each direction from building corner.

E. FM Approvals' RoofNav Listing: Roof membrane, base flashings, and component materials shall comply with requirements in FM Approvals 4450 or FM Approvals 4470 as part of a roofing system, and shall be listed in FM Approvals' RoofNav for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals Certification markings.

1. Fire/Windstorm Classification: Class 1A-120.
2. Hail-Resistance Rating: FM Global Property Loss Prevention Data Sheet 1-34 MH.

F. SPRI's Directory of Roof Assemblies Listing: Roof membrane, base flashings, and component materials shall comply with requirements in FM Approvals 4450 or FM Approvals 4470 as part of a roofing system, and shall be listed in SPRI's Directory of Roof Assemblies for roof assembly identical for that specified for this Project.

1. Wind Uplift Load Capacity: 90 psf.

G. Solar Reflectance Index (SRI): Three-year-aged SRI not less than 64 or initial SRI not less than 82 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.

H. ENERGY STAR Listing: Roofing system shall be listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.

I. Energy Performance: Roofing system shall have an initial solar reflectance of not less than 0.70 and an emissivity of not less than 0.75 when tested according to CRRC-1.

J. Exterior Fire-Test Exposure: ASTM E108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

K. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

2.2 POLYVINYL CHLORIDE (PVC) ROOFING

A. PVC Sheet: ASTM D4434/D4434M, Type III, fabric reinforced and fabric backed.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Carlisle SynTec Incorporated.
    b. Johns Manville; a Berkshire Hathaway company.
    c. Versico Roofing Systems.

2. Membrane Thickness: 80 mils.
3. Exposed Face Color: White.

B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 10 percent.

C. Source Limitations: Obtain components for roofing system from roof membrane manufacturer or manufacturers approved by roof membrane manufacturer.

2.3 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.

1. Adhesives and Sealants: Comply with VOC limits of authorities having jurisdiction.
2. Verify adhesives and sealants comply with the following limits for VOC content:

    a. Plastic Foam Adhesives: 50 g/L.
    b. Gypsum Board and Panel Adhesives: 50 g/L.

c. Multipurpose Construction Adhesives: 70 g/L.
d. Fiberglass Adhesives: 80 g/L.
e. Contact Adhesives: 80 g/L.
f. PVC Welding Compounds: 510 g/L.
g. Other Adhesives: 250 g/L.
h. Single-Ply Roof Membrane Sealants: 450 g/L.
i. Nonmembrane Roof Sealants: 300 g/L.
j. Sealant Primers for Nonporous Substrates: 250 g/L.
k. Sealant Primers for Porous Substrates: 775 g/L.

3. Verify adhesives and sealants comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as PVC sheet.

C. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.

D. Bonding Adhesive: Manufacturer's standard, water based.

E. Low-Rise, Urethane, Fabric-Backed Membrane Adhesive: Roof system manufacturer's standard spray-applied, low-rise, two-component urethane adhesive formulated for compatibility and use with fabric-backed membrane roofing.

F. Slip Sheet: Manufacturer's standard, of thickness required for application.

G. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.

H. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing components to substrate, and acceptable to roofing system manufacturer.

I. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.4 SUBSTRATE BOARDS

A. Substrate Board: ASTM C1177/C1177M, glass-mat, water-resistant gypsum substrate or ASTM C1278/C1278M, fiber-reinforced gypsum board.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CertainTeed Corporation; Saint-Gobain North America.
b. Georgia-Pacific Gypsum LLC.

c. National Gypsum Company.

2. Thickness: 1/4 inch.
3. Surface Finish: Factory primed.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate board to roof deck.

2.5 ROOF INSULATION

A. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2 or Type II, Class 2, Grade 2, felt or glass-fiber mat facer on both major surfaces.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Carlisle SynTec Incorporated.
b. GAF.
c. Johns Manville; a Berkshire Hathaway company.

2. Size: 48 by 48 inches or 48 by 96 inches.
3. Thickness:

a. As shown.

B. Tapered Insulation: Provide factory-tapered insulation boards.

1. Material: Match roof insulation.
2. Minimum Thickness: 1/4 inch.
3. Slope:

a. Roof Field: 1/4 inch per foot unless otherwise indicated.
b. Saddles and Crickets: 1/2 inch per foot unless otherwise indicated.

2.6 INSULATION ACCESSORIES

A. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.

B. Cover Board: ASTM C1177/C1177M, glass-mat, water-resistant gypsum board or ASTM C1278/C1278M fiber-reinforced gypsum board.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Georgia-Pacific Gypsum LLC.

b. National Gypsum Company.
c. USG Corporation.

2. Thickness: 1/4 inch.
3. Surface Finish: Factory primed.

C. Protection Mat: Woven or nonwoven polypropylene, polyolefin, or polyester fabric, water permeable and resistant to UV degradation, type and weight as recommended by roofing system manufacturer for application.

2.7 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch thick and acceptable to roofing system manufacturer.

1. Size: Approximately 36 by 60 inches.
2. Color: Match with roof membrane.

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.

3.2 PREPARATION

A. Perform fastener-pullout tests according to roof system manufacturer's written instructions.

1. Submit test result within 24 hours of performing tests.

a. Include manufacturer's requirements for any revision to previously submitted fastener patterns required to achieve specified wind uplift requirements.

3.3 INSTALLATION OF ROOFING, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions, FM Approvals' RoofNav listed roof assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.4 INSTALLATION OF SUBSTRATE BOARD

A. Install substrate board with long joints in continuous straight lines, with end joints staggered not less than 24 inches in adjacent rows.

1. At steel roof decks, install substrate board at right angle to flutes of deck.

    a. Locate end joints over crests of steel roof deck.

2. Tightly butt substrate boards together.
3. Cut substrate board to fit tight around penetrations and projections, and to fit tight to intersecting sloping roof decks.
4. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to roofing system manufacturers' written instructions.

3.5 INSTALLATION OF INSULATION

A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.

B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Installation Over Wood Panel Decking:

1. Install base layer of insulation with joints staggered not less than 12 inches in adjacent rows.
    a. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
    b. Make joints between adjacent insulation boards not more than 1/4 inch in width.
    c. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.

        1) Trim insulation so that water flow is unrestricted.

    d. Fill gaps exceeding 1/4 inch with insulation.
    e. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
    f. Mechanically attach base layer of insulation using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to wood panel decks.

1) Fasten insulation according to requirements in SPRI's Directory of Roof Assemblies for specified Wind Uplift Load Capacity.
2) Fasten insulation to resist specified uplift pressure at corners, perimeter, and field of roof.

2. Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches from previous layer of insulation.

a. Staggered end joints within each layer not less than 24 inches in adjacent rows.
b. Install with long joints continuous and with end joints staggered not less than 12 inches in adjacent rows.
c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
d. Make joints between adjacent insulation boards not more than 1/4 inch in width.
e. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.

1) Trim insulation so that water flow is unrestricted.

f. Fill gaps exceeding 1/4 inch with insulation.
g. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
h. Loosely lay each layer of insulation units over substrate.
i. Adhere each layer of insulation to substrate using adhesive according to SPRI's Directory of Roof Assemblies listed roof assembly requirements for specified Wind Uplift Load Capacity and FM Global Property Loss Prevention Data Sheet 1-29, as follows:

1) Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
2) Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

3.6 INSTALLATION OF COVER BOARDS

A. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction.

1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
2. At internal roof drains, conform to slope of drain sump.

a. Trim cover board so that water flow is unrestricted.

3. Cut and fit cover board tight to nailers, projections, and penetrations.

B. Install slip sheet over cover board and immediately beneath roof membrane.

3.7 INSTALLATION OF MECHANICALLY FASTENED ROOF MEMBRANE

A. Mechanically fasten roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.

B. Unroll roof membrane and allow to relax before installing.

C. For in-splice attachment, install roof membrane with long dimension perpendicular to steel roof deck flutes.

D. Accurately align roof membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

E. Mechanically fasten or adhere roof membrane securely at terminations, penetrations, and perimeter of roofing.

F. Apply roof membrane with side laps shingled with slope of roof deck where possible.

G. In-Seam Attachment: Secure one edge of PVC sheet using fastening plates or metal battens centered within seam, and mechanically fasten PVC sheet to roof deck.

H. Seams: Clean seam areas, overlap roof membrane, and hot-air weld side and end laps of roof membrane and sheet flashings to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roof membrane and sheet flashings.
2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.

I. Spread sealant bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

3.8 INSTALLATION OF BASE FLASHING

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.9 INSTALLATION OF WALKWAYS

A. Flexible Walkways: Install walkway products according to manufacturer's written instructions.

1. Install flexible walkways at the following locations:

a. As shown.

2. Provide 6-inch clearance between adjoining pads.
3. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.10 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to the State.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Acceptance of Work and according to warranty requirements.

END OF SECTION 07 54 19

SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes the following unless specified elsewhere:
   1. Manufactured reglets with counterflashing.
   2. Formed roof-drainage sheet metal fabrications.
   3. Formed low-slope roof sheet metal fabrications.
   4. Formed wall sheet metal fabrications.
   5. Formed equipment support flashing.

1.2 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

   1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
   3. Review requirements for insurance and certificates if applicable.
   4. Review sheet metal flashing observation and repair procedures after flashing installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Sustainable Design Submittals:
   1. Project Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

C. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of roof-penetration flashing.
8. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
9. Include details of special conditions.
10. Include details of connections to adjoining work.
11. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches (1:10)

D. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Submittals must be in conformance with LEED 4.1 requirements.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: for sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

B. Special warranty.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1. For copings and roof edge flashings that are SPRI ES-1 tested, shop shall be listed as able to fabricate required details as tested and approved.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.9 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Finish Warranty Period: 10 years from date of Beneficial Occupancy.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. FM Approvals Listing: Manufacture and install roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with name of fabricator and design approved by FM Approvals.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces

2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 (Z275) coating designation prepainted by coil-coating process to comply with ASTM A 755/A 755M.

1. Surface: Smooth, flat.
2. Exposed Coil-Coated Finish:
   a. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
3. Color: As selected by the State from manufacturer's full range.
4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil (0.013 mm).
5. Recycled Content: Postconsumer recycled content plus on-half of preconsumer recycled content not less that 10 percent.

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer, unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

   a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
   b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
   c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

C. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

2.4 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2. Obtain field measurements for accurate fit before shop fabrication.
3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

D. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
2. Use lapped expansion joints only where indicated.

E. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

G. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.

H. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

I. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.

J. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer.

K. Do not use graphite pencils to mark metal surfaces.

2.5 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters: Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch- (2400-mm-) long sections. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than twice the gutter thickness. Fabricate expansion joints**,** and gutter accessories from same metal as gutters.

B. Downspouts: Fabricate downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors.

C. Parapet Scuppers: Fabricate scuppers to dimensions required, with closure flange trim to exterior, 4-inch- (100-mm-) wide wall flanges to interior, and base extending 4 inches (100 mm) beyond cant or tapered strip into field of roof.

D. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape required, complete with outlet tubes.

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof Edge Flashing (Gravel Stop) and Fascia Cap: Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 12-foot- (3.6-m-) long sections. Furnish with 6-inch- (150-mm-) wide, joint cover plates.
   1. Fabricate from the Following Materials:
      a. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch (0.71 mm thick.

B. Copings: Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 12-foot- (3.6-m-) long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and interior leg. Miter corners watertight.
   1. Fabricate from the Following Materials:
      a. Aluminum-Zinc Alloy-Coated Steel: 0.040 inch (1.02 mm) thick.

C. Roof and Roof-to-Wall Transition, Roof-to-Roof Edge-Flashing (Gravel-Stop) Transition,) and Fascia-Cap Transition: Fabricate from the following materials:
   1. Aluminum-Zinc Alloy-Coated Steel: 0.034 inch (0.86 mm) thick.

D. Base Flashing: Fabricate from the following materials:
   1. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch (0.71 mm) thick.

E. Counterflashing: Fabricate from the following materials:
   1. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch (0.56 mm) thick.

F. Flashing Receivers: Fabricate from the following materials:
   1. Zinc-Tin Alloy-Coated Copper: 16 oz./sq. ft. (0.55 mm thick).

G. Roof-Penetration Flashing: Fabricate from the following materials:
   1. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch (0.71 mm) thick.

H. Roof-Drain Flashing: Fabricate from the following materials:
   1. Zinc-Tin Alloy-Coated Stainless Steel: 0.015 inch (0.38 mm) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.

   1. Verify compliance with requirements for installation tolerances of substrates.
   2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
   3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches (50 mm).

B. Synthetic Underlayment: Install synthetic underlayment, wrinkle free, according to manufacturers' written instructions, and using adhesive where possible to minimize use of mechanical fasteners under sheet metal.

C. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps and edges with roller. Cover underlayment within 14 days.

D. Apply slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

3.3 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use

fasteners**,** solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
5. Torch cutting of sheet metal flashing and trim is not permitted.
6. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of uncoated-aluminum sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet (3 m) with no joints within 24 inches (600 mm) of corner or intersection.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.
2. Use lapped expansion joints only where indicated.

D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated.
2. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 "Joint Sealants."

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches (38 mm); however, reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Do not solder metallic-coated steel sheet.
2. Do not use torches for soldering.
3. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

H. Rivets: Rivet joints where necessary for strength.

3.4 ROOF-DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Hanging Gutters: Join sections with riveted and soldered joints. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchor them in position. Provide end closures and seal watertight with sealant. Slope to downspouts.

1. Fasten gutter spacers to front and back of gutter.
2. Anchor and loosely lock back edge of gutter to continuous cleat.
3. Anchor gutter with straps spaced not more than 24 inches (600 mm) apart to roof deck, unless otherwise indicated, and loosely lock to front gutter bead.
4. Install gutter with expansion joints not exceeding 50 feet (15.24 m) apart. Install expansion-joint caps.

C. Downspouts: Join sections with 1-1/2-inch (38-mm) telescoping joints.

1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches (1500 mm) o.c.
2. Provide elbows at base of downspout to direct water away from building.
3. Connect downspouts to underground drainage system.

D. Parapet Scuppers: Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.

1. Anchor scupper closure trim flange to exterior wall and seal with elastomeric sealant to scupper.

E. Conductor Heads: Anchor securely to wall, with elevation of conductor head rim at minimum of 1 inch (25 mm) below gutter discharge.

3.5 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch (75-mm) centers.

C. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.

D. Copings: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated.

1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 24-inch (600-mm) centers.
2. Anchor interior leg of coping with washers and screw fasteners through slotted holes at 24-inch (600-mm) centers.

E. Copings: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for specified FM Approvals' listing for required windstorm classification.

F. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches (100 mm) over base flashing. Install stainless-steel draw band and tighten.

G. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches (100 mm) over base flashing. Lap counterflashing joints minimum of 4 inches (100 mm). Secure in waterproof manner.

H. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.6 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

3.7 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.8 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.9 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 62 00

SECTION 07 71 00

ROOF SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copings.
2. Roof-edge specialties.
3. Roof-edge drainage systems.
4. Reglets and counterflashings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

C. Shop Drawings: For roof specialties.

1. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
2. Include details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
4. Detail termination points and assemblies, including fixed points.
5. Include details of special conditions.

D. Samples: For each type of roof specialty and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Product Certificates: For each type of roof specialty.

C. Product Test Reports: For copings and roof-edge flashings, for tests performed by a qualified testing agency.

D. Sample Warranty: For manufacturer's special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing specialties to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and set quality standards for fabrication and installation.

1. Build mockup of typical roof edge as shown.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless the State specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Beneficial Occupancy.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.

B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof-specialty installation.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication and indicate measurements on Shop Drawings.

B. Coordination: Coordinate roof specialties with flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.8 WARRANTY

A. Roofing-System Warranty: Roof specialties are included in warranty provisions in Section 07 54 19.

B. Special Warranty on Painted Finishes: Manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Beneficial Occupancy.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 10 percent.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 COPINGS

A. Metal Copings: Manufactured coping system consisting of metal coping cap in section lengths not exceeding 12 feet (3.6 m), concealed anchorage; with corner units, end cap units, and concealed splice plates with finish matching coping caps.

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. Castle Metal Products.
b. Cheney Flashing Company.
c. Drexel Metals.

d. SAF (Southern Aluminum Finishing Company, Inc.).

2. Extruded-Aluminum Coping Caps: Extruded aluminum, thickness as required to meet performance requirements.

   a. Finish: Mill.
   b. Color: As selected by the State from manufacturer's full range.

3. Corners: Factory mitered and mechanically clinched and sealed watertight.
4. Coping-Cap Attachment Method: Snap-on or face leg hooked to continuous cleat with back leg fastener exposed, fabricated from coping-cap material.

   a. Snap-on Coping Anchor Plates: Concealed, galvanized-steel sheet, 12 inches (300 mm) wide, with integral cleats.
   b. Face-Leg Cleats: Concealed, continuous stainless steel.

2.3 ROOF-EDGE DRAINAGE SYSTEMS

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. Castle Metal Products.
   2. SAF (Southern Aluminum Finishing Company, Inc.).
   3. Or Equal.

B. Gutters: Manufactured in uniform section lengths not exceeding 12 feet (3.6 m), with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least 1 inch (25 mm) above front edge. Furnish flat-stock gutter straps, gutter brackets, expansion joints, and expansion-joint covers fabricated from same metal as gutters.

   1. Zinc-Coated Steel: Nominal 0.034-inch (0.86-mm).
   2. Aluminum Sheet: 0.032 inch (0.81 mm) thick.
   3. Gutter Profile: Style B according to SMACNA's "Architectural Sheet Metal Manual."
   4. Corners: Factory mitered and mechanically clinched and sealed watertight.
   5. Gutter Supports: Gutter brackets with finish matching the gutters.
   6. Special Fabrications: Radiussed sections.
   7. Gutter Accessories: Continuous screened leaf guard with sheet metal frame.

C. Downspouts: Plain round complete with mitered elbows, manufactured from the following exposed metal. Furnish with metal hangers, from same material as downspouts, and anchors.

   1. Zinc-Coated Steel: Nominal 0.028-inch (0.71-mm) thickness.
   2. Formed Aluminum: 0.032 inch (0.81 mm) thick.
   3. Extruded Aluminum: 0.125 inch (3.18 mm) thick.

D. Splash Pans: Fabricate from the following exposed metal:
   1. Formed Aluminum: 0.040 inch (1.02 mm) thick.

E. Zinc-Coated Steel Finish: Two-coat fluoropolymer.

   1. Color: As selected by the State from manufacturer's full range.

F. Aluminum Finish: Mill Insert finish.

   1. Color: As selected by the State from manufacturer's full range.

G. Stainless Steel Finish: ASTM A480/A480M No. 2B (bright, cold rolled, unpolished).

2.4 REGLETS AND COUNTERFLASHINGS

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. Castle Metal Products.
   2. Fry Reglet Corporation.
   3. Heckmann Building Products, Inc.
   4. Keystone Flashing Company, Inc.

B. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, from the following exposed metal:
   1. Formed Aluminum: 0.024 inch (0.61 mm) thick.
   2. Stainless Steel: 0.0188 inch (0.477 mm) thick.
   3. Corners: Factory mitered and mechanically clinched and sealed watertight.
   4. Surface-Mounted Type: Provide reglets with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
   5. Concrete Type, Embedded: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
   6. Masonry Type, Embedded: Provide reglets with offset top flange for embedment in masonry mortar joint.
   7. Multiuse Type, Embedded: For multiuse embedment in masonry mortar joints.

C. Counterflashings: Manufactured units of heights to overlap top edges of base flashings by 4 inches (100 mm) and in lengths not exceeding 12 feet (3.6 m) designed to snap into reglets and compress against base flashings with joints lapped, from the following exposed metal:
   1. Formed Aluminum: 0.024 inch (0.61 mm) thick.
   2. Stainless Steel: 0.0188 inch (0.477 mm) thick.

D. Accessories:

1. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where reglet is provided separate from metal counterflashing.
2. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

E. Zinc-Coated Steel Finish: Two-coat fluoropolymer.

1. Color: As selected by the State from manufacturer's full range.

F. Aluminum Finish: Mill.

1. Color: As selected by the State from manufacturer's full range.

G. Stainless Steel Finish: ASTM A480/A480M No. 2B (bright, cold rolled, unpolished).

2.5 MATERIALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653/A653M, G90 (Z275) coating designation.

B. Aluminum Sheet: ASTM B209 (ASTM B209M), alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.

C. Aluminum Extrusions: ASTM B221 (ASTM B221M), alloy and temper recommended by manufacturer for type of use and finish indicated, finished as follows:

D. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304.

E. Copper Sheet: ASTM B370, cold-rolled copper sheet, H00 or H01 temper.

2.6 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils (0.76 to 1.0 mm) thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

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. Owens Corning.
b. Polyglass U.S.A., Inc.
c. Or Equal.

2. Thermal Stability: ASTM D1970/D1970M; stable after testing at 240 deg F (116 deg C).

3. Low-Temperature Flexibility: ASTM D1970/D1970M; passes after testing at minus 20 deg F (29 deg C).

B. Slip Sheet: Rosin-sized building paper, 3-lb/100 sq. ft. (0.16-kg/sq. m) minimum.

2.7 MISCELLANEOUS MATERIALS

A. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:

1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
2. Fasteners for Copper Sheet: Copper, hardware bronze, or passivated Series 300 stainless steel.
3. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.
4. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.
5. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A153/A153M or ASTM F2329.

B. Elastomeric Sealant: ASTM C920, elastomeric polyurethane polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.

C. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type joints with limited movement.

D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

E. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.

2.8 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. 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.

D. Coil-Coated Galvanized-Steel Sheet Finishes:

1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with ASTM A755/A755M and coating and resin manufacturers' written instructions.

    a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
    b. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
    c. Two-Coat Mica Fluoropolymer: AAMA 621. Fluoropolymer finish with suspended mica flakes containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
    d. Three-Coat Metallic Fluoropolymer: AAMA 621. Fluoropolymer finish with suspended metallic flakes containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
    e. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

E. Coil-Coated Aluminum Sheet Finishes:

1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

    a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
    b. Three-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
    c. Two-Coat Mica Fluoropolymer: AAMA 2605. Fluoropolymer finish with suspended mica flakes containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
    d. Three-Coat Metallic Fluoropolymer: AAMA 2605. Fluoropolymer finish with suspended metallic flakes containing not less than 70 percent

polyvinylidene fluoride (PVDF) resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

e. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

2. Clear Anodic Finish: AAMA 611, or thicker.
3. Color Anodic Finish: AAMA 611, or thicker.

F. Aluminum Extrusion Finishes:

1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

b. Three-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

c. Two-Coat Mica Fluoropolymer: AAMA 2605. Fluoropolymer finish with suspended mica flakes containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

d. Three-Coat Metallic Fluoropolymer: AAMA 2605. Fluoropolymer finish with suspended metallic flakes containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

e. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

2. Clear Anodic Finish: AAMA 611, or thicker.
3. Color Anodic Finish: AAMA 611, or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.

C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF UNDERLAYMENT

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (152 mm) staggered 24 inches (610 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within 14 days.

1. Apply continuously under reglets and counterflashings.
2. Coordinate application of self-adhering sheet underlayment under roof specialties with requirements for continuity with adjacent air barrier materials.

B. Slip Sheet: Install with tape or adhesive for temporary anchorage to minimize use of mechanical fasteners under roof specialties. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches (50 mm).

3.3 INSTALLATION, GENERAL

A. Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.

1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
2. Provide uniform, neat seams with minimum exposure of solder and sealant.
3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
4. Torch cutting of roof specialties is not permitted.
5. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum and stainless steel roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.

2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.

C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.

1. Space movement joints at a maximum of 12 feet (3.6 m) with no joints within 18 inches (450 mm) of corners or intersections unless otherwise indicated.
2. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

D. Fastener Sizes: Use fasteners of sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws.

E. Seal concealed joints with butyl sealant as required by roofing-specialty manufacturer.

F. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F (4 deg C).

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches (38 mm); however, reduce pre-tinning where pre-tinned surface would show in completed Work. Tin edges of uncoated copper sheets using solder for copper. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

3.4 INSTALLATION OF COPINGS

A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor copings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

1. Interlock face and back leg drip edges of snap-on coping cap into cleated anchor plates anchored to substrate at 30-inch (762-mm) centers.
2. Interlock face-leg drip edge into continuous cleat anchored to substrate at 24-inch (610-mm) centers. Anchor back leg of coping with screw fasteners and elastomeric washers at 24-inch (610-mm) centers.

3.5 INSTALLATION OF ROOF-EDGE SPECIALITIES

A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

3.6 INSTALLATION OF ROOF-EDGE DRAINAGE-SYSTEM

A. Install components to produce a complete roof-edge drainage system according to manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof-edge drainage system.

B. Gutters: Join and seal gutter lengths. Allow for thermal expansion. Attach gutters to firmly anchored gutter supports spaced not more than 12 inches (305 mm) apart. Attach ends with rivets and seal with sealant to make watertight. Slope to downspouts.

1. Install gutter with expansion joints at locations indicated but not exceeding 50 feet (15.2 m) apart. Install expansion-joint caps.
2. Install continuous leaf guards on gutters with noncorrosive fasteners, removable for cleaning gutters.

C. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1500 mm) o.c.

1. Provide elbows at base of downspouts at grade to direct water away from building.
2. Connect downspouts to underground drainage system indicated.

D. Splash Pans: Install where downspouts discharge on low-slope roofs. Set in elastomeric sealant.

3.7 INSTALLATION OF REGLETS AND COUNTERFLASHINGS

A. Coordinate installation of reglets and counterflashings with installation of base flashings.

B. Embedded Reglets: See Section 04 20 00 "Unit Masonry" for installation of reglets.

C. Surface-Mounted Reglets: Install reglets to receive flashings where flashing without embedded reglets is indicated. Install at height so that inserted counterflashings overlap 4 inches (100 mm) over top edge of base flashings.

D. Counterflashings: Insert counterflashings into reglets or other indicated receivers; ensure that counterflashings overlap 4 inches (100 mm) over top edge of base flashings. Lap counterflashing joints a minimum of 4 inches (100 mm) and bed with butyl sealant. Fit counterflashings tightly to base flashings.

3.8 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.

D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 07 71 00

SECTION 07 84 13

PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Penetrations in fire-resistance-rated walls.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.
2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

C. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.

1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

1.4 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Approval according to FM Approval 4991, "Approval Standard for Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:

a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.

1) UL in its "Fire Resistance Directory."

2.2 PENETRATION FIRESTOPPING SYSTEMS

A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction

penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Hilti, Inc.
    b. HoldRite; Reliance Worldwide Company.
    c. International Fireproof Technology Inc.
    d. RectorSeal Firestop; a CSW Industrials Company.
    e. Specified Technologies, Inc.
    f. STC Sound Control.

B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).

C. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E84.

1. Verify sealant has a VOC content of 250 g/L or less.
2. Verify sealant complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

D. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.

1. Permanent forming/damming/backing materials.
2. Substrate primers.
3. Collars.
4. 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 sleeve lined with an intumescent strip, a 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 intumescent elastomeric sheet bonded to galvanized-steel sheet.

E. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.

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 nonshrinking, 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.

2.4 MIXING

A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. 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.

3.3 INSTALLATION

A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

C. Install fill materials by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches (76 mm) high and with minimum 0.375-inch (9.5-mm) strokes.

1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet (4.57 m) from end of wall and at intervals not exceeding 30 feet (9.14 m).

B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E2174.

B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.

C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Beneficial Occupancy. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

END OF SECTION 07 84 13

SECTION 07 84 43

JOINT FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Joints in or between fire-resistance-rated constructions.
2. Joints in smoke barriers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.
2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

C. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.

1. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

1.4 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Approvals according to FM Approvals 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install joint firestopping systems when ambient or substrate temperatures are outside limits permitted by joint firestopping system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Install and cure joint firestopping systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

1. Coordinate construction of joints to ensure that joint firestopping systems can be installed according to specified firestopping system design.
2. Coordinate sizing fo joints to accommodate joint firestopping systems.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain joint firestop systems for each type of joint opening indicated from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:

a. Joint firestopping systems shall bear classification marking of a qualified testing agency.

1) UL in its "Fire Resistance Directory."
2) Intertek Group in its "Directory of Listed Building Products."

2.3 JOINT FIRESTOPPING SYSTEMS

A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

1. Joint firestopping systems that are compatible with one another, with the substrates forming openings, and with penetrating items, if any.

2. Provide products that, upon curing, do not re-emulsify, dissolve, leach, breakdown, or otherwise deteriorate over time from exposer to atmospheric moisture, sweating pipes, ponding water or other forms of moisture.

3. Provide firestop products that do not contain ethylene glycol.

B. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E1966 or UL 2079.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. 3M Fire Protection Products.
b. Hilti, Inc.
c. Specified Technologies, Inc.

2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.

C. Joints in Smoke Barriers: Provide joint firestopping systems with ratings determined per UL 2079 based on testing at a positive pressure differential of 0.30-inch wg.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. 3M Fire Protection Products.
b. Hilti, Inc.
c. Specified Technologies, Inc.

2. L-Rating: Not exceeding 5.0 cfm/ft. of joint at both ambient and elevated temperatures.

D. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E84.

1. Verify sealant has a VOC content of 250 g/L or less.
2. Verify sealant complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of

Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

E. ACCESSORIES

1. Provide components of joint firestopping systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Before installing joint firestopping systems, clean joints immediately to comply with fire-resistive joint system manufacturer’s written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of elastomeric fill materials or compromise fire-resistive rating.

2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bon with elastomeric fill materials. Remove loose particles remaining from cleaning operation.

3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by joint firestopping system manufacturer using that manufacturer’s recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Apply a suitable bond-breaker to prevent three-sided adhesion in applications where this condition occurs, such as the intersection of a gypsum wall to floor or roof assembly where the joint is backed by a steel ceiling runner or track.

3.3 INSTALLATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.

B. General: Install joint firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

C. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

D. Install elastomeric fill materials for joint firestopping systems by proven techniques to produce the following results:

1. Elastomeric fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.
3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Wall Identification: Permanently label walls containing firestopping systems with the words “FIRE AND/OR SMOKE BARRIER – PROTECT ALL OPENINGS,” using lettering not less than 3 inches (76 mm) high and with minimum 0.375-inch (9.5mm) strokes.

1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 ft. (4.57 m) from end of wall and at intervals not exceeding 30 ft. (9.14m).

B. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels are visible to anyone seeking to remove or joint firestopping system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Joint Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing agency.
4. Date of installation.

5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Inspecting Agency: The State will engage a qualified testing agency to perform tests and inspections according to ASTM E2393.

B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.

C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 JOINT FIRESTOPPING SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's online directory "Product iQ" under product Category XHBN.

B. Wall-to-Wall, Joint Firestopping Systems:

1. UL-Classified Systems: WW-D-1115

C. Head-of-Wall, Fire-Resistive Joint Firestopping Systems: A563

1. UL-Classified Systems: HW-S-0088.

2. Assembly Rating: 1-hour.

D. Bottom-of-Wall, Joint Firestopping Systems: A612.

1. UL-Classified Systems: BW-S-0001.

2. Assembly Rating: 1-hour.

END OF SECTION 07 84 43

SECTION 07 92 00

JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Nonstaining silicone joint sealants.
3. Urethane joint sealants.
4. Immersible joint sealants.
5. Mildew-resistant joint sealants.
6. Latex joint sealants.

1.2 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.
2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

C. Samples: For each kind and color of joint sealant required.

D. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports: For each kind of joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency.

B. Preconstruction laboratory test schedule: Include the following information for each joint sealant and substrate material to be tested:

1. Joint-sealant location and designation.

2. Manufacturer and product name.

3. Type of substrate material.

4. Proposed test.

5. Number of samples required.

C. Preconstruction field-adhesion-test reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.

2. Interpretation of test results and written recommendations for primers and substrate preparation are needed for adhesion.

D. Preconstruction field-adhesion-test reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substates based on testing specified in “Preconstruction Testing” Article.

E. Field-adhesion-test reports: For each sealant application tested.

F. Sample warranties: For special warranties.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

B. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: Qualified according to ASTM C1021 to conduct the testing indicated.

C. 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.

1.5 PRECONSTRUCTION TESTING

A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Adhesion Testing: Use ASTM C794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

2. Compatibility Testing: Use ASTM C1087 to determine sealant compatibility when in contact with glazing and gasket materials.
3. Stain Testing: Use ASTM C1248 to determine stain potential of sealant when in contact with masonry substrates.
4. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint-sealant backings, and miscellaneous materials.
5. Testing will not be required if joint-sealant manufactures submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates. Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.

1.6 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or and below 40 deg F)5 deg C).

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 to yet been removed from joint substrates.

1.7 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Acceptance of Work.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Acceptance of Work.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. VOC Content: Verify sealants and sealant primers comply with the following:

1. Architectural sealants have a VOC content of 250 g/L or less.
2. Sealants and sealant primers for nonporous substrates have a VOC content of 250 g/L or less.
3. Sealants and sealant primers for porous substrates have a VOC content of 775 g/L or less.
4. Verify sealant complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Colors of Exposed Joint Sealants: As selected by the State from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Silicone, S, NS, 100/50, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Use NT.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Dow Chemical Company.- Dowsil 790 or Dowsil 795- Basis of design.
b. GE Construction Sealants; Momentive Performance Materials Inc.
c. Sika Corporation; Joint Sealants.

2.3 URETHANE JOINT SEALANTS

A. Urethane, M, P, 25, T, NT: Multicomponent, pourable, plus 25 percent and minus 25 Urethane, M, P, 25, T, NT: Multicomponent, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade P, Class 25, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Pecora Corporation.
b. Sika Corporation; Joint Sealants.
c. Tremco Incorporated.

2.4 MILDEW-RESISTANT JOINT SEALANTS

A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. GE Construction Sealants; Momentive Performance Materials Inc.
    b. The Dow Chemical Company.- Dowsil 786- basis of design.
    c. Tremco Incorporated.

C. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Pecora Corporation.- AC-2+Silicone- Basis of design.
    b. Sherwin-Williams Company (The).
    c. Tremco Incorporated.

2.5 JOINT-SEALANT BACKING

A. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin), Type O (open-cell material), Type B (bicellular material with a surface skin), or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated], and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Alcot Plastics Ltd.
    b. Construction Foam Products; a division of Nomaco, Inc.
    c. Master Builders Solutions.

B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

2.6 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.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 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 laitance and form-release agents from concrete.
2. 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.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces.

3.2 INSTALLATION OF JOINT SEALANTS

A. General: Comply with ASTM C1193 and joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. 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 end of sealant backings.

2. Do not strtch, twist, puncture, or tear sealant backings.

3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

D. 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.

E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.

1. Provide concave joint profile per Figure 8A in ASTM C1193 unless otherwise indicated.

3.3 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:

a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
b. Perform one test for each 1000 feet of joint length thereafter or one test per each floor per elevation.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.

B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.4 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

3.5 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 Beneficial Occupancy. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original worik.

3.6 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

    a. Construction joints in cast-in-place concrete.
    b. Joints between plant-precast architectural concrete units.
    c. Control and expansion joints in unit masonry.
    d. Tile control and expansion joints.
    e. Exterior and interior wall, door, and window frames.
    f. Other joints as indicated.

2. Joint Sealant: Silicone, S, NS, 100/50, NT.
3. Joint-Sealant Color: As selected by the State from manufacturer's full range of colors.

B. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.

1. Joint Locations:

    a. Isolation joints in cast-in-place concrete slabs.
    b. Control and expansion joints in stone flooring.
    c. Control and expansion joints in brick flooring.
    d. Control and expansion joints in tile flooring.
    e. Other joints as indicated.

2. Joint Sealant: Urethane, M, P, 25, T, NT.
3. Joint-Sealant Color: As selected by the State from manufacturer's full range of colors.

C. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

    a. Control and expansion joints on exposed interior surfaces of exterior walls.
    b. Tile control and expansion joints.

c. Vertical joints on exposed surfaces of unit masonry, concrete, walls, and partitions.
d. Other joints as indicated.

2. Joint Sealant: Silicone, S, NS, 100/50, NT.
3. Joint-Sealant Color: As selected by the State from manufacturer's full range of colors.

D. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
b. Tile control and expansion joints where indicated.
c. Other joints as indicated.

2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
3. Joint-Sealant Color: As selected by the State from manufacturer's full range of colors.

END OF SECTION 07 92 00

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Exterior standard steel doors and frames.
2. Interior standard steel doors and frames.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

C. Shop Drawings: Include the following:

1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.

D. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those provided. Coordinate with final door hardware schedule.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Field quality control reports.

1.4 CLOSEOUT SUBMITTALS

A. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.5 QUALITY ASSURANCE

A. Fire-Rated Door Inspector Qualifications: Inspector for field quality control inspections of fire-rated door assemblies shall meet the qualifications set forth in NFPA 80, Section 5.2.3.1 and the following:

1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

B. Egress Door Inspector Qualifications: Inspector for field quality control inspections of egress door assemblies shall meet the qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:

1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Custom Metal Products.
2. Steelcraft; an Allegion brand.
3. Stiles Custom Metal, Inc.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Door Assemblies: 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. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

B. Thermally Rated Door Assemblies: Provide door assemblies with U-factor of not more than 0.50 deg Btu/F x h x sq. ft. when tested according to ASTM C518.

2.3 INTERIOR STANDARD STEEL DOORS AND FRAMES

A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

A. Extra-Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 3; ANSI/SDI A250.4, Level A.

1. 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 A60 coating.
    d. Edge Construction: Model 2, Seamless.
    e. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
    f. Bottom Edges: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
    g. Core: Manufacturer's standard.
    h. Fire-Rated Core: Manufacturer's standard core for fire-rated doors.

2. Frames:

    a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A60 coating.
    b. Construction: Full profile welded.

2.4 EXTERIOR STANDARD STEEL DOORS AND FRAMES

A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Extra-Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 3; ANSI/SDI A250.4, Level A.

1. 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 A60 coating.
    d. Edge Construction: Model 2, Seamless or Model 3, Stile and Rail, as indicated in the Door and Frame Schedule.

e. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
f. Bottom Edges: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
g. Core: Polystyrene.
h. Fire-Rated Core: Manufacturer's standard core for fire-rated doors.

2. Frames:

a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A60 coating.
b. Construction: Full profile welded.

2.5 BORROWED LITES

A. Fabricate of metallic-coated steel sheet, minimum thickness of 0.042 inch.

B. Construction: Full profile welded.

C. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal as frames.

D. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

2.6 FRAME ANCHORS

A. Jamb Anchors:

1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.

B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.

C. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at top of underlayment.

D. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized according to ASTM A153/A153M, Class B.

2.7 MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

C. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

D. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A153/A153M.

F. 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.

G. Mineral-Fiber Insulation: ASTM C665, 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 E136 for combustion characteristics.

H. Glazing: Comply with requirements in the specifications.

2.8 FABRICATION

A. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.

1. Sidelite and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.

    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

B. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to ANSI/SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.

C. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted hairline joints.

1. Provide stops and moldings flush with face of door, and with square stops unless otherwise indicated.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
5. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

2.9 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 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. Touch up factory-applied finishes where spreaders are removed.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

A. Hollow-Metal Frames: Comply with ANSI/SDI A250.11.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.

    a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
    b. Install frames with removable stops located on secure side of opening.

2. Fire-Rated Openings: Install frames according to NFPA 80.
3. Floor Anchors: Secure with postinstalled expansion anchors.

    a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

4. Solidly pack mineral-fiber insulation inside frames.
5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
6. Installation Tolerances: Adjust hollow-metal frames 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.

B. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.

1. Non-Fire-Rated Steel Doors: Comply with ANSI/SDI A250.8.
2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
3. Smoke-Control Doors: Install doors according to NFPA 105.

C. Glazing: Comply with installation requirements in specifications and with hollow-metal manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

A. Inspections:

1. Fire-Rated Door Inspections: Inspect each fire-rated door according to NFPA 80, Section 5.2.

2. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements according to NFPA 101, Section 7.2.1.15.

B. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

C. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

D. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80.

3.4 REPAIR

A. 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.

B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

C. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 08 11 13

SECTION 08 14 16

FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Solid-core flush wood doors.
   2. Fire-rated wood door.
   3. Factory finishing flush wood doors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.

B. Sustainable Design Submittals:

   1. Environmental Product Declaration (EPD): For each product.
   2. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
   3. Chain-of-Custody Qualification Data: For manufacturer and vendor.
   4. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
   5. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data; and the following:

   1. Door schedule indicating door location, type, size, fire protection rating, and swing.
   2. Door elevations, dimension and locations of hardware, lite and louver cutouts, and glazing thicknesses.
   3. Dimensions and locations of blocking for hardware attachment.
   4. Clearances and undercuts.
   5. Apply AWI Quality Certification Program label to Shop Drawings.

D. Samples: For factory-finished doors.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For door inspector.

1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Section 5.2.3.1.
2. Egress Door Inspector: Submit documentation of compliance with NFPA 101, Section 7.2.1.15.4.
3. Submit copy of DHI's Fire and Egress Door Assembly Inspector (FDAI) certificate.

B. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

B. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.5 QUALITY ASSURANCE

A. Certified Wood: Provide an invoice including vendor's chain-of-custody number, product cost, and entity being invoiced.

B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

C. Manufacturer's Certification: Licensed participant in AWI's Quality Certification Program.

D. Fire-Rated Door Inspector Qualifications: Inspector for field quality-control inspections of fire-rated door assemblies shall comply with qualifications set forth in NFPA 80, Section 5.2.3.1 and the following:

1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.

E. Egress Door Inspector Qualifications: Inspector for field quality-control inspections of egress door assemblies shall comply with qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:

1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.

1.6 DELIVERY, STORAGE AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions

B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.

C. Mark each door on bottom rail with opening number used on Shop Drawings.

1.7 WARRANTY

A. Special Warranty: Manufacture agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Warping (bow, cup, or twist) more than ¼ inch in a 42-by-84 inch section.
   b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
2. Warranty shall also include installation and finishing that may be required due to repair or replace3ment of defective doors.
3. Warranty period for Solic-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Wood Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing at positive pressure in accordance with UL 10C.

1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
2. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

2.2 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with "Architectural Woodwork Standards."

1. Provide labels and certificates from AWI certification program indicating that doors comply with requirements of grades specified.

B. Regional Materials: Manufacture wood doors within 100 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.

C. Certified Wood: Certify wood doors as "FSC Pure" in accordance with FSC STD-01-001 and FSC STD-40-004.

D. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

E. Composite Wood Products: Verify products are made using ultra-low-emitting formaldehyde resins, as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products," or are made with no added formaldehyde.

2.3 SOLID-CORE FLUSH WOOD DOORS WITH PLASTIC-LAMINATE FACES

A. Interior Doors:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Oregon Door.
    b. Masonite Architectural.
    c. VT Industries Inc.

2. Performance Grade: ANSI/WDMA I.S. 1A Extra Heavy Duty.
3. Performance Grade:

    a. ANSI/WDMA I.S. 1A Heavy Duty unless otherwise indicated.

4. Architectural Woodwork Standards Grade: Premium.
5. Colors and Finishes: As selected by the State from manufacturer's full range of products.
6. Exposed Vertical Edges: Hardwood edges for staining to match faces.

    a. Fire-Rated Single Doors: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed vertical edges.

    b. Mineral-Core Doors: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

1) Screw-Holding Capability: 550 lbf in accordance with WDMA T.M. 10.

7. Core for Non-Fire-Rated Doors:

a. ANSI A208.1, Grade LD-2 particleboard.

1) Blocking: Provide wood blocking in particleboard-core doors as follows:

a) 5-inch top-rail blocking, in doors indicated to have closers.
b) 5-inch bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.
c) 5-inch midrail blocking, in doors indicated to have exit devices.

2) Provide doors with glued-wood-stave cores instead of particleboard cores for doors scheduled to receive exit devices in Section 08 71 00 "Door Hardware.".

b. Glued wood stave.
c. WDMA I.S. 10 structural composite lumber.

1) Screw Withdrawal, Face: 550 lbf.
2) Screw Withdrawal, Edge: 550 lbf.

d. Either glued wood stave or WDMA I.S. 10 structural composite lumber.

8. Core for Fire-Rated Doors: As required to achieve fire-protection rating indicated.

a. Blocking for Mineral-Core Doors: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as follows:

1) 5-inch top-rail blocking.
2) 5-inch bottom-rail blocking, in doors indicated to have protection plates.
3) 5-inch midrail blocking, in doors indicated to have armor plates.
4) 5-inch midrail blocking, in doors indicated to have exit devices.

9. Construction: Five plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before faces and crossbands are applied.

2.4 LIGHT FRAMES AND LOUVERS

A. Metal Louvers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allegion plc.
b. Anemostat Products; a Mestek company.

c. L & L Louvers, Inc.

2. Blade Type: Vision-proof, inverted Y
3. Metal and Finish: Hot-dip galvanized steel, 0.040 inch thick, factory primed for paint finish.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated.

1. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
2. Comply with NFPA 80 requirements for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied.

1. Locate hardware to comply with DHI-WDHS-3.
2. Comply with final hardware schedules, door frame Shop Drawings, ANSI/BHMA-156.115-W, and hardware templates.
3. Coordinate with hardware mortises in metal frames, to verify dimensions and alignment before factory machining.
4. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.
5. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

C. Openings: Factory cut and trim openings through doors.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 08 80 00 "Glazing."
3. Louvers: Factory install louvers in prepared openings.

2.6 FACTORY FINISHING

A. Comply with referenced quality standard for factory finishing.

1. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
2. Finish faces, all four edges, edges of cutouts, and mortises.
3. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.

B. Factory finish doors.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Hardware: For installation, see Section 08 71 00 "Door Hardware."

B. Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

C. Job-Fitted Doors:

1. Align and fit doors in frames with uniform clearances and bevels as indicated below.

a. Do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors.

2. Machine doors for hardware.
3. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
4. Clearances:

a. Provide 1/8 inch at heads, jambs, and between pairs of doors.
b. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated.
c. Where threshold is shown or scheduled, provide1/4 inch from bottom of door to top of threshold unless otherwise indicated.
d. Comply with NFPA 80 for fire-rated doors.

5. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
6. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.

D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.2 FIELD QUALITY CONTROL

A. Inspections:

1. Provide inspection of installed Work through AWI's Quality Certification Program, certifying that wood doors and frames, including installation, comply with requirements of AWI/AWMCA/WI's "Architectural Woodwork Standards" for the specified grade.
2. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.

3. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements in accordance with NFPA 101, Section 7.2.1.15.

B. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

C. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

D. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08 14 16

SECTION 08 31 13

ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Access doors and frames.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 ACCESS DOORS AND FRAMES

A. Flush Access Doors with Exposed Flanges:

1. Nystrom- Architectural Access Door- Basis of design or approved equal.
2. Description: Face of door flush with frame, with exposed flange and concealed hinge.
3. Size: 24”x24”
4. Uncoated Steel Sheet for Door: 16 gage, factory primed.
5. Frame Material: Same material, thickness, and finish as door.
6. Latch and Lock: Cam latch, screwdriver operated.

2.2 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A879/A879M, with cold-rolled steel sheet substrate complying with ASTM A1008/A1008M, Commercial Steel (CS), exposed.

C. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

D. Frame Anchors: Same material as door face.

E. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A153/A153M or ASTM F2329.

2.3 FABRICATION

A. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

B. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.

C. Latch and Lock Hardware:

1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.

2.4 FINISHES

A. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Adjust doors and hardware, after installation, for proper operation.

3.2 FIELD QUALITY CONTROL

A. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

B. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

END OF SECTION 08 31 13

SECTION 08 41 13

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aluminum-framed storefront systems.
2. Aluminum-framed entrance door systems.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.
2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.
3. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
4. Environmental Product Declaration (EPD): For each product.
5. Environmental Product Declaration: For each product.
6. Health Product Declaration: For each product.
7. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.

C. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
2. Include point-to-point wiring diagrams.

D. Samples: For each type of exposed finish required.

E. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams.

1.4 INFORMATIONAL SUBMITTALS

A. Energy Performance Certificates: NFRC-certified energy performance values from manufacturer.

B. Product test reports.

C. Source quality-control reports.

D. Field quality-control reports.

E. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer and that employs a qualified glazing contractor for this Project who is certified under the North American Contractor Certification Program (NACC) for Architectural Glass & Metal (AG&M) contractors.

B. Testing Agency Qualifications: Qualified in accordance with ASTM E699 for testing indicated and acceptable to the State.

C. Product Options: Information provided establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by the State, except with the State's approval. If changes are proposed, submit comprehensive explanatory data to the State for review.

1.7 WARRANTY

A. Special Warranty: Installer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 10 years from date of Beneficial Occupancy.

B. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.

1. Warranty Period: 10 years from date of Beneficial Occupancy.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:

    a. Thermal stresses transferring to building structure.
    b. Glass breakage.
    c. Noise or vibration created by wind and thermal and structural movements.
    d. Loosening or weakening of fasteners, attachments, and other components.
    e. Failure of operating units.

B. Structural Loads:

1. Wind Loads: As indicated.
2. Other Design Loads: As indicated.

C. Deflection of Framing Members Supporting Glass: At design wind load, as follows:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans of up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches.
2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch.

    a. Operable Units: Provide a minimum 1/16-inch clearance between framing members and operable units.

3. Cantilever Deflection: Limited to 2L/175 at unsupported cantilevers.

D. Structural: Test in accordance with ASTM E330/E330M as follows:

1. When tested at positive and negative wind-load design pressures, storefront assemblies, including entrance doors, do not evidence deflection exceeding specified limits.

2. When tested at 150 percent of positive and negative wind-load design pressures, storefront assemblies, including entrance doors and anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

E. Water Penetration under Static Pressure: Test in accordance with ASTM E331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas, including entrance doors, when tested in accordance with a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.

F. Energy Performance: Certified and labeled by manufacturer for energy performance as follows:

1. Thermal Transmittance (U-factor):

a. Fixed Glazing and Framing Areas: U-factor for the system of not more than 0.36 Btu/sq. ft. x h x deg F as determined in accordance with NFRC 100.
b. Entrance Doors: U-factor of not more than 0.68 Btu/sq. ft. x h x deg F as determined in accordance with NFRC 100.

2. Solar Heat-Gain Coefficient (SHGC):

a. Fixed Glazing and Framing Areas: SHGC for the system of not more than 0.38 as determined in accordance with NFRC 200.
b. Entrance Doors: SHGC of not more than 0.40 as determined in accordance with NFRC 200.

3. Air Leakage:

a. Fixed Glazing and Framing Areas: Air leakage for the system of not more than 0.06 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft. when tested in accordance with ASTM E283.
b. Entrance Doors: Air leakage of not more than 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..

4. Condensation Resistance Factor (CRF):

a. Fixed Glazing and Framing Areas: CRF for the system of not less than 55 as determined in accordance with AAMA 1503.
b. Entrance Doors: CRF of not less than 57 as determined in accordance with AAMA 1503.

G. Windborne-Debris Impact Resistance: Passes ASTM E1886 missile-impact and cyclic-pressure tests in accordance with ASTM E1996 for Wind Zone 1 for basic protection.

1. Large-Missile Test: For glazing located within 30 feet of grade.
2. Small-Missile Test: For glazing located between 30 feet and 60 feet above grade.

H. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 STOREFRONT SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Arcadia, Inc.
2. Kawneer North America, an Arconic company.
3. U.S. Aluminum; a brand of C.R. Laurence.

B. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Exterior Framing Construction: Thermally broken.
2. Interior Vestibule Framing Construction: Nonthermal.
3. Glazing System: Retained mechanically with gaskets on four sides.
4. Finish: Color anodic finish.
5. Fabrication Method: Field-fabricated stick system.
6. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
7. Steel Reinforcement: As required by manufacturer.

C. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

2.3 ENTRANCE DOOR SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Arcadia, Inc.
2. Kawneer North America, an Arconic company.
3. U.S. Aluminum; a brand of C.R. Laurence.

B. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing or automatic operation.

1. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch-thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.

    a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.

2. Door Design: Medium stile; 3-1/2-inch nominal width
3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.

    a. Provide nonremovable glazing stops on outside of door.

2.4 ENTRANCE DOOR HARDWARE

A. General: Provide entrance door hardware and entrance door hardware sets indicated in "Entrance Door Hardware Sets" Article for each entrance door, to comply with requirements in this Section.

1. Entrance Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products complying with BHMA standard referenced.
2. Opening-Force Requirements:

    a. Egress Doors: Not more than 5 lbf to release the latch and not more than 15 lbf to open the door to its minimum required width.
    b. Accessible Interior Doors: Not more than 5 lbf to fully open door.

B. Designations: Requirements for design, grade, function, finish, quantity, size, and other distinctive qualities of each type of entrance door hardware are indicated in "Entrance Door Hardware Sets" Article. Products are identified by using entrance door hardware designations as follows:

1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in "Entrance Door Hardware Sets" Article.
2. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.

C. Continuous-Gear Hinges: BHMA A156.26.

D. Mortise Auxiliary Locks: BHMA A156.5, Grade 1.

E. Automatic and Self-Latching Flush Bolts: BHMA A156.3, Grade 1.

F. Panic Exit Devices: BHMA A156.3, Grade 1, listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing in accordance with UL 305.

G. Cylinders:

1. As specified in Section 08 71 00 "Door Hardware."
2. BHMA A156.5, Grade 1.

a. Keying: Master key system. Permanently inscribe each key with a visual key control number and include notation "DO NOT DUPLICATE".

H. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.

I. Operating Trim: BHMA A156.6.

J. Closers: BHMA A156.4, Grade 1, with accessories required for a complete installation, sized as required by door size, exposure to weather, and anticipated frequency of use; adjustable to comply with field conditions and requirements for opening force.

K. Concealed Overhead Holders and Stops: BHMA A156.8, Grade 1.

L. Door Stops: BHMA A156.16, Grade 1, floor or wall mounted, as appropriate for door location indicated, with integral rubber bumper.

M. Weather Stripping: Manufacturer's standard replaceable components.

1. Compression Type: Made of ASTM D2000 molded neoprene or ASTM D2287 molded PVC.
2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

N. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.

O. Thresholds: BHMA A156.21 raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch.

P. Finger Guards: Manufacturer's standard collapsible neoprene or PVC gasket anchored to frame hinge-jamb at center-pivoted doors.

2.5 GLAZING

A. Glazing: Comply with Section 08 80 00 "Glazing."

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

C. Glazing Sealants: As recommended by manufacturer.

1. Verify sealant has a VOC content of 250 g/L or less.
2. Verify sealant complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.6 MATERIALS

A. Sheet and Plate: ASTM B209.

B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.

C. Structural Profiles: ASTM B308/B308M.

D. Steel Reinforcement:

1. Structural Shapes, Plates, and Bars: ASTM A36/A36M.
2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.

E. Steel Reinforcement Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods in accordance with recommendations in SSPC-SP COM, and prepare surfaces in accordance with applicable SSPC standard.

F. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

G. Recycled Content of Aluminum Components: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50 percent.

H. Regional Materials: Manufacture products within 100 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.

2.7 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.

4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from exterior.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

H. After fabrication, clearly mark components to identify their locations in Project in accordance with Shop Drawings.

2.8 ALUMINUM FINISHES

A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

1. Color: As selected by the State from full range of industry colors and color densities.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Comply with manufacturer's written instructions.

B. Do not install damaged components.

C. Fit joints to produce hairline joints free of burrs and distortion.

D. Rigidly secure nonmovement joints.

E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

F. Seal perimeter and other joints watertight unless otherwise indicated.

G. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

H. Set continuous sill members and flashing in full sealant bed, to produce weathertight installation.

I. Install joint filler behind sealant as recommended by sealant manufacturer.

J. Install components plumb and true in alignment with established lines and grades.

3.2 INSTALLATION OF GLAZING

A. Install glazing as specified in Section 08 80 00 "Glazing."

3.3 INSTALLATION OF ALUMINUM-FRAMED ENTRANCE DOORS

A. Install entrance doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware in accordance with entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed entrances and storefronts.

1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by the State shall be tested in accordance with AAMA 501.2 and shall not evidence water penetration.

    a. Perform a minimum of three tests in areas as directed by the State.

2. Air Leakage: ASTM E783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.09 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..

    a. Perform a minimum of three tests in areas as directed by the State.

3. Water Penetration: ASTM E1105 at a minimum uniform static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft., and shall not evidence water penetration.

C. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 08 41 13

SECTION 08 42 29.23

SLIDING AUTOMATIC ENTRANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes exterior and interior, sliding, power-operated automatic entrances.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:
1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Environmental Product Declaration (EPD): For each product.
3. Environmental Product Declaration: For each product.
4. Health Product Declaration: For each product.
5. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.

C. Shop Drawings: For sliding automatic entrances.
1. Include plans, elevations, sections, hardware mounting heights, and attachment details.
2. Include diagrams for power, signal, and control wiring.
3. Indicate locations of activation and safety devices.
4. Include hardware schedule and indicate hardware types, functions, quantities, and locations.

D. Samples: For each type of exposed finish required.

E. Delegated-Design Submittal: For automatic entrances.

1.4 INFORMATIONAL SUBMITTALS

A. Product certificates.

B. Product test reports.

C. Field quality-control reports.

D. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation and maintenance of units required for this Project.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of automatic entrances that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Two years from date of Acceptance of Work.

B. Special Finish Warranty: Manufacturer agrees to repair or replace components on which finishes fail in materials or workmanship within specified warranty period.
   1. Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
   2. Warranty Period: 10 years from date of Acceptance of Work.

PART 2 - PRODUCTS

2.1 AUTOMATIC ENTRANCE ASSEMBLIES

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Power-Operated Door Standard: BHMA A156.10.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Automatic entrances shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Seismic Loads: As indicated.
2. Wind Loads: As indicated.

B. Windborne-Debris Impact Resistance: Passes ASTM E1886 missile-impact and cyclic-pressure tests in accordance with ASTM E1996 for Wind Zone 1 for basic protection.
1. Large-Missile Test: For glazing located within 30 feet of grade.
2. Small-Missile Test: For glazing located between 30 feet and 60 feet above grade.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

D. Air Infiltration: Maximum air leakage through fixed glazing and framing areas of 1.25 cfm/sq. ft. of fixed entrance-system area when tested according to ASTM E283 at a minimum static-air-pressure difference of 1.57 lbf/sq. ft..

2.3 SLIDING AUTOMATIC ENTRANCES

A. General: Provide manufacturer's standard automatic entrances, including doors, sidelites, framing, headers, carrier assemblies, roller tracks, door operators, controls, and accessories required for a complete installation.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Horton Automatics
b. Assa Abloy Entrance Systems
c. Or Equal.

C. Aluminum and Glass Sliding Automatic Entrance:
1. Configuration: Single-sliding door with one sliding leaf and sidelite.
a. Traffic Pattern: Two way.
b. Emergency Breakaway Capability: Sliding leaf and sidelite.
c. Mounting: Between jambs.
2. Operator Features:
a. Power opening and closing.
b. Drive System: belt.
c. Adjustable opening and closing speeds.
d. Adjustable hold-open time between zero and 30 seconds.
e. Obstruction recycle.
f. On-off/hold-open switch to control electric power to operator**,** key operated.
3. Sliding-Door Carrier Assemblies and Overhead Roller Tracks: Carrier assembly that allows vertical adjustment; consisting of nylon- or delrin-covered, ball-bearing-center steel wheels operating on a continuous roller track, or ball-bearing-center steel wheels operating on a nylon- or delrin-covered, continuous roller track. Support doors from carrier assembly by cantilever and pivot assembly.
a. Rollers: Minimum of two ball-bearing roller wheels and two antirise rollers for each active leaf.

4. Sliding-Door Threshold: Threshold members and bottom-guide-track system with stainless steel, ball-bearing-center roller wheels.
    a. Configuration: No threshold across door opening and recessed guide-track system at sidelites.
5. Controls: Activation and safety devices according to BHMA standards.
    a. Activation Device: Motion sensor mounted on each side of door header to detect pedestrians in activating zone and to open door.
    b. Safety Device: Two photoelectric beams mounted in sidelite jambs on each side of door to detect pedestrians in presence zone and to prevent door from closing.
    c. Safety Device: Presence sensor mounted on each side of door header and two photoelectric beams mounted in sidelite jambs on one side of the door to detect pedestrians in presence zone and to prevent door from closing.
    d. Sidelite Safety Device: Presence sensor, mounted above each sidelite on side of door opening through which doors travel, to detect obstructions and to prevent door from opening.
6. Finish: Finish framing, door(s), and header with Class I, color anodic finish.
    a. Color: As selected by the State from full range of industry colors and color densities.

2.4 ENTRANCE COMPONENTS

A. Framing Members: Extruded aluminum, minimum 0.125 inch thick and reinforced as required to support imposed loads.
    1. Provide per section 08 41 13 “Aluminum-Framed Entrances and Storefronts”.

B. Stile and Rail Doors: 1-3/4-inch-thick, glazed doors with minimum 0.125-inch-thick, extruded-aluminum tubular stile and rail members. Mechanically fasten corners with reinforcing brackets that are welded, or incorporate concealed tie-rods that span full length of top and bottom rails.
    1. Glazing Stops and Gaskets: Snap-on, extruded-aluminum stops and preformed gaskets.
    2. Stile Design: Narrow stile, 2-1/8-inch nominal width.
    3. Rail Design: 10-inch nominal height.

C. Sidelite: 1-3/4-inch-deep sidelite with minimum 0.125-inch-thick, extruded-aluminum tubular stile and rail members matching door design.
    1. Glazing Stops and Gaskets: Snap-on, extruded-aluminum stops and preformed gaskets.

D. Headers: Fabricated from minimum 0.125-inch-thick extruded aluminum and extending full width of automatic entrance units to conceal door operators and controls. Provide hinged or removable access panels for service and adjustment of door operators and controls. Secure panels to prevent unauthorized access.
    1. Mounting: Concealed, with one side of header flush with framing.

E. Signage: As required by cited BHMA standard.
    1. Application Process: Door manufacturer's standard process.

2.5 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
   1. Extrusions: ASTM B221.
   2. Sheet: ASTM B209.

B. Steel Reinforcement: Reinforcement with corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Use surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

C. Glazing: As specified in Section 08 80 00 "Glazing."

D. Sealants and Joint Fillers: As specified in Section 07 92 00 "Joint Sealants."

E. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout; complying with ASTM C1107/C1107M; of consistency suitable for application.

F. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

G. Fasteners and Accessories: Corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

H. Recycled Content of Aluminum Components: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50 percent.

I. Regional Materials: Manufacture products within 100 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.

2.6 DOOR OPERATORS AND CONTROLS

A. General: Provide operators and controls, which include activation and safety devices, according to BHMA standards, for condition of exposure, and for long-term, maintenance-free operation under normal traffic load for type of occupancy indicated.

B. Door Operators: Provide door operators of size recommended by manufacturer for door size, weight, and movement.
   1. Door Operator Performance: Door operators shall open and close doors and maintain them in fully closed position when subjected to Project's design wind loads.
   2. Electromechanical Operators: Concealed, self-contained, overhead units powered by fractional-horsepower, permanent-magnet dc motor; with closing speed controlled mechanically by gear train and dynamically by braking action of

electric motor; with solid-state microprocessor controller; complying with UL 325; and with manual operation with power off.

C. Motion Sensors: Self-contained, K-band-frequency, microwave-scanner units; fully enclosed by their plastic housings; adjustable to provide detection-field sizes and functions required by BHMA A156.10.
   1. Provide capability for switching between bi- and unidirectional detection.
   2. For one-way traffic, sensor on egress side shall not be active when doors are fully closed.

D. Presence Sensors: Self-contained, active-infrared scanner units; adjustable to provide detection-field sizes and functions required by BHMA A156.10. Sensors shall remain active at all times.

E. Photoelectric Beams: Pulsed infrared, sender-receiver assembly for recessed mounting. Beams shall not be active when doors are fully closed.

F. Electrical Interlocks: Unless units are equipped with self-protecting devices or circuits, provide electrical interlocks to prevent activation of operator when door is locked, latched, or bolted.

2.7 HARDWARE

A. General: Provide units in sizes and types recommended by automatic entrance and hardware manufacturers for entrances and uses indicated. Finish exposed parts to match door finish.

B. Breakaway Device for Power-Operated Doors: Device that allows door to swing out in direction of egress to full 90 degrees from any operating position. Interrupt powered operation of door operator while in breakaway mode.

C. Deadlocks: Deadbolt operated by exterior cylinder and interior thumb turn, with minimum 1-inch-long throw bolt; BHMA A156.5, Grade 1.
   1. Cylinders: As specified in Section 08 71 00 "Door Hardware."
      a. Keying: Integrate into building master key system.
      b. Keys: Two for each cylinder.
   2. Deadbolts: Laminated-steel hook, mortise type, BHMA A156.5, Grade 1.
   3. Lock/Unlock Indicator: Lock position indicators integrated with locking system. Stile is mounted on secure side of door. Visual display of lock position as follows: "OPEN" in black letters when unlocked, and "LOCKED" in red letters when locked.
   4. Armored Strike: Reinforced security strike plate.

D. Uninterrupted Power Supply: UL 1778, fully integrated unit mounted within header.

E. Weather Stripping: Replaceable components.
   1. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

2.8 FABRICATION

A. General: Factory fabricate automatic entrance components to designs, sizes, and thicknesses indicated and to comply with indicated standards.

B. Framing: Provide automatic entrances as prefabricated assemblies. Complete fabrication, assembly, finishing, hardware application, and other work before shipment to Project site.
   1. Provide components with concealed fasteners and anchor and connection devices.
   2. Fabricate components with accurately fitted joints, with ends coped or mitered to produce hairline joints free of burrs and distortion.
   3. Fabricate exterior components to drain water passing joints, condensation occurring within framing members, and moisture migrating within system to exterior.
   4. Provide anchorage and alignment brackets for concealed support of assembly from building structure.
   5. Allow for thermal expansion of exterior units.

C. Doors: Factory fabricated and assembled in profiles indicated. Reinforce as required to support imposed loads and for installing hardware.

D. Door Operators: Factory fabricated and installed in headers, including adjusting and testing.

E. Glazing: Fabricate framing with minimum glazing edge clearances for thickness and type of glazing indicated, according to GANA's "Glazing Manual."

F. Hardware: Factory install hardware to greatest extent possible; remove only as required for final finishing operation and for delivery to and installation at Project site. Cut, drill, and tap for factory-installed hardware before applying finishes.
   1. Provide sliding-type weather stripping, mortised into door, at perimeter of doors and breakaway sidelites.

G. Controls:
   1. General: Factory install activation and safety devices in doors and headers as required by BHMA A156.10 for type of door and direction of travel.

2.9 ALUMINUM FINISHES

A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install automatic entrances according to manufacturer's written instructions and cited BHMA A156.10 for direction of pedestrian travel, including signage, controls, wiring, and connection to the building's power supply.
   1. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight.
   2. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
   3. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous coating.

B. Entrances: Install automatic entrances plumb and true in alignment with established lines and grades without warp or rack of framing members and doors. Anchor securely in place.
   1. Install surface-mounted hardware using concealed fasteners to greatest extent possible.
   2. Set headers, carrier assemblies, tracks, operating brackets, and guides level and true to location with anchorage for permanent support.
   3. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within system to exterior.
   4. Level recesses for recessed thresholds using nonshrink grout.

C. Door Operators: Connect door operators to electrical power distribution system.

D. Controls: Install and adjust activation and safety devices according to manufacturer's written instructions and cited BHMA standard for direction of pedestrian travel. Connect control wiring according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

E. Glazing: Install glazing as specified in Section 08 80 00 "Glazing."

F. Sealants: Comply with requirements specified in Section 07 92 00 "Joint Sealants" to provide weathertight installation.
   1. Set bottom-guide-track system**,** framing members and flashings in full sealant bed.
   2. Seal perimeter of framing members with sealant.

G. Signage: Apply signage on both sides of each door and breakaway sidelite, as required by cited BHMA standard for direction of pedestrian travel.

H. Wiring within Automatic Entrance Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's written limitations on bending radii. Provide and use lacing bars and distribution spools.

3.2 FIELD QUALITY CONTROL

A. Certified Inspector: Engage a Certified Inspector to test and inspect components, assemblies, and installations, including connections.

B. Perform the following tests and inspections:
   1. Test and inspect each automatic entrance, using AAADM inspection forms, to determine compliance of installed systems with applicable BHMA standards.

C. Automatic entrances will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.3 ADJUSTING

A. Adjust hardware, moving parts, door operators, and controls to function smoothly, and lubricate as recommended by manufacturer; comply with requirements of applicable BHMA standards.

B. Readjust door operators and controls after repeated operation of completed installation equivalent to three days' use by normal traffic (100 to 300 cycles).

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train the State’s maintenance personnel to adjust, operate, and maintain automatic entrances.

END OF SECTION 08 42 29.23

SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Mechanical door hardware for the following:

a. Swinging doors.

b. Sliding doors.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

B. Keying Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For electrified door hardware.

1. Include diagrams for power, signal, and control wiring.
2. Include details of interface of electrified door hardware and building safety and security systems.

C. Samples: For each exposed product in each finish specified.

D. Door hardware schedule.

E. Keying schedule.

1.4 INFORMATIONAL SUBMITTALS

A. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and of an Architectural Hardware Consultant who is available during the course of the Work to consult Contractor and the State about door hardware and keying.

1. Scheduling Responsibility: Preparation of door hardware and keying schedule.

2. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and who is currently certified by DHI as an Architectural Hardware Consultant (AHC) and an Electrified Hardware Consultant (EHC)

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Three years from date of Acceptance of Work unless otherwise indicated below:

a. Exit Devices: Two years from date of Acceptance of Work.
b. Manual Closers: 10 years from date of Acceptance of Work.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Door Assemblies: Where fire-rated doors are indicated, provide door hardware complying with NFPA 80 that is listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

B. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that complies with requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.

1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. at the tested pressure differential of 0.3-inch of water.

C. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation. Operable hardware to comply with CBC 11B-309.4.

E. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the USDOJ's "2010 ADA Standards for Accessible Design and 2022 California Building Code (CBC) Chapter 11B.

2.2 HINGES

A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allegion plc.
b. Hager Companies.
c. INOX by Unison Hardware, Inc.

2.3 SELF-CLOSING HINGES AND PIVOTS

A. Self-Closing Hinges and Pivots: BHMA A156.17 complying with CBC 11B-404.2.8.2.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allegion plc.
b. Hager Companies.
c. Stanley Commercial Hardware; a division of Stanley Security Solutions.

2.4 MECHANICAL LOCKS AND LATCHES

A. Lock Functions: As indicated in door hardware schedule.

B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
1. Mortise Locks: Minimum 3/4-inch latchbolt throw.

C. Lock Backset: 2-3/4 inches unless otherwise indicated.

D. Lock Trim:

1. Description: As indicated in Door Hardware Schedule.

2. Levers: Forged.

a. Schlage 06- Basis of design

3. Escutcheons (Roses): Wrought.
4. Dummy Trim: Match lever lock trim and escutcheons.

E. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.
4. Rabbet Front and Strike: Provide on locksets for rabbeted meeting stiles.

F. Mortise Locks: BHMA A156.13; Security Grade 1; stamped steel case with steel or brass parts; Series 1000.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allegion plc.
b. Best Access Systems; Stanley Security Solutions, Inc.
c. INOX by Unison Hardware, Inc.

2.5 SELF-CONTAINED ELECTRONIC LOCKS

A. Self-Contained Electronic Locks: BHMA A156.25, mortise; with internal, battery-powered, self-contained electronic locks; consisting of complete lockset, motor-driven lock mechanism, and actuating device; enclosed in zinc-dichromate-plated, wrought-steel case, and strike that suits frame. Provide key override, low-battery detection and warning, LED status indicators, and ability to program at the lock.

1. Keypad trim can accommodate up to 150 users, (including master, supervisor and emergency users) plus two one-time codes and three operational modes (standard, passage, and lockout). Powered by (4) standard “AA” Batteries.

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Schlage AD.
b. Best Access Systems; Stanley Security Solutions, Inc.
c. Kaba Ilco Corp.

2.6 EXIT LOCKS AND EXIT ALARMS

A. Exit Locks and Alarms: BHMA A156.29, Grade 1.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allegion plc.
b. Detex Corporation.
c. Precision Hardware, Inc.; dormakaba Group.

2.7 MANUAL FLUSH BOLTS

A. Manual Flush Bolts: BHMA A156.16; minimum 3/4-inch throw; designed for mortising into door edge.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allegion plc.
b. INOX by Unison Hardware, Inc.
c. Trimco.

2.8 EXIT DEVICES AND AUXILIARY ITEMS

A. Exit Devices and Auxiliary Items: BHMA A156.3.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allegion plc.
b. DORMA USA, Inc.
c. INOX by Unison Hardware, Inc.

2.9 LOCK CYLINDERS

A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver. Provide cylinder from same manufacturer of locking devices.

B. Standard Lock Cylinders: BHMA A156.5; Grade 1 permanent cores; face finished to match lockset.

1. Core Type: Removable.

C. High-Security Lock Cylinders: BHMA A156.30; Grade 1 permanent cores that are removable; face finished to match lockset.

1. Type: M, mechanical.

D. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.

E. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

2.10 KEYING

A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, appendix. Provide one extra key blank for each lock. Incorporate decisions made in keying conference.

1. No Master Key System: Only change keys operate cylinders.

a. Provide three cylinder change keys.

2. Master Key System: Change keys and a master key operate cylinders.

a. Provide three cylinder change keys and five master keys.

3. Grand Master Key System: Change keys, a master key, and a grand master key operate cylinders.

a. Provide three cylinder change keys and five each of master and grand master keys.

4. Great-Grand Master Key System: Change keys, a master key, a grand master key, and a great-grand master key operate cylinders.

a. Provide three cylinder change keys and five each of master, grand master, and great-grand master keys.

5. Keyed Alike: Key all cylinders to same change key.

B. Keys: Nickel silver

1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:

a. Notation: "DO NOT DUPLICATE.".

2.11 KEY CONTROL SYSTEM

A. Key Control Cabinet: Key cabinet to be provided by DMV and installed by contractor.

2.12 OPERATING TRIM

A. Operating Trim: BHMA A156.6; stainless steel unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allegion plc.
b. INOX by Unison Hardware, Inc.
c. Trimco. Basis of design

2.13 ACCESSORIES FOR PAIRS OF DOORS

A. Coordinators: BHMA A156.3; consisting of active-leaf, hold-open lever and inactive-leaf release trigger; fabricated from steel with nylon-coated strike plates; with built-in, adjustable safety release.

2.14 SURFACE CLOSERS

A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written instructions for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force. Closers to comply with CBC 11B-404.2.8.1.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allegion plc.
b. DORMA USA, Inc. Basis of design.
c. INOX by Unison Hardware, Inc.

2.15 MECHANICAL STOPS AND HOLDERS

A. Wall- and Floor-Mounted Stops: BHMA A156.16.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allegion plc.
b. Architectural Builders Hardware Mfg., Inc.
c. Trimco. Basis of design.

2.16 DOOR GASKETING

A. Door Gasketing: BHMA A156.22; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Hager Companies.
b. Legacy Manufacturing.
c. Pemko; an ASSA ABLOY Group Company. Basis of design.

B. Maximum Air Leakage: When tested according to ASTM E283 with tested pressure differential of 0.3-inch wg, as follows:

1. Smoke-Rated Gasketing: 0.3 cfm/sq. ft. of door opening.
2. Gasketing on Single Doors: 0.3 cfm/sq. ft. of door opening.
3. Gasketing on Double Doors: 0.50 cfm per ft. of door opening.

2.17 THRESHOLDS

A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated and complying with CBC 11B-404.2.5.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Hager Companies.
b. Legacy Manufacturing.
c. Pemko; an ASSA ABLOY Group Company. Basis of design.

2.18 METAL PROTECTIVE TRIM UNITS

A. Metal Protective Trim Units: BHMA A156.6; fabricated from 0.050-inch-thick stainless steel; with manufacturer's standard machine or self-tapping screw fasteners.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allegion plc.
b. INOX by Unison Hardware, Inc.
c. Trimco. Basis of design

2.19 AUXILIARY DOOR HARDWARE

A. Auxiliary Hardware: BHMA A156.16.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Allegion plc.
    b. Baldwin Hardware Corporation.
    c. Trimco. Basis of design

2.20 FINISHES

A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with CBC 11B-404.2.7.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Wood Doors: DHI's "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.

C. Hinges: Install types and in quantities indicated in door hardware schedule, but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

D. Intermediate Offset Pivots: Where offset pivots are indicated, provide intermediate offset pivots in quantities indicated in door hardware schedule, but not fewer than one intermediate offset pivot per door and one additional intermediate offset pivot for every 30 inches of door height greater than 90 inches.

E. Lock Cylinders: Install construction cores to secure building and areas during construction period.

1. Replace construction cores with permanent cores as directed by the State.
2. Furnish permanent cores to the State for installation.

F. Key Control Cabinet: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

G. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room. Verify location with the State.

1. Configuration: Provide least number of power supplies required to adequately serve doors with electrified door hardware.

H. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 07 92 00 "Joint Sealants."

I. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.

J. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

1. Do not notch perimeter gasketing to install other surface-applied hardware.

K. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

L. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.2 ADJUSTING

A. Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.3 DOOR HARDWARE SCHEDULE

A. Hardware Group 1 (Doors 108, 109, 121, & 122): Each door to have the following:

1 ½ PR	BUTTS	HAGER BB1279 4 ½" x 4 ½"
1 EA	PULL	TRIMCO 1012-3
1 EA	PUSH	TRIMCO 1001-3
1 EA	CLOSER	DORMA TS93-T
1 EA	KICK PLATE	TRIMCO K0064 36" x 12"
1 EA	STOP	TRIMCO 1270CV

B. Hardware Group 2 (Doors 126): Each door to have the following:

1 PR	SPRING LOADED BUTTS	HAGER 1250 4 ½" x 4 ½"
½ PR	BUTTS	HAGER BB1279 4 ½" x 4 ½"
1 EA	LOCKSET	SCHLAGE AD200-MS-70-KP-RHO
1 EA	KICK PLATE	TRIMCO K0064 36" x 12"
1 EA	STOP	TRIMCO 1270CV

C. Hardware Group 3 (Doors 110): Each door to have the following:

1 ½ PR	BUTTS	HAGER BB1279 4 ½" x 4 ½"
1 EA	LOCKSET	SCHLAGE L9080-06A
1 EA	CLOSER	DORMA TS93-T
1 EA	KICK PLATE	TRIMCO K0064 36" x 12"
1 EA	STOP	TRIMCO 1270CV

D. Hardware Group 4 (Door 128): Each door to have the following:

1 ½ PR	BUTTS	HAGER BB1279 4 ½" x 4 ½"
1 EA	LOCKSET	SCHLAGE AD200-MS-70-KP-RHO
1 EA	CLOSER	DORMA TS93-T
1 EA	KICK PLATE	TRIMCO K0064 36" x 12"
1 EA	STOP	TRIMCO 1270CV
1 SET	SMOKE SEAL	PEMKO S88D

E. Hardware Group 5 (Door 129B): Each door to have the following:

1 ½ PR	BUTTS	HAGER BB1279 4 ½" x 4 ½"
1 EA	LOCKSET	SCHLAGE L9070-06A
1 EA	CLOSER	DORMA TS93-TH
1 EA	KICK PLATE	TRIMCO K0064 36" x 48"
1 EA	STOP	TRIMCO 1270CV

F. Hardware Group 6 (Doors 116, 117, & 124): Each door to have the following:

1 ½ PR	BUTTS	HAGER BB1279 4 ½" x 4 ½"
1 EA	LOCKSET	SCHLAGE L9056-06A
1 EA	CLOSER	DORMA TS93-PT
1 EA	KICK PLATE	TRIMCO K0064 36" x 12"
1 EA	STOP	TRIMCO 1270CV

G. Hardware Group 7 (Door 111): Each door to have the following:

1 ½ PR	BUTTS	HAGER BB1279 4 ½" x 4 ½"
1 EA	LOCKSET	SCHLAGE AD200-MS-70-KP-RHO
1 EA	CLOSER	DORMA TS93-T
1 EA	ARMOUR PLATE	TRIMCO K0064 36" x 12"
1 EA	STOP	TRIMCO 1270CV
1 EA	PEEP HOLE	TRIMCO 976U-CAP

H. Hardware Group 8 (Doors 104A, 104B, 112, & 118A): Each door to have the following:

1 ½ PR	BUTTS	HAGER BB1279 4 ½" x 4 ½"
1 EA	LOCKSET	SCHLAGE L9070-06A
1 EA	CLOSER	DORMA TS93-TH
1 EA	KICK PLATE	TRIMCO K0064 36" x 12"
1 EA	STOP	TRIMCO 1270CV

I. Hardware Group 9 (Door 120A): Each door to have the following:

1 ½ PR	BUTTS	HAGER BB1279 4 ½" x 4 ½"
1 EA	PASSAGE SET/EXIT	VON DUPRIN 9875L-BE
1 EA	CLOSER	DORMA TS93-T
1 EA	KICK PLATE	TRIMCO K0064 36" x 12"
1 EA	STOP	TRIMCO 1270CV

J. Hardware Group 10 (Door 120B): Each door to have the following:

1 EA	CONT HINGE	BY STORE FRONT MANUFACTURER
1 EA	CLOSER	DORMA TS93-PT
1 EA	EXIT DEVICE	VON DUPRIN 9848EO
1 EA	LOCKSET	SCHLAGE AD200-993R-70-KP-RHO
1 EA	THRESHOLD	BY STORE FRONT MANUFACTURER
1 EA	DOOR BOTTOM	BY STORE FRONT MANUFACTURER

K. Hardware Group 11 (Door 103): Each door to have the following:

1 ½ PR	BUTTS	HAGER BB1279 4 ½" x 4 ½"
1 EA	OCCUPANCY SET	SCHLAGE ND40S
1 EA	CLOSER	DORMA TS93-PT
1 EA	KICK PLATE	TRIMCO K0064 36" x 12"
1 EA	STOP	TRIMCO 1270CV

L. Hardware Group 12 (Doors 100B & 101C):

1. Balance of hardware by storefront manufacturer.

M. Hardware Group 13 (Doors 100A, 101B & 106): Each door to have the following:

1 EA	CONT HINGE	BY STORE FRONT MANUFACTURER
1 EA	EXIT DEVICE	VON DUPRIN 9848NL
1 EA	CLOSER	DORMA TS93-PT

1 EA	THRESHOLD	BY STORE FRONT MANUFACTURER
1 EA	DOOR BOTTOM	BY STORE FRONT MANUFACTURER

N. Hardware Group 14 (Door 101A): Each door to have the following:

1 EA	CONT HINGE	BY STORE FRONT MANUFACTURER
1 EA	EXIT DEVICE	VON DUPRIN 9848EO
1 EA	LOCKSET	SCHLAGE AD200-993R-70-KP-RHO
1 EA	CLOSER	DORMA TS93-PT
1 EA	THRESHOLD	BY STORE FRONT MANUFACTURER
1 EA	DOOR BOTTOM	BY STORE FRONT MANUFACTURER

O. Hardware Group 15 (Door 119): Each door to have the following:

1 ½ PR	BUTTS	HAGER BB1279 NRP 4 ½” x 4 ½”
1 EA	CLOSER	DORMA TS93-SPT
1 EA	LOCKSET	SCHLAGE AD200-MS-70-KP-RHO
1 EA	EXIT	VON DUPRIN 9875EO
1 EA	KICK PLATE	TRIMCO K0064 36” x 12”
1 EA	PEEP HOLE	TRIMCO 976U-CAP
1EA	DRIP CAP	PEMKO 346
1 EA	BOTTOM DRIP	PEMKO 345

P. Hardware Group 16 (Door 115 & 118B): Each door to have the following:

1 ½ PR	BUTTS	HAGER BB1279 NRP 4 ½” x 4 ½”
1 EA	CLOSER	DORMA TS93-PT
1 EA	LOCKSET	SCHLAGE AD200-993R-70-KP-RHO
1 EA	THRESHOLD	PEMKO 2005AT
1 EA	DRIP CAP	PEMKO 346
1 EA	BOTTOM DRIP	PEMKO 345
1 EA	WEATHER STRIP	PEMKO S88
1 EA @ DOOR 118B	PEEP HOLE	TRIMCO 976U-CAP

Q. Hardware Group 17 (Door 129A): Each door to have the following:

3 PR	BUTTS	HAGER BB1279 NRP 4 ½" x 4 ½"
1 EA	LOCKSET	SCHLAGE AD200-993R-70-KP-RHO
1 EA	CLOSER/COORDINATOR	DORMA TS93-GSR/PT-EMF
2 EA	MANUAL FLUSH BOLTS	TRIMCO 3915
1 EA	DUST PROOF STRIKE	TRIMCO 3911
1 EA	LOCK ASTRIGAL	TRIMCO 5002
1 EA	THRESHOLD	PEMKO 2005AT
1 EA	PEEP HOLE	TRIMCO 976U-CAP
1 EA	KICK PLATE	TRIMCO K0064 36" x 12"
1 EA	DRIP CAP	PEMKO 346
1 EA	BOTTOM DRIP	PEMKO 345

R. Hardware Group 18 (Door 107): Each door to have the following:

3 PR	BUTTS	HAGER BB1279 NRP 4 ½" x 4 ½"
1 EA	LOCKSET	SCHLAGE B60
2 EA	MANUAL FLUSH BOLTS	TRIMCO 3915
1 EA	DUST PROOF STRIKE	TRIMCO 3911
1 EA	LOCK ASTRIGAL	TRIMCO 5002
1 EA	THRESHOLD	PEMKO 2005AT
1 EA	DRIP CAP	PEMKO 346
1 EA	BOTTOM DRIP	PEMKO 345
1 EA	WEATHER STRIP	PEMKO S88

S. Hardware Group 19 (Doors R01 & R02)): Each door to have the following:

1 ½ PR	BUTTS	HAGER BB1279 NRP 4 ½" x 4 ½"
1 EA	LOCKSET	SCHLAGE B60
1 EA	THRESHOLD	PEMKO 2005AT
1 EA	DRIP CAP	PEMKO 346
1 EA	BOTTOM DRIP	PEMKO 345
1 EA	WEATHER STRIP	PEMKO S88

T. Hardware Group 20 (Doors 113): Each door to have the following:

1 ½ PR	BUTTS	HAGER BB1279 4 ½" x 4 ½"
1 EA	LOCKSET	SCHLAGE AD200-993R-70-KP-RHO
1 EA	CLOSER	DORMA TS93-T
1 EA	KICK PLATE	TRIMCO K0064 36" x 12"
1 EA	STOP	TRIMCO 1270CV

U. Hardware Group 21 (Doors 127): Each door to have the following:

1 PR	SPRING LOADED BUTTS	HAGER 1250 4 ½" x 4 ½"
½ PR	BUTTS	HAGER BB1279 4 ½" x 4 ½"
1 EA	LOCKSET	SCHLAGE L9070-06A
1 EA	KICK PLATE	TRIMCO K0064 36" x 12"
1 EA	STOP	TRIMCO 1270CV

END OF SECTION 08 71 00

SECTION 08 80 00

GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glass for windows, doors, interior borrowed lites, & storefront framing.
2. Laminated glass.
3. Glazing sealants and accessories.

1.2 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thickness: Indicated by thickness designations in millimeters according to ASTM C1036.

C. IBC: International Building Code.

D. Interspace: Space in between lites of an insulating-glass unit.

1.3 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.
2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

C. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.

D. Glazing Accessory Samples: For sealants and colored spacers, in 12-inch lengths. Install sealant samples between two strips of material representative in color of the adjoining framing system.

E. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated.

F. 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.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For glass.

B. Product Test Reports: For obscure glass, coated glass, insulating glass, and glazing sealants, for tests performed by a qualified testing agency.

1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

C. Preconstruction adhesion and compatibility test report.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved by coated-glass manufacturer.

B. 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.

C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.

1. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.

2. Use ASTM C1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants 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 enough 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.

1.8 DELIVERY, STORAGE AND HANDLING

A. Protect glazing materials according to manufacturer's written instruction. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.9 FIELD CONDITIONS

A. Environments 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 are below 40 deg F.

1.10 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: 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 Beneficial Occupancy.

B. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of

laminated 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 edge separation, delamination materially obstructing vision through lass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: 10 years from date of Beneficial Occupancy.

C.

D. Manufacturer's Special Warranty for 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 Beneficial Occupancy.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Pilkington North America.
2. Viracon, Inc.
3. Vitro Architectural Glass.

B. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.

1. Obtain tinted glass from single source from single manufacturer.

2. Obtain obscure glass from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the California Building Code and ASTM E1300.

1. Design Wind Pressures: As indicated.
2. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

B. Windborne-Debris Impact Resistance: Exterior glazing shall pass ASTM E1886 missile-impact and cyclic-pressure tests in accordance with ASTM E1996 for Wind Zone 1 for basic protection.

1. Large-Missile Test: For glazing located within 30 feet of grade.
2. Small-Missile Test: For glazing located between 30 feet (9.1 m) and 60 feet above grade.

C. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

D. 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. 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.
2. 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.
3. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.3 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR A7, "Sloped Glazing Guidelines."
3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

B. 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. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.

E. 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 heat-strengthened float glass is indicated, provide 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.

2.4 GLASS PRODUCTS

A. Clear Annealed Float Glass: ASTM C1036, Type I, Class 1 (clear), Quality-Q3.

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. ICD High Performance Coatings.
    b. AGC Glass Company North America, Inc.
    c. Cardinal Glass Industries, Inc.
    d. Vitro Architectural Glass.

B. Tinted Annealed Float Glass: ASTM C1036, Type I, Class 2 (tinted), Quality-Q3.

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. AGC Glass Company North America, Inc.
    b. Vitro Architectural Glass.
    c. Or Equal.

C. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

D. Heat-Strengthened Float Glass: ASTM C1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

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 E2190.

1. Sealing System: Dual seal, with manufacturer’s standard primary and secondary sealants.
2. Perimeter Spacer: Manufacturer's standard spacer material and construction.

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) Vitro Architectural Glass, solarban 72, Glass Low-E, Basis of Design.
   2) Technoform Glass Insulation North America
   3) Thermix: a brand of Ensinger, USA

3. Desiccant: Molecular sieve or silica gel, or a blend of both.

2.6 GLAZING SEALANTS

A. General:

1. Compatibility: Compatible with one another and with other materials they 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 manufacturer's' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.

3. Verify sealant has a VOC content of 250 g/L or less.

4. Verify sealant complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical emissions from Indoor Sources Using Environmental Chambers."

5. Colors of Exposed Glazing Sealants: As selected by the State from manufacturer's full range.

B. Glazing Sealant:

1. Neutral-curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 100/50, Use NT.

   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) GE Construction Sealants; Momentive Performance Materials, Inc.
      2) Sika Corporation.
      3) The Dow Chemical Company.
      4) Tremco Inc.

2.7 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, with 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. Glazing Tapes: Back-bedding mastic glazing tapes: Preformed, butyl-based, 100 percent solids elastomeric tape: nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 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 in applications in which tape is not subject to continuous pressure.

C. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as primary sealant.

2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

D. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

E. Setting Blocks:
1. Neoprene with a Shore A durometer hardness of 85, plus or minus 5.
2. Type recommended by sealant or glass manufacturer.

F. Spacers:
1. Neoprene blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
2. Type recommended by sealant or glass manufacturer.

G. Edge Blocks:
1. Neoprene with a Shore A duometer hardness per manufacturer's written instruction.
2. Type recommended by sealant or glass manufacturer.

H. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.8 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 referend glazing publications, to comply with system performance requirements.

1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

2. Temperature Change: 120 deg F, ambient; 180 deg F material surfaces.

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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with 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 joins 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 before glazing. 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. So not use materials that 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. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. 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.

G. 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.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

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, then to jambs. Cover horizontal framing joints by applying tapes to jambs, 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 toward centers 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 securely in 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 depth of installed sealant relative to edge clearance for optimum sealant performance.

3.7 CLEANING AND PROTECTION

A. Immediately after installation remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. 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.

1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

C. Remove and replace glass that is damaged during construction period.

D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Beneficial Occupancy. Wash glass as recommended in writing by glass manufacturer.

3.8 MONOLITHIC GLASS SCHEDULE

A. Glass Type: Clear fully tempered float glass.

1. Minimum Thickness: 6 mm.
2. Safety glazing required.

3.9 INSULATING GLASS SCHEDULE

A. Glass Type: Low-E-coated, clear insulating glass.

1. Basis-of-Design Product: Vitro, Solarban 60 (2) + Clear.
2. Overall Unit Thickness: 1 inch.
3. Minimum Thickness of Each Glass Lite: 6 mm.
4. Outdoor Lite: Heat-strengthened float glass.
5. Interspace Content: Argon.
6. Indoor Lite: Heat-strengthened.
7. Low-E Coating: Sputtered on second surface.
8. Winter Nighttime U-Factor: 0.29 maximum.
9. Summer Daytime U-Factor: 0.9 maximum.
10. Visible Light Transmittance: 70 percent minimum.
11. Solar Heat Gain Coefficient: 0.39 maximum.
12. Safety glazing required- where indicated.

END OF SECTION 08 80 00

SECTION 08 83 00

MIRRORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the following types of silvered flat glass mirrors:

1. Annealed monolithic glass mirrors.
2. Tempered glass mirrors qualifying as safety glazing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Mirrors. Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.

B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachment details.

D. Samples: For each type of the following:

1. Mirrors: 12 inches (300 mm) square, including edge treatment on two adjoining edges.
2. Mirror Clips: Full size.
3. Mirror Trim: 12 inches (300 mm) long.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of mirror and mirror mastic.

C. Preconstruction Test Reports: From mirror manufacturer indicating that mirror mastic was tested for compatibility and adhesion with mirror backing and substrates on which mirrors are installed.

D. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For mirrors to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. 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.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Mirror Mastic Compatibility Test: Submit mirror mastic products to mirror manufacturer for testing to determine compatibility of mastic with mirror backing.

1. Testing is not required if data are submitted based on previous testing of mirror mastic products and mirror backing matching those submitted.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from moisture, condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to

manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

1. Warranty Period: Five years from date of Beneficial Occupancy.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Avalon Glass and Mirror Company.
2. Glasswerks LA, Inc.
3. Guardian Glass; SunGuard.

B. Source Limitations for Mirrors: Obtain mirrors from single source from single manufacturer.

C. Source Limitations for Mirror Accessories: Obtain mirror glazing accessories from single source.

2.2 SILVERED FLAT GLASS MIRRORS

A. Mirrors, General: ASTM C1503; manufactured using copper-free, low-lead mirror coating process.

B. Annealed Monolithic Glass Mirrors: Mirror Quality, clear.

1. Nominal Thickness: 6.0 mm.

C. Tempered Glass Mirrors: Mirror Glazing Quality for blemish requirements and complying with ASTM C1048 for Kind FT, Condition A, tempered float glass before silver coating is applied; clear.

1. Nominal Thickness: 6.0 mm.

D. Laminated Mirrors: ASTM C1172, Type II.

1. Glass for Outer Lite: Annealed float glass, Mirror Quality, clear.
2. Nominal Thickness for Outer Lite: 6.0 mm.
3. Glass for Inner Lite: Tempered float glass; ASTM C1048 Type I; Quality-Q3; Class I (clear), Kind FT, Condition A.
4. Nominal Thickness: 6.0 mm.

5. Interlayer: Mirror manufacturer's standard 0.030-inch- (0.76-mm-) thick, clear polyvinyl-butyral interlayer with a proven record of showing no tendency to delaminate from, or cause damage to, silver coating.

E. Safety Glazing Products: For tempered mirrors, provide products that comply with 16 CFR 1201, Category II.

2.3 MISCELLANEOUS MATERIALS

A. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

B. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.

C. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors and certified by both mirror and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.

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. C.R. Laurence Co., Inc.
    b. Franklin International.
    c. Macco Adhesives.
    d. Pecora Corporation.

2. Verify adhesives have a VOC content of 70 g/L or less.
3. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

D. Film Backing for Safety Mirrors: Film backing and pressure-sensitive adhesive; both compatible with mirror backing paint as certified by mirror manufacturer.

2.4 MIRROR HARDWARE

A. Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover edges of mirrors in a single piece.

1. Bottom and Side Trim: J-channels formed with front leg and back leg not less than 3/8 and 7/8 inch (9.5 and 22 mm) in height, respectively, and a thickness of not less than 0.04 inch (1.0 mm).

    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) Andscot Company, Inc.
2) C.R. Laurence Co., Inc.
3) Stylmark, Inc.

2. Top Trim: J-channels formed with front leg and back leg not less than 5/8 and 1 inch (16 and 25 mm) in height, respectively, and a thickness of not less than 0.04 inch (1.0 mm).

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Andscot Company, Inc.
2) C.R. Laurence Co., Inc.
3) Stylmark, Inc.

3. Finish: Clear bright anodized.

B. Aluminum J-Channels and Cleat: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover edges of mirrors in a single piece.

1. Bottom and Side Trim: J-channels formed with front leg and back leg not less than 5/16 and 3/4 inch (7.9 and 19 mm) in height, respectively.

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) C.R. Laurence Co., Inc.
2) Eagle Aluminum
3) Or Equal.

2. Top Trim: Formed with front leg with a height matching bottom trim and back leg designed to fit into the pocket created by wall-mounted aluminum cleat.

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) C.R. Laurence Co., Inc.
2) Eagle Aluminum
3) Or Equal.

3. Finish: Clear bright anodized.

C. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.

D. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield, expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.

2.5 FABRICATION

A. Fabricate mirrors in the shop to greatest extent possible.

B. Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.

C. Mirror Edge Treatment: Rounded polished.

1. Seal edges of mirrors with edge sealer after edge treatment to prevent chemical or atmospheric penetration of glass coating.
2. Require mirror manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.

D. Film-Backed Safety Mirrors: Apply film backing with adhesive coating over mirror backing paint, as recommended in writing by film-backing manufacturer, to produce a surface free of bubbles, blisters, and other imperfections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.

B. Verify compatibility with and suitability of substrates, including compatibility of existing finishes or primers with mirror mastic.

C. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.

3.3 INSTALLATION

A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.

1. GANA Publications: "Glazing Manual" and "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."

B. Provide a minimum airspace of 1/8 inch (3 mm) between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.

C. Install mirrors with mastic and mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.

1. Aluminum J-Channels: Provide setting blocks 1/8 inch (3 mm) thick by 4 inches (100 mm) long at quarter points. To prevent trapping water, provide, between setting blocks, two slotted weeps not less than 1/4 inch (6.4 mm) wide by 3/8 inch (9.5 mm) long at bottom channel.
2. Aluminum J-Channels and Cleat: Fasten J-channel directly to wall and attach top trim to continuous cleat fastened directly to wall.
3. Mirror Clips: Place a felt or plastic pad between mirror and each clip to prevent spalling of mirror edges. Locate clips so they are symmetrically placed and evenly spaced.
4. Install mastic as follows:

    a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
    b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
    c. After mastic is applied, align mirrors and press into place while maintaining a minimum airspace of 1/8 inch (3 mm) between back of mirrors and mounting surface.

3.4 CLEANING AND PROTECTION

A. Protect mirrors from breakage and contaminating substances resulting from construction operations.

B. Do not permit edges of mirrors to be exposed to standing water.

C. Maintain environmental conditions that prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.

D. Clean exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Beneficial Occupancy. Clean mirrors as recommended in writing by mirror manufacturer.

END OF SECTION 08 83 00

SECTION 09 24 00

CEMENT PLASTERING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Exterior vertical plasterwork (stucco).
   2. Exterior horizontal and nonvertical plasterwork (stucco).

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

   1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

C. Samples: For each type of factory-prepared finish coat and for each color and texture specified.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: Where indicated, provide cement plaster assemblies identical to those of assemblies tested for fire resistance according to ASTM E119 by a qualified testing agency.

2.2 METAL LATH

A. Expanded-Metal Lath: ASTM C847, cold-rolled carbon-steel sheet with ASTM A653/A653M, G60, hot-dip galvanized-zinc coating.

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. CEMCO; California Expanded Metal Products Co.
      b. ClarkDietrich.
      c. Phillips Manufacturing Co.
   2. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

3. Flat-Rib Lath: Rib depth of not more than 1/8 inch, 3.4 lb/sq. yd.

B. Wire-Fabric Lath:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. ClarkDietrich.
   b. Davis Wire; a Heico Wire Group company.
   c. K-Lath; a Tree Island Steel Ltd. company.
2. Welded-Wire Lath: ASTM C933; self-furring, 1.4 lb/sq. yd.
3. Woven-Wire Lath: ASTM C1032; self-furring, with stiffener wire backing, 1.4 lb/sq. yd..

C. Paper Backing: FS UU-B-790a, Type I, Grade B, Style 1A vapor-retardant paper.
1. Provide paper-backed lath at exterior locations.

2.3 ACCESSORIES

A. General: Comply with ASTM C1063, and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.

B. Metal Accessories:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. CEMCO; California Expanded Metal Products Co.
   b. ClarkDietrich.
   c. Phillips Manufacturing Co.
2. Foundation Weep Screed: Fabricated from hot-dip galvanized-steel sheet, ASTM A653/A653M, G60 zinc coating.
3. Cornerite: Fabricated from metal lath with ASTM A653/A653M, G60, hot-dip galvanized-zinc coating.
4. External- (Outside-) Corner Reinforcement: Fabricated from metal lath with ASTM A653/A653M, G60, hot-dip galvanized-zinc coating.
5. Cornerbeads: Fabricated from zinc-coated (galvanized) steel.
   a. Smallnose cornerbead with expanded flanges; use unless otherwise indicated.
   b. Smallnose cornerbead with perforated flanges; use on curved corners.
   c. Smallnose cornerbead with expanded flanges reinforced by perforated stiffening rib; use on columns and for finishing unit masonry corners.
   d. Bullnose cornerbead, radius 3/4 inch minimum, with expanded flanges; use at locations indicated.
6. Casing Beads: Fabricated from zinc-coated (galvanized) steel; square-edged style; with expanded flanges.
7. Control Joints: Fabricated from zinc-coated (galvanized) steel; one-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.
8. Expansion Joints: Fabricated from zinc-coated (galvanized) steel; folded pair of unperforated screeds in M-shaped configuration; with expanded flanges.

9. Two-Piece Expansion Joints: Fabricated from zinc-coated (galvanized) steel; formed to produce slip-joint and square-edged reveal that is adjustable from 1/4 to 5/8 inch wide; with perforated flanges.

2.4 MISCELLANEOUS MATERIALS

A. Water for Mixing and Finishing Plaster: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.

B. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, 1/2 inch long, free of contaminants, manufactured for use in cement plaster.

C. Bonding Compound: ASTM C932.

D. Fasteners for Attaching Metal Lath to Substrates: ASTM C1063.

E. Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, not less than 0.0475-inch diameter unless otherwise indicated.

2.5 PLASTER MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I.
   1. Color for Finish Coats: Gray.

B. Colorants for Job-Mixed Finish Coats: Colorfast mineral pigments that produce finish plaster color as chosen by the State from full range of manufacturer’s colors.

C. Lime: ASTM C206, Type S; or ASTM C207, Type S.

D. Sand Aggregate: ASTM C897.
   1. Color for Job-Mixed Finish Coats: as chosen by the State from full range of manufacturer’s colors.

E. Ready-Mixed Finish-Coat Plaster: Mill-mixed portland cement, aggregates, coloring agents, and proprietary ingredients.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. California Stucco Products Corp.
      b. LaHabra Stucco Solutions; Parex USA.
      c. Omega Products International, Inc.
   2. Color: As selected by the State from manufacturer's full range.

F. Acrylic-Based Finish Coatings: Factory-mixed acrylic-emulsion coating systems formulated with colorfast mineral pigments and fine aggregates; for use over cement plaster base coats. Include manufacturer's recommended primers and sealing topcoats for acrylic-based finishes.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. California Stucco Products Corp.

b. El Rey Stucco Solutions; a Parex USA, Inc. brand.
c. Omega Products International, Inc.

2. Color: As selected by the State from manufacturer's full range.

2.6 PLASTER MIXES

A. General: Comply with ASTM C926 for applications indicated.
1. Fiber Content: Add fiber to base-coat mixes after ingredients have mixed at least two minutes. Comply with fiber manufacturer's written instructions for fiber quantities in mixes, but do not exceed 1 lb of fiber/cu. yd. of cementitious materials.

B. Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork as follows:
1. Portland Cement Mixes:
a. Scratch Coat: For cementitious material, mix 1 part portland cement and 0 to 3/4 parts lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
b. Brown Coat: For cementitious material, mix 1 part portland cement and 0 to 3/4 parts lime. Use 3 to 5 parts aggregate per part of cementitious material, but not less than volume of aggregate used in scratch coat.
2. Portland and Masonry Cement Mixes:
a. Scratch Coat: For cementitious material, mix 1 part portland cement and 1 part masonry cement. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
b. Brown Coat: For cementitious material, mix 1 part portland cement and 1 part masonry cement. Use 3 to 5 parts aggregate per part of cementitious material, but not less than volume of aggregate used in scratch coat.

C. Job-Mixed Finish-Coat Mixes:
1. Portland Cement Mix: For cementitious materials, mix 1 part portland cement and 3/4 to 1-1/2 parts lime. Use 1-1/2 to 3 parts aggregate per part of cementitious material.

D. Factory-Prepared Finish-Coat Mixes: For ready-mixed finish-coat plasters or acrylic-based finish coatings, comply with manufacturer's written instructions.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Prepare smooth, solid substrates for plaster according to ASTM C926.

B. Fire-Resistance-Rated Assemblies: Install components according to requirements for design designations from listing organization and publication indicated.

C. Sound-Attenuation Blankets: Where required, install blankets before installing lath unless blankets are readily installed after lath has been installed on one side.

3.2 INSTALLING METAL LATH

A. Metal Lath: Install according to ASTM C1063.

3.3 INSTALLING ACCESSORIES

A. Install according to ASTM C1063 and at locations indicated.

B. Reinforcement for External (Outside) Corners:
   1. Install cornerbead at exterior locations.
   2. Install cornerbead at interior locations.

C. Control Joints: Locate as indicated.

3.4 PLASTER APPLICATION

A. General: Comply with ASTM C926.

B. Walls; Base-Coat Mixes for Use over Metal Lath: For scratch and brown coats, for three-coat plasterwork with 3/4-inch total thickness, as follows:
   1. Portland cement mixes.

C. Ceilings; Base-Coat Mixes for Use over Metal Lath: For scratch and brown coats, for three-coat plasterwork and having 3/4-inch total thickness, as follows:
   1. Portland cement mixes.

D. Plaster Finish Coats: Apply to provide smooth finish.

E. Acrylic-Based Finish Coatings: Apply coating system, including primers, finish coats, and sealing topcoats, according to manufacturer's written instructions.

F. Concealed Exterior Plasterwork: Where plaster application is used as a base for adhered finishes, omit finish coat.

3.5 PLASTER REPAIRS

A. Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

END OF SECTION 09 24 00

SECTION 09 29 00

GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.
   a. Rated Conditions
   b. Tile Backerboard
2. Exterior gypsum board.
3. Texture finishes.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Fire-Resistive Assembly Information:

1. Assembly listing for each type of patch and repair.
2. Sample of each type of patch and repair.

C. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Environmental Product Declaration (EPD): For each product.
3. Product Data: For adhesives and sealants, indicating VOC content.
4. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.
5. Laboratory Test Reports: For ceiling and wall materials, indicating compliance with requirements for low-emitting materials.

D. Samples: For each texture finish indicated on same backing indicated for Work.

1.3 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 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 E119 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 E90 and classified according to ASTM E413 by an independent testing agency.

C. Verify ceiling and wall materials comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 GYPSUM BOARD, GENERAL

A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Regional Materials: Manufacture products within 100 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.

C. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Gypsum Wallboard: ASTM C1396/C1396M.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. American Gypsum.
    b. National Gypsum Company.
    c. USG Corporation.
2. Thickness: 5/8 inch.
3. Long Edges: Tapered.

B. Gypsum Board, typical U.O.N.: Type X: ASTM C1396/C1396M.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. American Gypsum.
   b. National Gypsum Company.
   c. USG Corporation.

2. Thickness: 5/8 inch.
3. Long Edges: Tapered.

C. Gypsum Ceiling Board: Type X: ASTM C1396/C1396M.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. American Gypsum.
   b. National Gypsum Company.
   c. USG Corporation.

2. Thickness: 5/8 inch.
3. Long Edges: Tapered.

2.4 EXTERIOR GYPSUM BOARD FOR CEILINGS AND SOFFITS

A. Glass-Mat Gypsum Sheathing Board: ASTM C1177/C1177M, with fiberglass mat laminated to both sides and with manufacturer's standard edges.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. American Gypsum.
   b. National Gypsum Company.
   c. USG Corporation.

2. Core: 5/8 inch, Type X.

2.5 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C1325, with manufacturer's standard edges.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. James Hardie Building Products, Inc.
   b. National Gypsum Company.
   c. USG Corporation.

2. Thickness: 5/8 inch.
3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

2.6 TRIM ACCESSORIES

A. Interior Trim: ASTM C1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:

    a. Cornerbead.
    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.
    g. Curved-Edge Cornerbead: With notched or flexible flanges.
3. Screws: ASTM C1002, with corrosion resistant treatment.

B. Exterior Trim: ASTM C1047.

1. Material: Hot-dip galvanized-steel sheet.
2. Shapes:

    a. Cornerbead.
    b. LC-Bead: J-shaped; exposed long flange receives joint compound.
    c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.

2.7 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C475/C475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Exterior Gypsum Soffit Board: Paper.
3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
4. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints**,** rounded or beveled panel edges, 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.
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.

D. Joint Compound for Exterior Applications:

1. Exterior Gypsum Soffit Board: Use setting-type taping compound and setting-type, sandable topping compound.
2. Glass-Mat Gypsum Sheathing Board: As recommended by sheathing board manufacturer.

E. Joint Compound for Tile Backing Panels:

1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
2. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.8 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

1. Verify adhesives have a VOC content of 50 g/L or less.
2. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Steel Drill Screws: ASTM C1002 unless otherwise indicated.

1. Use screws complying with ASTM C954 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 C665, 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.
2. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

E. Thermal Insulation: As specified in Section 07 21 00 "Thermal Insulation."

F. Weather Barriers: As specified in Section 07 25 00 “Weather Barriers.”

PART 3 - EXECUTION

3.1 APPLYING AND FINISHING PANELS

A. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

B. Comply with ASTM C840.

C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

D. 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.

E. Prefill open joints, rounded or beveled edges and damaged surface areas.

F. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

G. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile or Panels that are substrate for acoustical tile.
3. Level 3: Panels that are substrates for applied decorative wall panels
4. Level 4: At panel surfaces that will be exposed in electrical rooms, communication rooms, fire riser rooms, storage room and janitor rooms.

    a. Primer and its application to surfaces are specified in Section 09 91 23 "Interior Painting."

5. Level 5: All panel not noted above in parts 1, 2, 3, or 4.

    a. Primer and its application to surfaces are specified in Section 09 91 23 "Interior Painting."

H. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.

I. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

J. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.2 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 and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Match existing adjacent finish or Level-4 where no adjacent finish exists.

3.3 APPLYING TEXTURE FINISHES

A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.

B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture free of starved spots or other evidence of thin application or of application patterns.

C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masing agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture-finish manufacturer’s written recommendations.

3.4 TILE INSTALLATIONS

A. General: In accordance with ASTM C840, manufacturer’s recommendations and TCA Handbook for Ceramic Tile Installation.

3.5 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 29 00

SECTION 09 30 13

CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Pressed floor tile.
2. Glazed wall tile.
3. Tile backing panels.
4. Waterproof membrane for thinset applications.
5. Crack isolation membrane.
6. Metal edge strips.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
3. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

C. Samples:

1. Each type and composition of tile and for each color and finish required.
2. Assembled samples, with grouted joints for each type and composition of tile and for each color and finish required.
3. Stone thresholds.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer is a Five-Star member of the National Tile Contractors Association or a Trowel of Excellence member of the Tile Contractors' Association of America.
2. Installer's supervisor for Project holds the International Masonry Institute's Foreman Certification.
3. Installer employs only Ceramic Tile Education Foundation Certified Installers or installers recognized by the U.S. Department of Labor as Journeyman Tile Layers for Project.
4. Installer employs at least one installer for Project that has completed the Advanced Certification for Tile Installers (ACT) certification for installation of mud floors, mud walls, membranes, shower receptors, gauged porcelain tile/gauged porcelain tile panels and slabs, and large format tile.

B. General: Materials, preparation, setting beds, cements, compounds, mortars, reinforcements, membranes, waterproofing, accessories, techniques, application, installation, and the like, shall be appropriate for the installation in accordance with TCA; and as specified herein.

C. References and Standards: Referenced references, standards, codes, regulations, and the like, shall be deemed to establish minimum requirements; effect each proper modification, customization, process, testing, finishing, and the like, to effect proper upgrade, improvement, fortification, and the like, in compliance with the Contract Documents. If provisions of codes, regulations, safety orders, authorities having jurisdiction, Contract Documents, referenced manufacturer’s specifications, professional societies, manufacturer's instructions, industry standards, and the like, are in conflict, then the ore restrictive and higher quality shall be deemed to govern.

D. Manufacturer: The Contractor shall obtain products from a nationally and industry recognized Manufacturer with 5 years minimum, of immediately recent, continuous, documented and properly authenticated successful experience of specialization in the manufacture of each product specified herein.

E. Quality: Certified by TCA, and in accordance with Standard Grade requirements of ANSI A137.1.

F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of floor tile installation.
2. Build mockup of wall tile installation.
3. Approved mockups may become part of the completed Work if undisturbed at time of Beneficial Occupancy.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide Standard-grade tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

C. Low-Emitting Materials: Tile flooring systems 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."

2.2 TILE PRODUCTS

A. Ceramic Floor Tile Type CFT 1 (Field Color) and CFT 2 (Accent Color): Glazed porcelain tile.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Daltile- Basis of design.
    b. American Marazzi Tile, Inc.
    c. American Olean; a division of Dal-Tile Corporation.

2. Composition: Impervious porcelain.
3. Face Size: 12 inches by 12 inches.
4. Face Size Variation: Rectified.
5. Thickness: 3/8 inch.
6. Face: Plain with square edges.
7. Dynamic Coefficient of Friction: Not less than 0.42.
8. Glaze: Mat, opaque.
9. Tile Color and Pattern: As selected by the State from manufacturer's full range.
10. Grout Color: As selected by the State from manufacturer's full range.
11. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile.

B. Ceramic Wall Tile Type CT 1 (Field Color) & CT 2 (Accent Color): Glazed porcelain tile.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Daltile- Basis of design.
    b. American Marazzi Tile, Inc.

c. American Olean; a division of Dal-Tile Corporation.

2. Certification: Tile certified by the Porcelain Tile Certification Agency.
3. Face Size: 12 inches by 24 inches.
4. Face Size Variation: Rectified.
5. Thickness: 3/8 inch.
6. Face: Plain with square edges.
7. Dynamic Coefficient of Friction: Not less than 0.42.
8. Tile Color, Glaze, and Pattern: Chord “Canyon Gray” CH22- Light polish.
9. Grout Color: As selected by the State from manufacturer's full range.
10. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile:

C. Ceramic Wall Tile Type ECT 1 (Field Color) & CT 2 (Accent Color): Glazed porcelain tile.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Daltile- Basis of design.
b. American Marazzi Tile, Inc.
c. American Olean; a division of Dal-Tile Corporation.

2. Certification: Tile certified by the Porcelain Tile Certification Agency.
3. Face Size: 12 inches by 12 inches.
4. Face Size Variation: Rectified.
5. Thickness: 3/8 inch.
6. Face: Plain with square edges.
7. Dynamic Coefficient of Friction: Not less than 0.42.
8. Tile Color, Glaze, and Pattern: Chord “Canyon Gray” CH22- Light polish.
9. Grout Color: As selected by the State from manufacturer's full range.
10. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile:

2.3 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 or ASTM C1325, Type A.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. James Hardie Building Products, Inc.
b. National Gypsum Company.
c. USG Corporation.

2. Thickness: 5/8 inch.

B. Fiber-Cement Backer Board: ASTM C1288.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. James Hardie Building Products, Inc.
    b. National Gypsum Company.
    c. USG Corporation.

2. Thickness: 5/8 inch.

2.4 WATERPROOF MEMBRANE

A. General: Manufacturer's standard product**,** selected from the following, that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Polyethylene Sheet: Polyethylene faced on both sides with fleece webbing; 0.008-inch nominal thickness.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Schluter Systems L.P.; KERDI
    b. Or equal.

2.5 CRACK ISOLATION MEMBRANE

A. General: Manufacturer's standard product**,** selected from the following, that complies with ANSI A118.12 for high performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

2.6 SETTING MATERIALS

A. Latex-Portland Cement Mortar (Thin Set) Installation Materials: ANSI A118.4..

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Custom Building Products.
    b. Laticrete International, Inc.
    c. MAPEI Corporation.

2. Provide prepackaged, dry-mortar mix to which only water must be added at Project site.
3. Provide prepackaged, dry-mortar mix combined with liquid-latex additive at Project site.
4. For wall applications, provide non-sagging mortar.

2.7 GROUT MATERIALS

A. Sand-Portland Cement Grout: ANSI A108.10, consisting of white or gray cement and white or colored aggregate as required to produce color indicated.

B. Water-Cleanable Epoxy Grout: ANSI A118.3, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Custom Building Products.
b. Laticrete International, Inc.
c. MAPEI Corporation.

2.8 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Metal Edge Strips: Angle or L-shape and formed corner trims, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring and wall applications; White zinc alloy or stainless steel, ASTM A276/A276M or ASTM A666, 300 Series exposed-edge material.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Blanke Corporation.
b. Ceramic Tool Company, Inc.
c. Schluter Systems L.P.

C. Grout Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Custom Building Products.
b. Laticrete International, Inc.
c. Sakrete; CRH Americas, Oldcastle APG.

2. Verify products comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
2. Verify that concrete substrates for tile floors installed with bonded mortar bed comply with surface finish requirements in ANSI A108.01 for installations indicated.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproof membrane by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:

a. Exterior tile floors.
b. Tile floors in wet areas.
c. Tile floors in laundries.

d. Tile floors consisting of tiles 8 by 8 inches or larger.
e. Tile floors consisting of rib-backed tiles.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Where accent tile differs in thickness from field tile, vary setting bed thickness so that tiles are flush.

F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
1. Pressed Floor Tile: 3/8 inch.
2. Glazed Wall Tile: 3/8 inch.
3. Porcelain Tile: 3/8 inch.

H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

I. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

J. Metal Edge Strips: Install at locations indicated and exterior corners, interior corners, transition between floor to wall, and edges between material transitions, such as door frames and counter tops.

K. Floor Sealer: Apply floor sealer to grout joints in tile floors according to floor-sealer manufacturer's written instructions. As soon as floor sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

L. Install tile backing panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use modified dry-

set mortar for bonding material unless otherwise directed in manufacturer's written instructions.

M. Install waterproof membrane to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.

N. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.

3.4 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor:

1. Ceramic Tile Installation: TCNA F121 and ANSI A108.1B; latex-portland cement mortar bed (thinset) on waterproof membrane.

a. Ceramic Tile Type: CFT 1 & CFT 2
b. Bond Coat for Cured-Bed Method: Modified dry-set mortar.
c. Grout: High-performance sanded grout.

B. Interior Wall Installations, Wood Studs or Furring:

1. Ceramic Tile Installation: TCNA W244C or TCNA W244F; thinset mortar on cementitious backer units or fiber-cement backer board over vapor-retarder membrane.

a. Ceramic Tile Type: CT 1 & CT 2.
b. Thinset Mortar: Modified dry-set mortar.
c. Grout: High-performance sanded grout.

C. Exterior Wall Installations, Wood Studs or Furring:

1. Ceramic Tile Installation: TCNA W244C or TCNA W244F; thinset mortar on cementitious backer units or fiber-cement backer board over vapor-retarder membrane.

a. Ceramic Tile Type: CT 1 & CT 2.
b. Thinset Mortar: Modified dry-set mortar.
c. Grout: High-performance sanded grout.

END OF SECTION 09 30 13

SECTION 09 51 13

ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Acoustical tiles for interior ceilings.
2. Fully concealed, direct-hung, suspension systems.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Laboratory Test Reports: For ceiling products, indicating compliance with requirements for low-emitting materials.

C. Samples: For each exposed product and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, and coordinated with each other, using input from installers of the items involved.

B. Product test reports.

C. Research reports.

D. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Verify ceiling products comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Seismic Performance: Suspended ceilings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

C. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Class A according to ASTM E1264.
2. Smoke-Developed Index: 50 or less.

2.2 ACOUSTICAL PANELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Armstrong Ceiling & Wall Solutions, basis of design.
2. CertainTeed Corporation; Saint-Gobain North America.
3. USG Corporation.

B. Acoustical Panel Standard: Manufacturer's standard panels according to ASTM E1264, ASTM 84 for Class C.

C. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50 percent.

D. Classification: Mesa Second Look

E. Color: White

F. Light Reflectance (LR): 0.85.

G. Ceiling Attenuation Class (CAC): 35.

H. Noise Reduction Coefficient (NRC): 0.60.

I. Edge/Joint Detail: Angled tegular

J. Thickness: 15/16 inch.

K. Modular Size: 24 by 48 inches.

2.3 METAL SUSPENSION SYSTEM

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Armstrong Ceiling & Wall Solutions, Suprafine XL High Recycle Contentbasis of design.
2. CertainTeed Corporation; Saint-Gobain North America.
3. USG Corporation.

B. Metal Suspension-System Standard: Manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C635/C635M.

C. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 60 percent.

D. Narrow-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 coating designation; with prefinished 9/16-inch-wide metal caps on flanges.

1. Structural Classification: Heavy-duty system.
2. End Condition of Cross Runners: Override (stepped) type.
3. Face Design: Flat, flush.
4. Cap Material: Cold-rolled steel.
5. Cap Finish: Painted in color as selected from manufacturer's full range.

2.4 ACCESSORIES

A. Attachment Devices: Size for five times the design load indicated in ASTM C635/C635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

B. Hold-Down Clips: Manufacturer's standard hold-down.

C. Impact Clips: Manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.

D. Seismic Clips: Manufacturer's standard seismic clips designed to secure acoustical panels in place during a seismic event.

2.5 METAL EDGE MOLDINGS AND TRIM

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Armstrong World Industries, Inc.

2. CertainTeed Corporation: Saint-Gobain North America.
3. Fry Reglet Corporation.
4. USG Corporation.

B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations complying with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for suspension-system runners.

PART 3 - EXECUTION

3.1 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated.

B. Layout openings for penetrations centered on the penetrating items.

3.2 INSTALLATION

A. Install acoustical panel ceilings according to ASTM C636/C636M**,** seismic design requirements, and manufacturer's written instructions.

B. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Do not use exposed fasteners, including pop rivets, on moldings and trim.
2. Arrange directionally patterned acoustical panels as follows:

    a. As indicated on reflected ceiling plans.

3. Install hold-down, impact, and seismic clips in areas indicated; space according to panel manufacturer's written instructions unless otherwise indicated.

3.3 FIELD QUALITY CONTROL

A. Inspections:

1. Periodic inspection during the installation of suspended ceiling grids according to ASCE/SEI 7.

END OF SECTION 09 51 13

SECTION 09 65 13

RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Resilient base.
2. Molding accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
3. Product Data: For sealants, indicating VOC content.
4. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.
5. Laboratory Test Reports: For resilient base and stair products and accessories, indicating compliance with requirements for low-emitting materials.
6. Environmental Product Declaration: For each product.
7. Health Product Declaration: For each product.
8. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.

C. Samples: For each exposed product and for each color and texture specified.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Verify products comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 RESILIENT BASE B-1

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Burke Mercer Flooring Products; a division of Burke Industries Inc.
2. Johnsonite; a Tarkett company.
3. Nora Systems, Inc.
4. Forbo Flooring Systems, basis of design.

B. Product Standard: ASTM F1861, Type TP (rubber, thermoplastic).

1. Group: I (solid, homogeneous).
2. Style and Location:

a. Style A, Cove: Throughout building.

C. Thickness: 0.125 inch

D. Height: 6 inches.

E. Lengths: Coils in manufacturer's standard length

F. Outside Corners: Job formed.

G. Inside Corners: Job formed.

H. Colors: As selected by the State from manufacturer’s full range.

2.3 INSTALLATION MATERIALS

A. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

1. Verify adhesives have a VOC content of 50 g/L or less.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Do not install resilient products until materials are the same temperature as space where they are to be installed.

C. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.2 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. Preformed Corners: Not allowed.

G. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 12 inches in length.

    a. Form without producing discoloration (whitening) at bends.

2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 12 inches in length.

    a. Miter corners to minimize open joints.

3.3 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Cover resilient products subject to wear and foot traffic until acceptance of work.

END OF SECTION 09 65 13

SECTION 09 65 19

RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Luxury vinyl composition floor tile.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
3. Product Data: For chemical-bonding compounds, indicating VOC content.
4. Laboratory Test Reports: For chemical-bonding compounds, indicating compliance with requirements for low-emitting materials.
5. Product Data: For sealants, indicating VOC content.
6. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.
7. Laboratory Test Reports: For flooring products, indicating compliance with requirements for low-emitting materials.
8. Environmental Product Declaration: For each product.
9. Health Product Declaration: For each product.
10. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.

C. Samples: For each exposed product and for each color and pattern specified.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

B. Verify flooring products comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 LUXURY VINYL COMPOSITION FLOOR TILE LVT 1, LVT 2 & LVT 3

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Armstrong Flooring, Inc.
2. Mannington Mills, Inc. (Basis of design)
3. Shaw Contract Group; a Berkshire Hathaway company.

B. Tile Standard: ASTM F1066, as indicated by product designations.

C. Thickness: 0.125 inch.

D. Size: Varies, per design.

E. Colors and Patterns: As selected by the State from manufacturer’s full range.

2.3 INSTALLATION MATERIALS

A. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

1. Verify adhesives have a VOC content of 50 g/L or less.
2. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
4. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft. and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
    a. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

C. Install Moisture Vapor Emission Control system.

D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

E. Do not install floor tiles until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

F. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles in pattern indicated.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles with grain direction alternating in adjacent tiles (basket-weave pattern) in pattern of colors and sizes indicated.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

I. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.

1. Apply two coat(s).

END OF SECTION 09 65 19

SECTION 09 68 13

TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Modular carpet tile.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
3. Laboratory Test Reports: For flooring products, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For carpet tile installation, plans showing the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type, color, and dye lot.
3. Type of subfloor.
4. Type of installation.
5. Pattern of installation.
6. Pattern type, location, and direction.
7. Pile direction.
8. Type, color, and location of insets and borders.
9. Type, color, and location of edge, transition, and other accessory strips.
10. Transition details to other flooring materials.

D. Samples: For each exposed product and for each color and texture required.

1.4 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

B. Single Source Responsibility: Provide product material by a single manufacturer for recyclable carpet type selected.

1.7 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 10 years from date of Beneficial Occupancy.

PART 2 - PRODUCTS

2.1 CARPET TILE: CPT 1

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Bentley Mills (Basis of design)
2. Mohawk Group (The); Mohawk Carpet, LLC.
3. Shaw Contract Group; a Berkshire Hathaway company.

B. Color: As selected by the State from manufacturer’s full range.

C. Size: 24 by 24 inches.

D. Applied Treatments:

1. Soil-Resistance Treatment: Manufacturer's standard treatment.
2. Antimicrobial Treatment: Manufacturer's standard treatment that protects carpet tiles as follows:

a. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria, not less than 1-mm halo of inhibition for gram-negative bacteria, and no fungal growth, according to AATCC 174.

E. Sustainable Design Requirements:

1. Sustainable Product Certification: Platinum level certification according to ANSI/NSF 140.
2. Verify flooring products comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

F. Performance Characteristics:

1. Appearance Retention Rating: Severe traffic, 3.5 minimum according to ASTM D7330.
2. Critical Radiant Flux Classification: Not less than 0.22 W/sq. cm according to NFPA 253.
3. Tuft Bind: Not less than 6.2 lbf according to ASTM D1335.
4. Delamination: Not less than 3.5 lbf/in. according to ASTM D3936.
5. Dimensional Tolerance: Within 1/32 inch of specified size dimensions, as determined by physical measurement.
6. Dimensional Stability: 0.2 percent or less according to ISO 2551 (Aachen Test).
7. Noise Reduction Coefficient (NRC): 0.15 NRC according to ASTM C423.
8. Colorfastness to Crocking: Not less than 4, wet and dry, according to AATCC 165.
9. Colorfastness to Light: Not less than 4 after 60 AFU (AATCC fading units) according to AATCC 16, Option E.
10. Electrostatic Propensity: Less than 3.5 kV according to AATCC 134.

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.

1. Verify adhesives have a VOC content of 50 g/L or less.
2. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Concrete Slabs:

1. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft. and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
   a. Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
   b. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.

3.2 PREPARATION

A. General: Comply with the Carpet and Rug Institute's CRI 104 and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.

C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.

D. Install Moisture Vapor Emission Control system.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with the Carpet and Rug Institute's CRI 104, Section 10, "Carpet Tile," and with carpet tile manufacturer's written installation instructions.

B. Installation Method: As recommended in writing by carpet tile manufacturer.

C. Maintain dye-lot integrity. Do not mix dye lots in same area.

D. Maintain pile-direction patterns recommended in writing by carpet tile manufacturer.

E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.

H. Install pattern parallel to walls and borders.

I. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 09 68 13

SECTION 09 91 13

EXTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes surface preparation and the application of paint systems on exterior substrates.
   1. Steel and iron.
   2. Galvanized metal.
   3. Portland cement plaster (stucco).
   4. Wood trim.

1.2 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.

B. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.

C. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.

D. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523.

E. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D523.

F. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D523.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.
   1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.

B. Sustainable Design Submittals:
   1. Product Data: For paints and coatings, indicating VOC content.
   2. Environmental Product Declaration (EPD): For each product.
   3. Health Product Declaration (HPD): For each product.
   4. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.

5. Manufacturer Inventory: For each product, provide manufacturer's manifest of ingredients.

C. Samples: For each type of paint system and each color and gloss of topcoat.

1.4 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set qualify standard for materials and execution.
   1. The State will select on surface to represent surfaces and conditions for application of each paint system.
      a. Vertical or Horizontal Surfaces: Provide samples of at least 100 sq. ft.
      b. Other Items: The State will designate items or areas required.
   2. Final approval of color selections will be based on mockups.
      a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by the State at no added cost to the State.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Benjamin Moore & Co.
   2. Kelly-Moore Paint Company Inc.
   3. PPG Paints.
   4. Sherwin-Williams Company (The).

B. Products: Subject to compliance with requirements, provide product listed in the Exterior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

B. Material Compatibility:
   1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

C. VOC Content: For field applications, verify paints and coatings comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 50 g/L.
3. Dry-Fog Coatings: 150 g/L.
4. Primers, Sealers, and Undercoaters: 100 g/L.
5. Rust-Preventive Coatings: 100 g/L.
6. Zinc-Rich Industrial Maintenance Primers: 100 g/L.
7. Pretreatment Wash Primers: 420 g/L.
8. Shellacs, Clear: 730 g/L.
9. Shellacs, Pigmented: 550 g/L.

D. Colors: As selected by the State from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
1. Concrete: 12 percent.
2. Fiber-Cement Board: 12 percent.
3. Masonry (Clay and CMUs): 12 percent.
4. Wood: 15 percent.
5. Portland Cement Plaster: 12 percent.
6. Gypsum Board: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Proceed with coating application only after unsatisfactory conditions have been corrected.
1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."

B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

C. Painting Fire Suppression, Plumbing, and HVAC:

1. Paint the following work where exposed to view:
   a. Uninsulated metal piping.
   b. Uninsulated plastic piping.
   c. Pipe hangers and supports.
   d. Metal conduit.
   e. Plastic conduit.

3.4 CLEANING AND PROTECTION

A. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by the State, and leave in an undamaged condition.

B. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 EXTERIOR PAINTING SCHEDULE

A. Steel and Iron Substrates:
1. Water-Based Light Industrial Coating System MPI EXT 5.1C:
   a. Prime Coat: Primer, alkyd, anti-corrosive for metal, MPI #79.
      1) Sherwin William All Surface Enamel Latex.
   b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
   c. Topcoat: Light industrial coating, exterior, water based, semi-gloss (MPI Gloss Level 5), MPI #163.
      1) Sherwin Williams Emerald Rain Refresh Exterior Acrylic.

B. Galvanized-Metal Substrates:
1. Water-Based Light Industrial Coating System MPI EXT 5.3J:
   a. Prime Coat: Primer, galvanized, water based, MPI #134.
      1) Sherwin William All Surface Enamel Latex.
   b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.

c. Topcoat: Light industrial coating, exterior, water based, semi-gloss (MPI Gloss Level 5), MPI #163.
1) Sherwin William All Surface Enamel Latex.

C. Portland Cement Plaster Substrates:
1. Latex System:
a. Prime Coat: Latex, exterior, matching topcoat.
b. Intermediate Coat: Latex, exterior, matching topcoat.
c. Topcoat: Latex, exterior, low sheen (MPI Glass Level 3-4).
2. High-Building Latex System: Dry film thickness of not less than 10 mils.
a. Prime Coat: As recommended in writing by topcoat manufacturer.
b. Intermediate Coat: As recommended in writing by topcoat manufacturer..
c. Topcoat: Latex, exterior, high build.

D. Wood Substrates: Architectural woodwork.
1. Latex over Latex Primer System:
a. Prime Coat: Primer, latex for exterior wood.
b. Intermediate Coat: Latex, exterior, matching topcoat.
c. Topcoat: Latex, exterior, low sheen (MPI Glass Level 3-4).
2. Latex System:
a. Prime Coat: Primer, alkyd for exterior wood.
b. Intermediate Coat: Latex, exterior, matching topcoat.
c. Topcoat: Latex, exterior, low sheen (MPI Glass Level 3-4).
3. Alkyd System:
a. Prime Coat: Primer, alkyd for exterior wood.
b. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
c. Topcoat: Alkyd, exterior, semi-gloss (MPI Glass Level 5).

E. Wood Substrates: Glued-laminated construction.
1. Latex over Latex Primer System:
a. Prime Coat: Primer, latex for exterior wood.
b. Intermediate Coat: Latex, exterior, matching topcoat.
c. Topcoat: Latex, exterior, low sheen (MPI Glass Level 3-4).
2. Latex over Alkyd Primer System:
a. Prime Coat: Primer, alkyd for exterior wood.
b. Intermediate Coat: Latex, exterior, matching topcoat.
c. Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4).
3. Alkyd System:
a. Prime Coat: Primer, alkyd for exterior wood.
b. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
c. Topcoat: Alkyd, exterior, semi-glass (MPI Gloss Level 5).

END OF SECTION 09 91 13

SECTION 09 91 23

INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes surface preparation and field painting of exposed interior items and surfaces.

1.2 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.

B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.

C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.

D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.

E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523.

F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D523.

G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D523.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.

B. Sustainable Design Submittals:

1. Product Data: For paints and coatings, indicating VOC content.
2. Laboratory Test Reports: For paints and coatings, indicating compliance with requirements for low-emitting materials.

C. Samples: For each type of paint system and in each color and gloss of topcoat.

D. Samples for Verification: For each type of paint system and in each color and glass of topcoat.

1. Submit Samples on rigid backing, 8 inches square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

E. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated. Include color designations.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product, run that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.5 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. The State will select on surface to represent surfaces and conditions for application of each paint system.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
b. Other Items: The State will designate items or areas required.

2. Final approval of color selections will be based on mockups.

a. If preliminary color selections are not approved, apply additional mockups of additional color selected by the State at no added cost to the State.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless the State specifically approves such deviations in writing.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply pains only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply pains when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or t damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Dunn Edwards (Basis of design)
2. Kelly-Moore Paint Company Inc.
3. PPG Paints.
4. Sherwin-Williams Company (The)

B. Products: Subject to compliance with requirements, [provide product] [provide one of the products] [available products that may be incorporated into the Work include but are not limited to products] listed in the Interior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

B. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

C. VOC Content: For field applications that are inside the weatherproofing system, verify paints and coatings comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 50 g/L.
3. Dry-Fog Coatings: 150 g/L.
4. Primers, Sealers, and Undercoaters: 100 g/L.
5. Rust-Preventive Coatings: 100 g/L.
6. Zinc-Rich Industrial Maintenance Primers: 100 g/L.

7. Pretreatment Wash Primers: 420 g/L.
8. Shellacs, Clear: 730 g/L.
9. Shellacs, Pigmented: 550 g/L.

D. Low-Emitting Materials: For field applications that are inside the weatherproofing system, verify 90 percent of paints and coatings comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

E. Colors: As selected by the State from manufacturer's full range

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Fiber-Cement Board: 12 percent.
3. Masonry (Clay and CMUs): 12 percent.
4. Wood: 15 percent.
5. Gypsum Board: 12 percent.
6. Plaster: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of

size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of pains, including dust, dirt, oilc grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers and apply tie coat as required to produce paint systems indicated.

D. Galvanized-Matal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

E. Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
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.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

C. Painting Fire-Suppression, Plumbing, and HVAC:

1. Paint the following work where exposed in equipment rooms:
   a. Uninsulated metal piping.
   b. Uninsulated plastic piping.
   c. Pipe hangers and supports.

d. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.

2. Paint the following work where exposed in occupied spaces:
   a. Uninsulated metal piping.
   b. Uninsulated plastic piping.
   c. Pipe hangers and supports.
   d. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
   e. Other items as directed by the State.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: The State may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint applications, clean spattered surfaces, Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by the State, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Gypsum Board, New:

1. Acrylic Finish: Two finish coats over primer coat(s).

   a. Primer: Interior gypsum board PVA primer.
   b. Finish Coats: Interior low-luster acrylic enamel.

B. Gypsum Board, Existing:

1. Acrylic Finish: One finish coat over existing painted surface. Additional finish coats as required until proper coverage is achieved.

    a. Finish Coats: Interior low-luster acrylic enamel.

C. Ferrous Metal, New:

1. Acrylic Finish: Two finish coats over primer coat.

    a. Primer, if not factory primed: Interior ferrous-metal primer.
    b. Finish Coats: Interior semigloss acrylic enamel.

D. Ferrous Metal, Existing:

1. Acrylic Finish: One finish coat over existing painted surface. Additional finish coats as required until proper coverage is achieved.

    a. Primer, if needed: Interior ferrous-metal primer.
    b. Finish Coat: Interior semigloss acrylic enamel.

E. Fire-Rated Plywood (protect fire stamp):

1. Acrylic Finish: Two finish coats over primer coat(s).

    a. Primer: Interior acrylic multi-surface primer.
    b. Finish Coats: Interior low-luster acrylic enamel.

END OF SECTION 09 91 23

SECTION 10 11 00

VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Markerboards.
   2. Tackboards.

1.2 DEFINITIONS

A. Tackboard: Framed or unframed, tackable, visual display board assembly.

B. Visual Display Board Assembly: Visual display surface that is factory fabricated into composite panel form, either with or without a perimeter frame; includes chalkboards, markerboards, and tackboards.

C. Visual Display Surface: Surfaces that are used to convey information visually, including surfaces of chalkboards, markerboards, tackboards, and surfacing materials that are not fabricated into composite panel form but are applied directly to walls.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for visual display surfaces.

B. LEED Submittals:

   1. Product Data for Credit IEQ 4.1: For adhesives, documentation including printed statement of VOC content.
   2. Product Data for Credit IEQ 4.4: For composite wood products, documentation indicating that the product contains no urea formaldehyde.
   3. Laboratory Test Reports for Credit IEQ 4: For adhesives and composite wood products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Shop Drawings: For visual display surfaces. Include plans, elevations, sections, details, and attachments to other work.

   1. Show locations of panel joints.

2. Show locations of special-purpose graphics for visual display surfaces.
3. Include sections of typical trim members.

D. Samples for Initial Selection: For each type of visual display surface indicated, for units with factory-applied color finishes, and as follows:

1. Actual sections of melamine visual display surface, high-pressure-laminate visual display surface, tackboard assembly.
2. Fabric swatches of vinyl- and polyester-fabric-faced tack assemblies.
3. Include accessory Samples to verify color selected.

E. Samples for Verification: For each type of visual display surface indicated.

1. Visual Display Surface: Not less than 8-1/2 by 11 inches (215 by 280 mm), mounted on substrate indicated for final Work. Include one panel for each type, color, and texture required.
2. Trim: 6-inch- (152-mm-) long sections of each trim profile.
3. Display Rail: 6-inch- (152-mm-) long sections.
4. Accessories: Full-size Sample of each type of accessory.

F. Product Schedule: For visual display surfaces. Use same designations indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for surface-burning characteristics of fabrics.

C. Warranties: Sample of special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For visual display surfaces to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of motor-operated, sliding visual display units required for this Project.

B. Source Limitations: Obtain visual display surfaces from single source from single manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-built visual display surfaces, including factory-applied trim where indicated, completely assembled in one piece without joints, where possible. If dimensions exceed maximum manufactured panel size, provide two or more pieces of equal length as acceptable to the State. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site.

B. Store visual display surfaces vertically with packing materials between each unit.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install visual display surfaces until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Field Measurements: Verify actual dimensions of construction contiguous with visual display surfaces by field measurements before fabrication.

1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

1.9 WARRANTY

A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer's standard form in which manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Surfaces lose original writing and erasing qualities.
b. Surfaces exhibit crazing, cracking, or flaking.

2. Warranty Period: Life of the building.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Porcelain-Enamel Face Sheet: ASTM A 424, enameling-grade steel, uncoated thickness indicated; with exposed face and edges coated with primer, 1.7-to-2.5-mil-(0.043-to-0.064-mm-) thick ground coat, and color cover coat; and with concealed face coated with primer and 1.7-to-2.5-mil- (0.043-to-0.064-mm-) thick ground coat.

1. Matte-Finish Cover Coat: Low reflective; chalk wipes clean with dry cloth or standard eraser. Minimum 2.0-to-2.5-mil- (0.051-to-0.064-mm-) thick cover coat. Cover and ground coats shall be fused to steel at manufacturer's standard firing temperatures but not less than 1250 deg F (677 deg C).

    a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:.

        1) PolyVision Corporation, a Steelcase company; P3 ceramicsteel Chalkboard.
        2) Claridge Products.
        3) Or Equal.

2. Gloss-Finish Cover Coat: Gloss as indicated; dry-erase markers wipe clean with dry cloth or standard eraser. Minimum 3.0-to-4.0-mil- (0.076-to-0.102-mm-) thick cover coat. Cover and ground coats shall be fused to steel at manufacturer's standard firing temperatures but not less than 1475 deg F (802 deg C).

    a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:.

        1) PolyVision Corporation, a Steelcase company; P3 ceramicsteel Markerboard.
        2) Claridge Products.
        3) Or Equal.

B. Melamine: Thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.

C. High-Pressure Plastic Laminate: NEMA LD 3.

D. Natural Cork Sheet: Seamless, single-layer, compressed fine-grain cork sheet; bulletin board quality; face sanded for natural finish.

E. Plastic-Impregnated Cork Sheet: Seamless, homogeneous, self-sealing sheet consisting of granulated cork, linseed oil, resin binders, and dry pigments that are mixed and calendared onto fabric backing; with washable vinyl finish and integral color throughout.

F. Vinyl Fabric: Mildew resistant, washable, complying with FS CCC-W-408D, Type II,; weighing not less than 13 oz./sq. yd. (440 g/sq. m); with surface-burning characteristics indicated.

G. Polyester Fabric: Nondirectional weave, 100 percent polyester; weighing not less than 15 oz./sq. yd. (508 g/sq. m); with surface-burning characteristics indicated.

H. Hardboard: ANSI A135.4, tempered.

I. Particleboard: ANSI A208.1, Grade M-1, made with binder containing no urea formaldehyde., that complies 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."

J. Fiberboard: ASTM C 208.

K. Extruded Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6063.

L. Adhesives: Manufacturer's standard product that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 MARKERBOARD ASSEMBLIES

A. Melamine Markerboards: Fabricated from 1/4-inch- (6-mm-) thick, sealed and primed hardboard panels permanently bonded with melamine or another high-pressure-laminate writing surface.

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. AARCO Products, Inc.
b. Ghent Manufacturing, Inc.
c. Marsh Industries, Inc.; Visual Products Group.

B. High-Pressure-Laminate Markerboard Assembly: Balanced, high-pressure, factory-laminated chalkboard assembly of three-ply construction consisting of backing sheet, fiberboard core material, and high-pressure-laminate writing surface.

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. Best-Rite Manufacturing.
b. EverProducts by Glenroy Inc.
c. Marsh Industries, Inc.; Visual Products Group.

2.3 TACKBOARD ASSEMBLIES

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. Best-Rite Manufacturing.
2. Claridge Products and Equipment, Inc.

3. Egan Visual Inc.
4. EverProducts by Glenroy Inc.
5. Marsh Industries, Inc.; Visual Products Group.
6. Platinum Visual Systems; a division of ABC School Equipment, Inc.
7. PolyVision Corporation; a Steelcase company.

B. Vinyl-Fabric-Faced Tackboard: Vinyl fabric factory laminated to ½-inch-thick fiberboard backing.

2.4 MARKERBOARD AND TACKBOARD ACCESSORIES

A. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch- (1.57-mm-) thick, extruded aluminum; slim size and standard shape.
   1. Factory-Applied Trim: Manufacturer's standard.

B. Chalk Tray: Manufacturer's standard, continuous.

   1. Box Type: Extruded aluminum with slanted front, grooved tray, and cast-aluminum end closures.
   2. Solid Type: Extruded aluminum with ribbed section and smoothly curved exposed ends.

2.5 FABRICATION

A. Visual Display Boards: Factory assemble visual display boards unless otherwise indicated.

   1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display boards at manufacturer's factory before shipment.

B. Factory-Assembled Visual Display Units: Coordinate factory-assembled units with trim and accessories indicated. Join parts with a neat, precision fit.

   1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to the State.
   2. Provide manufacturer's standard vertical-joint spline system between abutting sections of markerboards.
   3. Provide manufacturer's standard mullion trim at joints between markerboards and tackboards of combination units.
   4. Where size of visual display boards or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by the State from manufacturer's standard structural support accessories to suit conditions indicated.

C. Aluminum Frames and Trim: Fabricate units straight and of single lengths, keeping joints to a minimum. Miter corners to a neat, hairline closure.

1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display units at manufacturer's factory before shipment.

2.6 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

B. Color Anodic Finish: AAMA 611, AA-M12C22A32/A34, Class II, 0.010 mm or thicker.

C. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.8 VISUAL DISPLAY SURFACE SCHEDULE

A. Visual Display Board: Factory assembled.

1. Markerboard: Melamine markerboard assembly.

a. Color: White As selected by the State from full range of industry colors.

2. Corners: Square.
3. Width: As indicated.
4. Height: As indicated.
5. Mounting: Wall.
6. Mounting Height: As indicated.
7. Factory-Applied Aluminum Trim: Manufacturer's standard with clear anodic finish.
8. Accessories:

a. Chalk tray: Box type.

B. Tackboard: Factory assembled.

1. Tack Surface: Natural-cork tackboard assembly.
2. Corners: Square.

3. Width: As indicated.
4. Height: As indicated.
5. Mounting: Wall.
6. Mounting Height: As indicated.
7. Edges: Concealed by trim.

a. Factory-Applied Aluminum Trim: Manufacturer's standard style, with clear anodic finish.

1) Color: As selected by the State from full range of industry colors and color densities.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.

B. Examine roughing-in for electrical power systems to verify actual locations of connections before installation of motor-operated, sliding visual display units.

C. Examine walls and partitions for proper preparation and backing for visual display surfaces.

D. Examine walls and partitions for suitable framing depth where sliding visual display units will be installed.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances that could impair the performance of and affect the smooth, finished surfaces of visual display boards, including dirt, mold, and mildew.

C. Prepare recesses for sliding visual display units as required by type and size of unit.

3.3 INSTALLATION, GENERAL

A. General: Install visual display surfaces in locations and at mounting heights indicated, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

3.4 CLEANING AND PROTECTION

A. Clean visual display surfaces according to manufacturer's written instructions. Attach one cleaning label to visual display surface in each room.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

C. Cover and protect visual display surfaces after installation and cleaning.

END OF SECTION 10 11 00

SECTION 10 14 19

DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Cutout dimensional characters.

1.2 DEFINITIONS

A. Illuminated: Illuminated by lighting source integrally constructed as part of the sign unit.

1.3 COORDINATION

A. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

   1. Product Data: For adhesives, indicating VOC content.

   2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For signs.

   1. Include fabrication and installation details and attachments to other work.
   2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
   3. Show message list, typestyles, graphic elements, and layout for each sign at least half size.

   4. Show locations of electrical service connections.

D. Samples: For each exposed product and for each color and texture specified.

E. Delegated-Design Submittal: For signs indicated in "Performance Requirements" Article.

1. Include structural analysis calculations for signs indicated to comply with design loads; signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance data: For signs to include in maintenance manuals.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of finishes beyond normal weathering.
b. Separation of delamination of sheet materials and components.

2. Warranty Period: Five years from date of Beneficial Occupancy.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Signs and supporting elements shall withstand the effects of gravity and other loads within limits and under conditions indicated.

B. Thermal Movements: For exterior dimensional characters, allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

C. Room and door signage to comply with 2022 California Building Code 11B-216 & 11B-703.

2.2 DIMENSIONAL CHARACTERS

A. Cast Characters: Characters with uniform faces, sharp corners, and precisely formed lines and profiles, and as follows:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. A.R.K. Ramos.
    b. Gemini Incorporated.
    c. Steel Art Company.

2. Character Material: Sheet or plate aluminum.
3. Character Height: As indicated.
4. Thickness: As indicated.
5. Finishes:

    a. Integral Metal Finish: As selected by the State from full range of industry finishes.

6. Mounting: Projecting studs.

7. Typeface: Arial.
8. Braille to be Grade 2.

2.3 DIMENSIONAL CHARACTER MATERIALS

A. Aluminum Castings: ASTM B26/B26M, alloy and temper recommended by sign manufacturer for casting process used and for type of use and finish indicated.

B. Aluminum Sheet and Plate: ASTM B209 (ASTM B209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

C. Aluminum Extrusions: ASTM B221 (ASTM B221M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

D. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resisteant for colors and exposure indicated.

2.4 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:

1. Use concealed fasteners and anchors unless indicated to be exposed.
2. For exterior exposure, furnish stainless-steel devices unless otherwise indicated.
3. Exposed Metal-Fastener Components, General:

a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
b. Fastener Heads: For nonstructural connections, use flathead or oval countersunk screws and bolts with tamper-resistant Allen-head slots unless otherwise indicated.

4. Sign Mounting Fasteners:

a. Projecting Studs: Threaded studs with sleeve spacer, welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.
b. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, installed in predrilled holes.

B. Adhesive: As recommended by sign manufacturer.

1. Verify adhesives have a VOC content of 70 g/L or less.

2. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.5 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
2. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
3. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
4. Internally brace dimensional characters for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners.
5. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
6. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.

B. Brackets: Fabricate brackets, fittings, and hardware for bracket-mounted signs to suit sign construction and mounting conditions indicated. Modify manufacturer's standard brackets as required.

1. Aluminum Brackets: Factory finish brackets with baked-enamel or powder-coat finish color as selected by the State from manufacturer's full range color unless otherwise indicated.
2. Stainless Steel Brackets: Factory finish brackets to match sign background finish unless otherwise indicated.

2.6 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.

D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.7 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, Class I, 0.063 gauge or thicker.

2.8 STAINLESS-STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend to finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
2. Directional Satin Finish: No. 4.
3. Dull Satin Finish: No. 6.
4. Reflective, Directional Polish: No. 7.
5. Mirrorlike Reflective, Nondirectional Polish: No. 8.

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.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Verify that electrical service is correctly sized and located to accommodate signs.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions and per requirements in CBC 11B-703.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Mounting Methods:

1. Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.

    a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.
    b. Thin or Hollow Surfaces: Place spacers on studs, place sign in position with spacers pinched between sign and substrate and install washers and nuts on stud ends projecting through opposite side of surface, and tighten.

2. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
3. Back Bar and Brackets: Remove loose debris from substrate surface and install backbar or bracket supports in position, so that signage is correctly located and aligned.

4. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
5. Two-Faced Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position and push to engage tape adhesive.

C. Remove temporary protective coverings and strippable films as signs are installed.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by the State.

END OF SECTION 10 14 19

SECTION 10 14 23

PANEL SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Room Identification Signs
   2. Exit Signs
   3. Miscellaneous Access Signs
   4. Field-applied Vinyl Signs

B. Related Codes and Standards:
   1. California Building Code (CBC) Title 24.
   2. Americans with Disabilities Act (ADA) – Standards for Accessible Design.
   3. Contracted Grade 2 Braille shall be used whenever Braille symbols are specifically required (CBC 11B-703.3 Braille).
   4. Means of Egress identification: CBC 11B-216.1 and 11B-703.1.
   5. Tactile Exit Signs: CBC 1011.4.
   6. Restroom Identification Symbols: CBC 11B-216.6 and 11B-703.7.2.6.
   7. Signs and Identification: CBC 11B-213.2.
   8. International Symbol of Accessibility: CBC 11B-703.7.2.1.
   9. Identification Signs: CBC 11B-213.2.
   10. Direction and Information Signs: CBC 11B-703.1.
   11. Symbols of Accessibility: CBC 11B-703.7.
   12. Finish and Contrast: CBC 11B-703.5.1.
   13. Character Proportions: CBC 11B-703.2.4.
   14. Character Height: CBC 11B-703.2.5.
   15. Raised Characters and Pictorial Symbol Signs: CBC 11B-703.2 and 11B-703.6.
   16. Braille: CBC 11B-703.3 and Table 11B-703.3.1.
   17. Mounting Height and Location: CBC 11B-703.4.1 and 11B-703.4.2.
   18. Symbols of Accessibility: CBC 11B-703.7.2.
   19. Color of Symbol: CBC 11B-703.7.2.1.
   20. Entrance Sign: CBC 11B-216.6.

1.2 DEFINITIONS

A. Accessible: In accordance with the accessibility standard.

B. Illuminated: Illuminated by lighting source integrally constructed as part of the sign unit.

C. Unified English Braille (UEB): In accordance with the standards adopted by the Braille Authority of North America.

D. Grade 2 Braille: Contracted Braille

1.3 COORDINATION

A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.

B. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For panel signs.

1. Include fabrication and installation details and attachments to other work.
2. Provide product data for two-sided tape and fasteners.
3. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
4. Show message list, typestyles, graphic elements, including raised characters and Grade 2 Braille, and layout for each sign at least **[half size]** <Insert scale>.
5. Dimension all text elements in height, width and stroke width.
6. Dimension line spacing at all text from the baseline to the baseline of the adjacent text line.
7. Dimension spacing between the base of lowest line of raised characters to top of the highest line of Grade 2 Braille cells.
8. Dimension Grade 2 Braille cell height, width, dot size and dot spacing.
9. Dimension line spacing at multi-line Grade 2 Braille, from base of one line to the base of the line below.

D. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.

1. Include representative Samples of available typestyles and graphic symbols.

E. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:

1. Panel Signs: Not less than 12 inches (300 mm) square, including corner.

2. Variable Component Materials: 8-inch (200-mm) Sample of each base material, character (letter, number, and graphic element) in each exposed color and finish not included in Samples above.
3. Exposed Accessories: Half-size Sample of each accessory type.
4. Full-size Samples, if approved, will be returned to Contractor for use in Project.

F. Sign Schedule: For each type of sign assembly, exposed component, and exposed finish.

1. Include representative Samples of available typestyles and graphic symbols.

G. Unified English Braille (UEB) contracted (Grade 2) Braille Certification: Prior to submission to the state, each specific Braille message shall be reviewed and verified by a Certified Braille transcriber. Braille transcribers are certified by the National Library of Congress. A list of Certified Braille transcribers can be found at https://nfb.org/braille-transcription-resource-list or by contacting the National Federation of the Blind at (410)-659-9314. The following items are required to accompany the sign submittal and shall be approved by the State prior to fabrication.

1. A print of each raised text message; the corresponding print of the UEB Grade 2 Braille transcription for each raised text message; a copy of Braille transcriber's certificate as issued by the Library of Congress; and, a signed memo, from the Certified Braille transcriber, stating that the Grade 2 Braille as submitted has been reviewed, and is consistent with the UEB Brade 2 Braille transcription for each raised text message.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Evaluation Reports: For post-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Variable Component Materials: 12 replaceable text inserts and interchangeable characters (letters, numbers, and graphic elements) of each type.

2. Tools: One set(s) of specialty tools for assembling signs and replacing variable sign components.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.9 FIELD CONDITIONS

A. Field Measurements: Verify locations of anchorage devices embedded in permanent construction by other installers by field measurements before fabrication and indicate measurements on Shop Drawings.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of finishes beyond normal weathering.
b. Deterioration of embedded graphic image.
c. Separation or delamination of sheet materials and components.

2. Warranty Period: Five years from date of Beneficial Occupancy.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

B. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design".

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.

2.2 PANEL SIGNS

A. Panel Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. 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. ACE Sign Systems, Inc.
b. ASI Sign Systems, Inc.
c. Cosco.
d. Or approved equal.

A. Room Identification Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Laminated-Sheet Sign: Photopolymer face sheet with raised graphics laminated to acrylic backing sheet to produce composite sheet.
a. Composite-Sheet Thickness: 0.25 inch (6.35 mm).
b. Color(s): match building standard.
c. Paper insert not included. Provide template for printing inserts.
d. 1/16" thick non-glare clear acrylic panel with surface painted 3/8” wide masks top and bottom to be mounted on top section in front of name piece.
e. 1/16" thick acrylic spacer top and bottom to be mounted on top face of 1/8" acrylic sign panel to allow for window inserts.
f. Sheen: Non-glare.
g. California seal in 1” diameter mounted on left corner. Seal to be silkscreen printed on a 1/16” thick piece of silver matte circular material and placed on the header.
125 thick x 10” long polished metal bar to be placed at the header.

2. Sign-Panel Perimeter: Finish edges smooth.
a. Edge Condition: Square cut.
b. Corner Condition in Elevation: Square.

B. Exit Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Laminated-Sheet Sign: Photopolymer face sheet with raised graphics laminated to acrylic backing sheet to produce composite sheet.
a. Composite-Sheet Thickness: 0.25 inch (6.35 mm).
b. Color(s): As selected by the State from manufacturer's full range.
c. Sheen: Non-glare

2. Sign-Panel Perimeter: Finish edges smooth.
a. Edge Condition: Square cut.
b. Corner Condition in Elevation: Square.

3. Mounting: Surface mounted to wall with two-face tape and silicone adhesive.

4. Text and Typeface: Accessible raised characters and Grade 2 Braille and variable content as scheduled. Finish raised characters to contrast with background color, and finish Grade 2 Braille to match background color.

C. Miscellaneous Access Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Laminated-Sheet Sign: Photopolymer face sheet with raised graphics laminated to acrylic backing sheet to produce composite sheet.

a. Composite-Sheet Thickness: 0.25 inch (6.35 mm).
b. Surface-Applied Graphics: Applied vinyl film.
c. Color(s): As selected by The State from manufacturer's full range.
d. Finish: Non-glare.

2.3 PANEL-SIGN MATERIALS

A. Aluminum Sheet and Plate: ASTM B 209 (ASTM B 209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

B. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).

C. Vinyl Film Applied Graphics: UV-resistant vinyl film of nominal thickness indicated, with pressure-sensitive, permanent adhesive on back; die cut to form characters or images as indicated and suitable for exterior applications.

D. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.4 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following unless otherwise indicated:

1. Use concealed fasteners and anchors unless indicated to be exposed.
2. For exterior exposure, furnish nonferrous-metal devices unless otherwise indicated.
3. Exposed Metal-Fastener Components, General:

a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.

b. Fastener Heads: For nonstructural connections, use flathead screws and bolts with tamper-resistant spanner-head slots unless otherwise indicated.

4. Sign Mounting Fasteners:

a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material or screwed into back of sign assembly unless otherwise indicated.
b. Projecting Studs: Threaded studs with sleeve spacer, welded or brazed to back of sign material or screwed into back of sign assembly, unless otherwise indicated.
c. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, and installed in predrilled holes.

5. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with silicone adhesive.

B. Adhesive: As recommended by sign manufacturer.

1. Verify adhesives have a VOC content of 70 g/L or less.
2. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Magnetic Tape: Manufacturer's standard magnetic tape with adhesive on one side.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

2.5 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
5. Internally brace signs for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners.

6. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

2.6 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.

D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.7 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, or thicker.

B. Color Anodic Finish: AAMA 611, or thicker.

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. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Verify that anchorage devices embedded in permanent construction are correctly sized and located to accommodate signs.

D. Verify that electrical service is correctly sized and located to accommodate signs.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Install signs so they do not protrude or obstruct according to the accessibility standard.
3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Accessible Signage: Install in locations on walls as indicated and according to the accessibility standard.

C. Mounting Methods:

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.

a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.

2. Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.

a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.
b. Thin or Hollow Surfaces: Place spacers on studs, place sign in position with spacers pinched between sign and substrate, and install washers and nuts on stud ends projecting through opposite side of surface, and tighten.

3. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
4. Brackets: Remove loose debris from substrate surface and install backbar or bracket supports in position so that signage is correctly located and aligned.

5. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
6. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.
7. Hook-and-Loop Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply sign component of two-part tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage; push to engage tape adhesive. Keep tape strips 0.250 inch (6.35 mm) away from edges to prevent visibility at sign edges when sign is initially installed or reinstalled. Apply substrate component of tape to substrate in locations aligning with tape on back of sign; push and rub well to fully engage tape adhesive to substrate.

D. Field-Applied, Vinyl-Character Signs: Clean and dry substrate. Align sign characters in final position before removing release liner. Remove release liner in stages, and apply and firmly press characters into final position. Press from the middle outward to obtain good bond without blisters or fishmouths. Remove carrier film without disturbing applied vinyl film.

E. Signs Mounted on Glass: Provide opaque sheet matching sign material and finish onto opposite side of glass to conceal back of sign.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by the State.

END OF SECTION 10 14 23

SECTION 10 21 13.17

PHENOLIC-CORE TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Phenolic-core toilet compartments configured as toilet enclosures and urinal screens.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

C. Shop Drawings: For toilet compartments.

1. Include plans, elevations, sections, details, and attachment details.

2. Show locations of cutouts for compartment-mounted toilet accessories.
3. Show locations of centerlines of toilet fixtures.
4. Show locations of floor drains.
5. Show ceiling grid, ceiling-mounted items, and overhead support or bracing locations.

D. Samples for Initial Selection: For each type of toilet compartment material indicated.

1. Include Samples of hardware and accessories involving material and color selection.

E. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:

1. Each type of material, color, and finish required for toilet compartments, prepared on 6-inch- (152-mm-) square Samples of same thickness and material indicated for Work.
2. Each type of hardware and accessory.

F. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of toilet compartment.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Door Hinges: One hinge(s) with associated fasteners.
2. Latch and Keeper: One latch(es) and keeper(s) with associated fasteners.
3. Door Bumper: One door bumper(s) with associated fasteners.
4. Door Pull: One door pull(s) with associated fasteners.
5. Fasteners: Ten fasteners of each size and type.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 75 or less.
2. Smoke-Developed Index: 450 or less.

B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

C. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities for toilet compartments designated as accessible.

2.2 PHENOLIC-CORE TOILET COMPARMENTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Bobrick Washroom Equipment, Inc.
2. Global Industrial
3. Or equal.

B. Toilet-Enclosure Style: Ceiling hung.

C. Urinal-Screen Style: Wall hung.

D. Door, Panel, Screen, and Pilaster Construction: Solid phenolic-core panel material with melamine facing on both sides fused to substrate during panel manufacture (not separately laminated), and with eased and polished edges. Provide minimum 3/4-inch- (19-mm-) thick doors and pilasters and minimum 1/2-inch- (13-mm-) thick panels.

E. Pilaster: Formed from stainless steel sheet, not less than 0.031-inch (0.79-mm) nominal thickness and 3 inches (76 mm) high, finished to match hardware.

F. Brackets (Fittings):

1. Stirrup Type: Ear or U-brackets, stainless steel.

G. Phenolic-Panel Finish:

1. Facing Sheet Finish: One color and pattern in each room.

2. Color and Pattern: As selected by the State from manufacturer's full range, with manufacturer's standard dark color core.

3. Edge Color: Manufacturer's standard.

2.3 HARDWARE AND ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard operating hardware and accessories.

1. Material: Stainless steel.

2. Hinges: Manufacturer's standard paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees, allowing emergency access by lifting door.

3. Latch and Keeper: Manufacturer's standard surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible complying with CBC 11B-309.4.

4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
5. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
6. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.

B. Hardware and Accessories: Manufacturer's heavy-duty operating hardware and accessories.

1. Hinges: Manufacturer's minimum 0.062-inch- (1.59-mm-) thick stainless steel paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees, allowing emergency access by lifting door. Mount with through-bolts.

2. Latch and Keeper: Manufacturer's heavy-duty surface-mounted cast-stainless steel latch unit designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible. Mount with through-bolts.
3. Coat Hook: Manufacturer's heavy-duty combination cast-stainless steel hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories. Mount with through-bolts.
4. Door Bumper: Manufacturer's heavy-duty rubber-tipped cast-stainless steel bumper at out-swinging doors. Mount with through-bolts.
5. Door Pull: Manufacturer's heavy-duty cast-stainless steel pull at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible. Mount with through-bolts.

C. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

D. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.4 MATERIALS

A. Aluminum Castings: ASTM B26/B26M.

B. Aluminum Extrusions: ASTM B221 (ASTM B221M).

C. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.

D. Stainless Steel Castings: ASTM A743/A743M.

E. Zamac: ASTM B86, commercial zinc-alloy die castings.

2.5 FABRICATION

A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.

B. Ceiling-Hung Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for connection to structural support above finished ceiling. Provide assemblies that support pilasters from structure without transmitting load to finished ceiling. Provide sleeves (caps) at tops of pilasters to conceal anchorage.

C. Door Size and Swings: Unless otherwise indicated, provide 24-inch- (610-mm-) wide in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide in-swinging doors with a minimum 32-inch- (813-mm-) wide clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.

1. Confirm location and adequacy of blocking and supports required for installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Maximum Clearances:

a. Pilasters and Panels: 1/2 inch (13 mm).
b. Panels and Walls: 1 inch (25 mm).

B. Ceiling-Hung Units: Secure pilasters to supporting structure and level, plumb, and tighten. Hang doors and adjust so bottoms of doors are level with bottoms of pilasters when doors are in closed position.

C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.3 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 10 21 13.17

SECTION 10 26 00

WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wall guards.
2. Corner guards.
3. End-wall guards.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes.
2. Include fire ratings of units recessed in fire-rated walls and listings for door-protection items attached to fire-rated doors.

B. Sustainable Design Submittals:

1. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
2. Chain-of-Custody Qualification Data: For manufacturer and vendor.
3. Product Data: For adhesives, indicating VOC content.
4. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
5. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For each type of wall and door protection showing locations and extent.

1. Include plans, elevations, sections, and attachment details.

D. Samples for Initial Selection: For each type of impact-resistant wall-protection unit indicated, in each color and texture specified.

1. Include Samples of accent strips and accessories to verify color selection.

E. Samples for Verification: For each type of exposed finish on the following products, prepared on Samples of size indicated below:

1. Corner and End-Wall Guards: 12 inches (300 mm) long. Include example top caps.
2. Door-Surface Protection: 6 by 6 inches (150 by 150 mm) square.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of handrail.

B. Material Certificates: For each type of exposed plastic material.

C. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of wall and door protection product to include in maintenance manuals.

1. Include recommended methods and frequency of maintenance for maintaining best condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to finishes and performance.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Corner-Guard Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of cover installed, but no fewer than two, 48-inch-(1200-mm-) long units.
2. Mounting and Accessory Components: Amounts proportional to the quantities of extra materials. Package mounting and accessory components with each extra material.

1.6 QUALITY ASSURANCE

A. Certified Wood: Provide an invoice including vendor's chain-of-custody number, product cost, and entity being invoiced.

B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store wall and door protection in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1. Maintain room temperature within storage area at not less than 70 deg F (21 deg C) during the period plastic materials are stored.
2. Keep plastic materials out of direct sunlight.
3. Store plastic wall- and door-protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F (21 deg C).

    a. Store corner-guard covers in a vertical position.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of wall- and door-protection units that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Structural failures including detachment of components from each other or from the substrates, delamination, and permanent deformation beyond normal use.
    b. Deterioration of metals, metal finishes, plastics, and other materials beyond normal use.

2. Warranty Period: Five years from date of Beneficial Occupancy.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain wall- and door-protection products from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Surface Burning Characteristics: Comply with ASTM E84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities.

2.3 WALL GUARDS

A. Wall Guards: Fabricated from plastic sheet wall-covering material

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers offering products that may be incorporated into the Work include the following or an approved equal:

    a. Construction Specialties, Inc.
    b. IPC Door and Wall Protection Systems; Division of InPro Corporation.
    c. Korogard Wall Protection Systems; Division of RJF International Corporation.
    d. Kwalu, LLC.

2. Size: 48 by 96 inches minimum and as indicated for pattern and location.
3. Sheet Thickness: 0.040 inch.
4. Color and Texture: As selected by the State from the full range.
5. Height: Full wall and as indicated.
6. Trim and Joint Moldings: Extruded rigid plastic that matches sheet wall covering color.
7. Mounting: Adhesive.

2.4 CORNER GUARDS

A. Surface-Mounted, Plastic-Cover Corner Guards: Manufacturer's standard, PVC-free assembly consisting of snap-on, resilient plastic cover installed over retainer; including mounting hardware; fabricated with 90- or 135-degree turn to match wall condition.

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. Construction Specialties, Inc.
    b. J. L. Industries, Inc.; Activar Construction Products Group, Inc.
    c. Koroseal Interior Products, LLC.
    d. WallGuard.com.

2. Cover: Extruded rigid plastic, minimum 0.078-inch (2.0-mm) wall thickness; as follows:

    a. Profile: Nominal 2-inch- (50-mm-) long leg and 1/4-inch (6-mm) corner radius.
    b. Height: 4 feet (1.2 m).
    c. Color and Texture: As indicated by manufacturer's designations.

3. Continuous Retainer: One-piece extruded plastic.

4. Retainer Clips: Manufacturer's standard impact-absorbing clips.

5. Top and Bottom Caps: Prefabricated, injection-molded plastic; color matching cover; field adjustable for close alignment with snap-on cover.

2.5 END-WALL GUARDS

A. Surface-Mounted, Plastic-Cover, End-Wall Guard: Manufacturer's standard, PVC-free assembly consisting of snap-on, resilient plastic cover installed over continuous retainer; including mounting hardware.

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. Construction Specialties, Inc.
b. J. L. Industries, Inc.; Activar Construction Products Group, Inc.
c. Koroseal Interior Products, LLC.
d. WallGuard.com.

2. Cover: Extruded rigid plastic, minimum 0.078-inch (2.0-mm) wall thickness;

a. Profile: Nominal 2-inch- (50-mm-) long leg and 1/4-inch (6-mm) corner radius.
b. Height: 4 feet (1.2 m).
c. Color and Texture: As indicated by manufacturer's designations.

3. Retainer: Minimum 0.060-inch- (1.5-mm-) thick, one-piece, extruded aluminum.

4. Top and Bottom Caps: Prefabricated, injection-molded plastic; color matching cover; field adjustable for close alignment with snap-on cover.

2.6 MATERIALS

A. Plastic Materials: Chemical- and stain-resistant, high-impact-resistant plastic with integral color throughout; extruded and sheet material as required, thickness as indicated.

B. Polycarbonate Plastic Sheet: ASTM D6098, S-PC01, Class 1 or Class 2, abrasion resistant; with a minimum impact-resistance rating of 15 ft.-lbf/in. (800 J/m) of notch when tested according to ASTM D256, Test Method A.

C. Solid Wood: Clear hardwood lumber of species indicated, free of appearance defects, and selected for compatible grain and color.

1. Certified Wood: Certify wood products as "FSC Pure" in accordance with FSC STD-01-001 and FSC STD-40-004.

D. Composite Wood Products: Verify products are made using ultra-low-emitting formaldehyde resins, as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products," or are made with no added formaldehyde.

E. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.

F. Adhesive: As recommended by protection product manufacturer.

1. Verify adhesives have a VOC content of 70 g/L or less.
2. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.7 FABRICATION

A. Fabricate wall and door protection according to requirements indicated for design, performance, dimensions, and member sizes, including thicknesses of components.

B. Curved Panels: Preform curved semirigid, abuse-resistant sheet wall covering in factory for radius and sheet thickness as follows:

1. Sheet Thickness of 0.040 Inch (1.0 mm): 24-inch (610-mm) radius.
2. Sheet Thickness of 0.060 Inch (1.5 mm): 36-inch (914-mm) radius.

C. Factory Assembly: Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.

D. Quality: Fabricate components with uniformly tight seams and joints and with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

2.8 FINISHES

A. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances, fire rating, and other conditions affecting performance of the Work.

B. Examine walls to which wall and door protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.

1. For wall and door protection attached with adhesive, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Complete finishing operations, including painting, before installing wall and door protection.

B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

A. Installation Quality: Install wall and door protection according to manufacturer's written instructions, level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

B. Mounting Heights: Install wall and door protection in locations and at mounting heights indicated.

C. Accessories: Provide splices, mounting hardware, anchors, trim, joint moldings, and other accessories required for a complete installation.

1. Provide anchoring devices and suitable locations to withstand imposed loads.
2. Where splices occur in horizontal runs of more than 20 feet (6.1 m), splice aluminum retainers and plastic covers at different locations along the run, but no closer than 12 inches (305 mm) apart.
3. Adjust end and top caps as required to ensure tight seams.

D. Abuse-Resistant Wall Covering: Install top and edge moldings, corners, and divider bars as required for a complete installation.

E. Door-Frame Protectors: Install on both door jams.

F. Fire Doors: Install protection according to the listing of each item.

3.4 CLEANING

A. Immediately after completion of installation, clean plastic covers and accessories using a standard ammonia-based household cleaning agent.

B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 10 26 00

SECTION 10 28 00

TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.
2. Warm-air dryers.
3. Childcare accessories.
4. Underlavatory guards.
5. Custodial accessories.

1.2 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Include electrical characteristics.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.6 WARRANTY

A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 15 years from date of Beneficial Occupancy.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.

B. Combination Toilet Tissue Dispenser:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Bobrick Washroom Equipment, Inc. - Basis of design
   b. American Specialties, Inc.
   c. Bradley Corporation.
   d. Or approved equal

2. Description: Combination unit with double roll tissue dispenser and the following:

   a. Removable sanitary napkin waste receptacle with self-closing, disposal opening cover (at womens or all-gender restrooms only).
   b. Seat cover dispenser with minimum capacity of 500 single or half-fold seat covers.

3. Mounting:

a. At partition: Recessed partition mounted, dual access with two tissue rolls per compartment.
b. At stud wall: Recessed wall mounted.

4. Toilet Tissue Dispenser Capacity: Up to two 5 ¼" diameter tissue rolls.
5. Toilet Tissue Dispenser Operation: Noncontrol delivery with theft-resistant, heavy duty spindles.
6. Material and Finish: 22 ga. stainless steel finish (satin).
7. Lockset: Tumbler type.

C. Paper Towel (Folded) Dispenser:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Specialties, Inc.
b. Bobrick Washroom Equipment, Inc. - Basis of design.
c. GAMCO Specialty Accessories; a division of Bobrick.

2. Mounting: Semirecessed.

3. Minimum Capacity: 400 C-fold or 525 multifold towels.

4. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
5. Lockset: Tumbler type.

6. Refill Indicator: Pierced slots at sides or front.

D. Waste Receptacle:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Specialties, Inc.
b. Bobrick Washroom Equipment, Inc.- Basis of design
c. GAMCO Specialty Accessories; a division of Bobrick.

2. Mounting: Open top, semirecessed.
3. Minimum Capacity: 12.8 gal.
4. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
5. Liner: Reusable, vinyl waste-receptacle liner with -134 "LinerMate".
6. Lockset: Tumbler type for waste receptacle.

E. Combination Towel (Folded) Dispenser/Waste Receptacle:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. American Specialties, Inc.
    b. Bobrick Washroom Equipment, Inc. - Basis of design
    c. GAMCO Specialty Accessories; a division of Bobrick.

2. Description: Combination unit for dispensing C-fold or multifold towels, with removable waste receptacle.
3. Mounting: Semirecessed with projecting receptacle.

    a. Designed for nominal 4-inch wall depth.

4. Minimum Towel-Dispenser Capacity: 600 C-fold or 800 multifold paper towels, with -130 “TowelMate”.
5. Minimum Waste-Receptacle Capacity: 12 gal.
6. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
7. Liner: Reusable, vinyl waste-receptacle liner with -134 “LinerMate”.
8. Lockset: Tumbler type for towel-dispenser compartment and waste receptacle.

F. Automatic Liquid-Soap Dispenser:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. American Specialties, Inc.
    b. Bobrick Washroom Equipment, Inc. - Basis of design
    c. GAMCO Specialty Accessories; a division of Bobrick.

2. Description: Automatic dispenser with infrared sensor to detect presence of hands; battery powered; designed for dispensing antibacterial soap in liquid or lotion form.

3. Mounting: Vertically oriented, surface mounted.

4. Capacity: 30 oz. min.
5. Materials: Stainless steel, ASTM A480/A480M No. 4 finish (satin)

6. Refill Indicator: LED indicator.

7. Low Battery Indicator: LED indicator.

G. Grab Bar:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Specialties, Inc.
b. Bobrick Washroom Equipment, Inc. - Basis of design
c. GAMCO Specialty Accessories; a division of Bobrick.

2. Mounting: Flanges with exposed tamper resistant fasteners.
3. Material: Stainless steel, 0.05 inch thick.

a. Finish: Smooth, ASTM A480/A480M No. 4 finish satin on ends and slip-resistant texture in grip area.

4. Outside Diameter: 1-1/4 inches.
5. Configuration and Length: As indicated.

H. Mirror Unit (over lavatory):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Specialties, Inc.
b. Bobrick Washroom Equipment, Inc. - Basis of design
c. GAMCO Specialty Accessories; a division of Bobrick.

2. Frame: Stainless steel channel.

a. Corners: Manufacturer's standard.

3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.

a. One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.

b. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.

4. Size: 28” wide x 36” tall.

I. Mirror Unit:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Specialties, Inc.
b. Bobrick Washroom Equipment, Inc. - Basis of design
c. GAMCO Specialty Accessories; a division of Bobrick.

2. Frame: Stainless steel channel.

    a. Corners: Manufacturer's standard.

3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.

    a. One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.

    b. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.

4. Size: 24” wide x 50” tall.

J. Coat Hook:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. American Specialties, Inc.
    b. Bobrick Washroom Equipment, Inc. - Basis of design
    c. GAMCO Specialty Accessories; a division of Bobrick.

2. Description: Single-prong unit.
3. Material and Finish: Nickel-plated brass.
4. Fasteners: Tamper proof.

K. Folding Utility Shelf:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. American Specialties, Inc.
    b. Bobrick Washroom Equipment, Inc. - Basis of design
    c. GAMCO Specialty Accessories; a division of Bobrick.

2. Mounting: Surface mounted.
3. Minimum Capacity: 100 lbs
4. Exposed Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
5. Fasteners: Tamper Proof.

2.3 WARM-AIR DRYERS

A. Warm-Air Dryer:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Dyson Technologies Limited.
    b. American Specialties, Inc.
    c. Bobrick Washroom Equipment, Inc.
    d. GAMCO Specialty Accessories; a division of Bobrick.

2. Description: Multiple airflow warm-air hand dryer, using two or more airstreams for rapid hand drying.

3. Mounting: Surface mounted.

4. Operation: Electronic sensor activated with timed power cut-off switch.

    a. Operation Time: 12 seconds.

5. Cover Material and Finish: Sprayed Nickel.
6. Electrical Requirements: 110-127 V AC, 12 A, 1000 W.

2.4 CHILDCARE ACCESSORIES

A. Diaper-Changing Station:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. American Specialties, Inc.
    b. GAMCO Specialty Accessories; a division of Bobrick.
    c. Koala Kare Products; a Division of Bobrick - Basis of design.

2. Description: Horizontal unit that opens by folding down from stored position and with child-protection strap.

    a. Engineered to support minimum of 250-lb static load when opened.

3. Mounting: Surface mounted, with unit projecting not more than 4 inches from wall when closed.
4. Operation: By pneumatic shock-absorbing mechanism.
5. Material and Finish: Injection-molded polypropylene with antimicrobial additive embedded into the bed surface in manufacturer's standard color with reinforced steel on steel hinge mechanism and mounting frame.
6. Liner Dispenser: Built in.

2.5 UNDERLAVATORY GUARDS

A. Underlavatory Guard:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Buckaroos, Inc.
    b. Plumberex Specialty Products, Inc.
    c. Truebro by IPS Corporation. - Basis of design

2. Description: Insulating pipe covering for supply and drain piping assemblies that prevents direct contact with and burns from piping; allow service access without removing coverings.
3. Material and Finish: Antimicrobial, molded plastic, white.

2.6 CUSTODIAL ACCESSORIES

A. Mop and Broom Holder:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. American Specialties, Inc.
    b. Bobrick Washroom Equipment, Inc. - Basis of design
    c. GAMCO Specialty Accessories; a division of Bobrick.

2. Description: Unit with shelf, hooks, and holders.
3. Length: 34 inches.
4. Hooks: Four.
5. Mop/Broom Holders: Three, spring-loaded, rubber hat, cam type.
6. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

    a. Shelf: Not less than nominal 0.05-inch-thick stainless steel.

B. Utility Shelf:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. American Specialties, Inc.
    b. Bobrick Washroom Equipment, Inc. - Basis of design
    c. GAMCO Specialty Accessories; a division of Bobrick.

2. Description: With exposed edges turned down not less than ½ inch and supported by two triangular brackets welded to shelf underside.
3. Size: 16 inches long by 6 inches deep.
4. Material and Finish: Not less than nominal 0.05-inch-thick Stainless steel, ASTM A480/A480M No. 4 finish (satin).

2.7 MATERIALS

A. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.

B. Brass: ASTM B19, flat products; ASTM B16/B16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B30, castings.

C. Steel Sheet: ASTM A1008/A1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.

D. Galvanized-Steel Sheet: ASTM A653/A653M, with G60 (Z180) hot-dip zinc coating.

E. Galvanized-Steel Mounting Devices: ASTM A153/A153M, hot-dip zinc coating.

F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

G. Chrome Plating: ASTM B456, Service Condition Number SC 2 (moderate service).

H. Mirrors: ASTM C1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.8 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to the State's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated. Install per CBC 11B-603 and 11B-604.7.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION 10 28 00

SECTION 10 44 13

FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes fire-protection cabinets for portable fire extinguishers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For fire-protection cabinets.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.4 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

1.5 SEQUENCING

A. Apply decals on field-painted fire-protection cabinets after painting is complete.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

2.2 FIRE-PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher.

1. Manufacturers: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Fire-End & Croker Corporation.
    b. GMR International Equipment Corporation.
    c. Guardian Fire Equipment, Inc.
    d. JL Industries, Inc.; a division of the Activar Construction Products Group.
    e. Larsens Manufacturing Company.
    f. Modern Metal Products, Division of Technico Inc.
    g. Nystrom, Inc.
    h. Potter Roemer LLC.
    i. Strike First Corporation of America.

B. Cabinet Construction: Nonrated.

C. Cabinet Material: Stainless-steel sheet.

D. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

1. Square-Edge Trim: 1-1/4- to 1-1/2-inch backbend depth.
2. Rolled-Edge Trim: 2-1/2-inch backbend depth.

E. Cabinet Trim Material: Stainless-steel sheet.

F. Door Material: Stainless-steel sheet.

G. Door Style: Center glass panel within frame.

H. Door Glazing: Acrylic sheet.

1. Acrylic Sheet Color: Clear transparent acrylic sheet.

I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

J. Accessories:
1. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
2. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by the State.

    a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."

        1) Location: Applied to cabinet door.
        2) Application Process: Pressure-sensitive vinyl letters.
        3) Lettering Color: Red.
        4) Orientation: Vertical.

K. Materials:

1. Stainless Steel: ASTM A 666, Type 304.

a. Finish: No. 4 directional satin finish.

2. Transparent Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), 3 mm thick, with Finish 1 (smooth or polished).

2.3 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Prepare recesses for recessed and semirecessed fire-protection cabinets as required by type and size of cabinet and trim style.

B. Install fire-protection cabinets in locations and at mounting heights indicated.

C. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.

D. Identification: Apply vinyl lettering at locations indicated.

E. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

END OF SECTION 10 44 13

SECTION 10 44 16

FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes portable, hand-carried fire extinguishers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Six years from date of Acceptance of Work.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Amerex Corporation.
b. Babcock-Davis.
c. Kidde Residential and Commercial Division.

2. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B

B. Regular Dry-Chemical Type: UL-rated 2A10BC nominal capacity, with sodium bicarbonate-based dry chemical in manufacturer's standard enameled container.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Install fire extinguishers in locations indicated and in compliance with requirements of authorities having jurisdiction.

END OF SECTION 10 44 16

SECTION 10 51 13

METAL LOCKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Welded corridor lockers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker.

B. Sustainable Design Submittals:

   1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
   2. Environmental Product Declaration: For each product.
   3. Health Product Declaration: For each product.
   4. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.
   5. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For metal lockers.

   1. Include plans, elevations, sections, and attachment details.
   2. Show locker trim and accessories.
   3. Include locker identification system and numbering sequence.

D. Samples: For each color specified, in manufacturer's standard size.

E. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available.

F. Samples for Verification: For the following products, in manufacturer's standard size:

   1. Lockers and equipment.
   2. Locker benches.

G. Product Schedule: For lockers.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. The following metal locker hardware items equal to 10 percent of amount installed for each type and finish installed, but no fewer than five units:

a. Locks.
b. Blank identification plates.
c. Hooks.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.

B. Deliver master and control keys to the State by registered mail or overnight package service.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of recessed openings by field measurements before fabrication.

1.8 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures.
b. Faulty operation of latches and other door hardware.

2. Damage from deliberate destruction and vandalism is excluded.
3. Warranty Period for Knocked-Down Metal Lockers: Two years from date of Beneficial Occupancy.
4. Warranty Period for Welded Metal Lockers: Lifetime from date of Beneficial Occupancy.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain metal lockers and accessories from single source from single locker manufacturer.

1. Obtain locks from single lock manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: For lockers indicated to be accessible, comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design".

2.3 WELDED CORRIDOR LOCKERS

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. ASI Storage Solutions; ASI Group.
2. DeBourgh Mfg. Co.
3. Top Tier Storage Products.

B. Doors: One piece; fabricated from 0.075-inch (1.90-mm) nominal-thickness steel sheet; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges.

1. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches (381 mm) wide; welded to inner face of doors.
2. Door Style: Vented panel as follows:

    a. Louvered Vents: No fewer than two louver openings at top and bottom, or three louver openings at top or bottom, for triple-tier lockers.

C. Body: Assembled by welding body components together. Fabricate from unperforated steel sheet with thicknesses as follows:

1. Tops, Bottoms, and Sides: 0.060-inch (1.52-mm) nominal thickness.
2. Backs: 0.048-inch (1.21-mm) nominal thickness.
3. Shelves: 0.060-inch (1.52-mm) nominal thickness, with double bend at front and single bend at sides and back.

D. Frames: Channel formed; fabricated from 0.060-inch (1.52-mm) nominal-thickness steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.

E. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.
1. Continuous Hinges: Manufacturer's standard, steel, full height.

F. Recessed Door Handle and Latch: Stainless steel cup with integral door pull, recessed so locking device does not protrude beyond door face; pry and vandal resistant.

1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks or padlocks; positive automatic latching and prelocking.

    a. Latch Hooks: Equip doors 48 inches (1219 mm) and higher with three latch hooks and doors less than 48 inches (1219 mm) high with two latch hooks; fabricated from 0.120-inch (3.04-mm) nominal-thickness steel sheet; welded to full-height door strikes; with resilient silencer on each latch hook.
    b. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.

2. Single-Point Latching: Nonmoving latch hook with steel padlock loop that projects through recessed cup and is finished to match metal locker body.

    a. Latch Hook: Equip each door with one latch hook, fabricated from 0.120-inch (3.04-mm) nominal-thickness steel sheet; welded midway up full-height door strike; with resilient silencer.

G. Locks: Combination padlocks.

H. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8 inch (9 mm) high.

I. Hooks: Manufacturer's standard ball-pointed, aluminum or steel; zinc plated.

J. Coat Rods: Manufacturer's standard.

K. Legs: 6 inches (152 mm) high; formed by extending vertical frame members or fabricated from 0.075-inch (1.90-mm) nominal-thickness steel sheet; welded to bottom of locker.

1. Closed Front and End Bases: Fabricated from 0.036-inch (0.91-mm) nominal-thickness steel sheet.

L. Continuous Sloping Tops: Fabricated from 0.048-inch (1.21-mm) nominal-thickness steel sheet, with a pitch of approximately 20 degrees.

1. Closures: Vertical-end type.

M. Finished End Panels: Fabricated from 0.024-inch (0.61-mm) nominal-thickness steel sheet to cover unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.

N. Materials:

1. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
2. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B; with A60 (ZF180) zinc-iron, alloy (galvannealed) coating designation.
3. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

O. Finish: Baked enamel or powder coat.

1. Color: As selected by the State from manufacturer's full range.

2.4 LOCKS

A. Combination Padlock: Provided by the State. See item 2.5E for the type of lock/key for accessible lockers.

2.5 FABRICATION

A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.

1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.

B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments.

C. Equipment: Provide each locker with an identification plate and the following equipment:
1. Triple-Tier Units: One double-prong ceiling hook.

D. Welded Construction: Factory preassemble metal lockers by welding all joints, seams, and connections; with no bolts, nuts, screws, or rivets used in assembly of main locker groups. Factory weld main locker groups into one-piece structures. Grind exposed welds smooth and flush.

E. Accessible Lockers: Fabricate as follows:

1. Locate bottom shelf no lower than 15 inches (381 mm) above the floor.
2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches (1219 mm) above the floor.

F. Continuous Zee Base: Fabricated in lengths as long as practical to enclose base and base ends; finished to match lockers.

G. Continuous Sloping Tops: Fabricated in lengths as long as practical, without visible fasteners at splice locations; finished to match lockers.

H. Individual Sloping Tops: Fabricated in width to fit one locker frame in lieu of flat locker tops; with integral back; finished to match lockers. Provide wedge-shaped divider panels between lockers.

I. Recess Trim: Fabricated with minimum 2-1/2-inch (64-mm) face width and in lengths as long as practical; finished to match lockers.

J. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.

K. Boxed End Panels: Fabricated with 1-inch- (25-mm-) wide edge dimension and designed for concealing fasteners and holes at exposed ends of nonrecessed metal lockers; finished to match lockers.

1. Provide one-piece panels for double-row (back-to-back) locker ends.

L. Finished End Panels: Fabricated to conceal unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.

1. Provide one-piece panels for double-row (back-to-back) locker ends.

M. Center Dividers: Full-depth, vertical partitions between bottom and shelf; finished to match lockers.

2.6 ACCESSORIES

A. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.

B. Anchors: Material, type, and size required for secure anchorage to each substrate.

1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls for corrosion resistance.
2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and floors or support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install lockers level, plumb, and true; shim as required, using concealed shims.

1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches (910 mm) o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
2. Anchor single rows of metal lockers to walls near top and bottom of lockers.
3. Anchor back-to-back metal lockers to floor.

B. Welded Lockers: Connect groups together with manufacturer's standard fasteners, with no exposed fasteners on face frames.

C. Equipment:

1. Attach hooks with at least two fasteners.
2. Attach door locks on doors using security-type fasteners.
3. Identification Plates: Identify metal lockers with identification indicated.

a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
b. Attach plates to upper shelf of each open-front metal locker, centered, with a least two aluminum rivets.

D. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.

1. Attach recess trim to recessed metal lockers with concealed clips.
2. Attach filler panels with concealed fasteners. Locate filler panels where indicated.
3. Attach sloping-top units to metal lockers, with closures at exposed ends.
4. Attach finished end panels using fasteners only at perimeter to conceal exposed ends of nonrecessed metal lockers.

E. Fixed Benches: Provide no fewer than two pedestals for each bench, uniformly spaced not more than 72 inches (1830 mm) apart. Securely fasten tops of pedestals to undersides of bench tops, and anchor bases to floor.

F. Movable Benches: Place benches in locations indicated.

3.3 ADJUSTING

A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding.

3.4 PROTECTION

A. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.

B. Touch up marred finishes or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 10 51 13

SECTION 10 56 13

METAL STORAGE SHELVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Case-type metal storage shelving.

1.2 COORDINATION

A. Coordinate sizes and locations of blocking and backing required for installation of metal storage shelving attached to wall and ceiling assemblies.

B. Coordinate locations and installation of metal storage shelving that may interfere with ceiling systems including lighting, HVAC, speakers, sprinklers, access panels, electrical switches or outlets, and floor drains.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:
1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For metal storage shelving.
1. Include plans, elevations, sections, and attachment details.
2. Include installation details of connectors, lateral bracing, and special bracing.

D. Samples: For each type of metal storage shelving and for each color specified.

1.4 INFORMATIONAL SUBMITTALS

A. Product certificates.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Metal storage shelving shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
   1. Seismic Component Importance Factor: 1.0.

B. Sustainable Design Performance:

C. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

D. Composite Wood Products: Verify products are made using ultra-low-emitting formaldehyde resins, as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products," or are made with no added formaldehyde.

2.2 CASE-TYPE METAL STORAGE SHELVING

A. Case-Type Metal Shelving: Complying with MH 28.1; freestanding units and field assembled from factory-formed components. Shelves span between two independent supporting sheet metal end panels that allow shelf-height adjustment over full height of shelving unit. Provide fixed top and bottom shelves, adjustable intermediate shelves, and accessories indicated.

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Borroughs Corporation.
      b. Lyon Workspace Products, LLC.
      c. UNICOR.

B. Load-Carrying Capacity per Shelf: 400 lb, uniformly distributed.

C. End Panels: Fabricated from cold-rolled steel sheet, with concealed perforations at front and back edges at 1 inch o.c. for receiving adjustable shelf clips.
   1. Adjustable Shelf Clips: Cold-rolled steel, with projections designed to engage at least two perforations in end panels.

D. End Panels: Fabricated from cold-rolled steel sheet; with horizontal slots spaced at 1 inch o.c. for supporting shelves.

E. Back Panel: One piece, fabricated from cold-rolled steel sheet.

F. Shelves: Fabricated from cold-rolled steel sheet. Fabricate shelves with vertical front that is flanged and returned.

   1. Shelf-Divider Slots: 2 inches o.c.

G. Base: Closed front, with base strips fabricated from same material and with same finish as end panels.

H. Accessories:

1. Finished End Panels: Fabricated as solid full-height panels from same material and with same finish as end panels, with trim along edges abutting end panels and top shelf.
2. Shelf Dividers: Fabricated from same material and with same finish as shelves; full-height type.
3. Shelf-Label Holders: Colored plastic, designed to clip onto front edge of shelf.

I. Steel Finish: Baked enamel or powder coat.

1. Color and Gloss: As selected by the State from manufacturer's full range.

2.3 ANCHORS

A. Floor Anchors: Galvanized-steel, post-installed expansion anchors or threaded concrete screws. Provide number per unit recommended by manufacturer unless additional anchors are indicated in calculations.

B. Wall Anchors: Manufacturer's standard, galvanized-steel anchors designed to secure metal storage shelving to adjacent wall. Provide 3 per shelving unit for each shelving unit adjacent to a wall unless additional anchors are indicated in calculations.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install metal storage shelving level, plumb, square, rigid, true, and with shelves flat and free of dents or distortion. Make connections to form a rigid structure, free of buckling and warping.

1. Install exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
2. Install braces, straps, plates, brackets, and other reinforcements as needed to support shelf loading and as required for stability.
3. Adjust post-base bolt leveler to achieve level and plumb installation.
4. Anchor shelving units to floor with floor anchors through floor plate. Shim floor plate to achieve level and plumb installation.
5. Install seismic restraints.
6. Connect side-to-side and back-to-back shelving units together.
7. Install shelves in each shelving unit at spacing indicated.

a. Case-Type Metal Storage Shelving: Install adjustable shelf clips at front and back of each shelf.

B. Accessories:

1. Install finished end panels and trim at exposed ends of shelving units.
2. Shelf Dividers: As indicated in shop drawings
3. Shelf-Label Holders: Install one on each shelf.

a. Install centered within each shelving unit.

3.2 ERECTION TOLERANCES

A. Erect case-type metal storage shelving to a maximum tolerance from vertical of 1/2 inch in up to 10 feet of height, not exceeding 1 inch for heights taller than 10 feet.

B. Erect post-and-beam metal storage shelving to a maximum tolerance from vertical of 1/4 inch in 84 inches of height.

3.3 ADJUSTING

A. Adjust metal storage shelving so that connectors and other components engage accurately and securely.

B. Adjust and lubricate operable components to operate smoothly and easily, without binding or warping. Check and readjust operating hardware.

C. Touch up marred finishes or replace metal storage shelving that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by metal storage shelving manufacturer.

D. Replace metal storage shelving components that have been damaged beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 10 56 13

SECTION 12 21 13

HORIZONTAL LOUVER BLINDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Horizontal louver blinds, aluminum slats.

1.2 ACTION SUBMITTALS

A. Product Data:
   1. Horizontal louver blinds, aluminum slats.

B. Product Data Submittals: For each product.

C. Shop Drawings:
   1. Fabrication and installation details.

D. Samples: Manufacturer's standard color sheets, showing full range of available colors for each type and color of horizontal louver blind.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.4 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of motorized products that fail in materials or workmanship within specified warranty period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Window Covering Safety Standard: Provide horizontal louver blinds that comply with WCMA A100.1.

2.2 HORIZONTAL LOUVER BLINDS, ALUMINUM SLATS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hunter Douglas
2. Levolor Inc
3. Or approved equal.

B. Slats: Aluminum; alloy and temper recommended by producer for type of use and finish indicated; with crowned profile and radius corners.

1. Width: 1 inch.
2. Thickness: 0.008 inch.
3. Spacing: Manufacturer's standard.
4. Finish: Ionized antistatic, dust-repellent, baked polyester finish.

C. Ladders: Evenly spaced across headrail at spacing that prevents long-term slat sag.

1. Type: Braided cord.

D. Headrail: Formed steel or extruded aluminum; long edges returned or rolled. Headrails fully enclose control mechanisms on three sides.

1. Capacity: Two blind(s) per headrail unless otherwise indicated.
2. Ends: Manufacturer's standard.

E. Manual Corded Operation:

1. Lift Mechanism:

a. Lift-Cord Lock: Variable; stops lift cord at user-selected position within blind full operating range.

2. Lift Operator: Extension of inner lift cord(s) through lift-cord lock mechanism to form lift cord.
3. Lift Cord: Manufacturer's standard braided cord.
4. Lift-Cord Length: Accessible cord, not greater than 40 percent of product height when blind is fully closed, with cord cleat. Below window sill for window that would be too tall to reach
5. Tilt Mechanism: Enclosed worm-gear mechanism and linkage rod that adjusts ladders.
6. Tilt Position:

a. Full.

7. Tilt Operator: Clear-plastic wand.
8. Tilt Over-Rotation Protection: Manufacturer's detachable operator or slip clutch to prevent over-rotation of gear.

9. Tilt-Operator Length, Wand or Rod: 24 inches. Long enough to reach for high windows.

F. Bottom Rail: Formed-steel or extruded-aluminum tube that secures and protects ends of ladders and inner lift cords and has plastic- or metal-capped ends.

1. Type: Manufacturer's standard.

G. Valance: Manufacturer's standard.

H. Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.

1. Type: Two piece for pocket installation.
2. Intermediate Support: Provide intermediate support brackets to produce support spacing recommended by horizontal louver blind manufacturer for weight and size of blind.

I. Colors, Textures, Patterns, and Gloss:

1. Slats: As selected by the State from manufacturer's full range.
2. Components: Provide rails, cords, ladders, and materials exposed to view matching or coordinating with slat color unless otherwise indicated.

2.3 FABRICATION OF HORIZONTAL LOUVER BLINDS

A. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:

2.4 Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which blind is installed less 1/4 inch per side or 1/2 inch total, plus or minus 1/8 inch. Length equal to head-to-sill dimension of opening in which blind is installed less 1/4 inch, plus or minus 1/8 inch

PART 3 - EXECUTION

3.1 INSTALLATION OF HORIZONTAL LOUVER BLINDS

A. Install horizontal louver blinds level and plumb, aligned and centered in openings, and aligned with adjacent units in accordance with manufacturer's written instructions.
1. Locate so exterior slat edges are not closer than 1 inch from interior faces of glass and not closer than 1/2 inch from interior faces of glazing frames through full operating ranges of blinds.
2. Install mounting brackets to prevent deflection of headrails.

3. Install with clearances that prevent interference with adjacent blinds, adjacent construction, and operating hardware of glazed openings, other window treatments, and similar building components and furnishings.

B. Adjust horizontal louver blinds to operate free of binding or malfunction through full operating ranges.

3.2 Clean horizontal louver blind surfaces after installation in accordance with manufacturer's written instructions.

END OF SECTION 12 21 13

SECTION 12 36 61.16

SOLID SURFACING COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid surface material countertops.
2. Solid surface material backsplashes.
3. Solid surface material end splashes.
4. Solid surface material apron fronts.

1.2 ACTION SUBMITTALS

A. Product Data: For countertop materials.

B. Sustainable Design Submittals:

1. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
2. Product Data: For adhesives, indicating VOC content.
3. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
4. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

1. Show locations and details of joints.
2. Show direction of directional pattern, if any.

D. Samples for Initial Selection: For each type of material exposed to view.

E. Samples for Verification: For the following products:

1. Countertop material, 6 inches (150 mm) square.
2. Wood trim, 8 inches (200 mm) long.
3. One full-size solid surface material countertop, with front edge and backsplash, 8 by 10 inches (200 by 250 mm) of construction and in configuration specified.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For solid surface material countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of countertops.

C. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and execution.

1. Build mockup of typical countertop as shown.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Beneficial Occupancy.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.7 COORDINATION

A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID SURFACE COUNTERTOP MATERIALS

A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.

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. Avonite Surfaces.
b. Formica Corporation.
c. Corian Solid Surfaces (Basis of design)
d. Samsung Chemical USA, Inc.
e. Wilsonart LLC.

2. Type: Provide Standard type unless Special Purpose type is indicated.

3. Colors and Patterns: As selected by the State from manufacturer’s full range.

2.2 COUNTERTOP FABRICATION

A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."

1. Grade: Premium.

B. Configuration:

1. Front: Straight, slightly eased at top.
2. Backsplash: Radius edge with 3/8-inch (9.5-mm) radius.
3. End Splash: None.

C. Countertops: 3/4-inch- (19-mm-) thick, solid surface material with front edge built up with same material.

D. Backsplashes: 3/4-inch- (19-mm-) thick, solid surface material.

E. Fabricate tops with shop-applied edges and backsplashes unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

1. Fabricate with loose backsplashes for field assembly.
2. Install integral sink bowls in countertops in the shop.

F. Joints: Fabricate countertops without joints.

G. Joints: Fabricate countertops in sections for joining in field.

1. Joint Locations: Not within 18 inches (450 mm) of a sink or cooktop and not where a countertop section less than 36 inches (900 mm) long would result, unless unavoidable.
2. Splined Joints: Accurately cut kerfs in edges at joints for insertion of metal splines to maintain alignment of surfaces at joints. Make width of cuts slightly more than thickness of splines to provide snug fit.

H. Cutouts and Holes:

1. Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.

a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch (5 mm) into fixture opening.
b. Provide vertical edges, rounded to 3/8-inch (10-mm) radius at juncture of cutout edges with top surface of countertop, slightly eased at bottom, and projecting 3/16 inch (5 mm) into fixture opening.

c. Provide 3/4-inch (20-mm) full bullnose edges projecting 3/8 inch (10 mm) into fixture opening.

2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.
4. Counter-Mounted Cooktops: Prepare countertops in shop for field cutting openings for cooktops. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.

2.3 INSTALLATION MATERIALS

A. Adhesive: Product recommended by solid surface material manufacturer.

1. Verify adhesives have a VOC content of 70 g/L or less.
2. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install countertops level to a tolerance of 1/8 inch in 8 feet (3 mm in 2.4 m), 1/4 inch (6 mm) maximum. Do not exceed 1/64-inch (0.4-mm) difference between planes of adjacent units.

B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

C. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.

D. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

E. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.

1. Install metal splines in kerfs in countertop edges at joints. Fill kerfs with adhesive before inserting splines and remove excess immediately after adjoining units are drawn into position.
2. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.

F. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.

G. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.

H. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.

1. Seal edges of cutouts in particleboard subtops by saturating with varnish.

I. Apply sealant to gaps at walls.

END OF SECTION 12 36 61.16

SECTION 12 48 16

ENTRANCE FLOOR GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Recessed floor grilles and frames.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:
   1. Items penetrating floor grilles and frames, including door control devices.
   2. Divisions between grille sections.
   3. Perimeter floor moldings.

C. Samples: For each exposed product and for each color and texture specified.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance data.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Babcock-Davis.
   2. C/S Group- Basis of design.
   3. Reese Enterprises, Inc.

2.2 ENTRANCE FLOOR GRILLES, GENERAL

A. Accessibility Standard: Comply with applicable provisions in 2022 California Building Code.

2.3 FLOOR GRILLES

A. Aluminum Floor Grilles: Provide manufacturer's standard floor grilles with extruded members, top-surfaced tread rails, and as follows:
   1. Aluminum Color: As selected by the State from full range of industry colors and color densities.
   2. Tread Rail Spacing: 1-1/2 inches o.c. with 1/8- to 3/16-inch- wide openings between treads.
   3. Top Surface: Fusion-bonded, level-cut-pile nylon carpet insert; 1/4 inch high, 28 oz./sq. yd.
      a. Top Surface Color: As selected by the State from manufacturer's full range of industry colors.
   4. Grille Size: As indicated.

B. Lockdown: Manufacturer's standard.

2.4 FRAMES

A. Provide manufacturer's standard frames of size and style for grille type.

2.5 SUPPORT SYSTEM

A. Level Bed Applications: Provide manufacturer's standard, vinyl cushion support system for interior entrance floor grilles.

B. Drainage Pit Applications: Provide manufacturer's special deep-pit frame and support extrusion system with intermediate support beams, sized and spaced as recommended by manufacturer for indicated spans and equipped with vinyl support cushions for exterior floor grilles.

2.6 DRAIN PANS

A. Provide manufacturer's standard, 0.060-inch-thick, aluminum or stainless steel sheet drain pan with NPS 2 drain outlet for each floor-grille unit. Coat bottom of pan with protective coating recommended by manufacturer.

2.7 MATERIALS

A. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.

B. Stainless Steel Plate Sheet, and Strip: ASTM A240/A240M or ASTM A666, Type 304.

C. Stainless Steel Flat Bars: ASTM A666, Type 304.

D. Stainless Steel Angles: ASTM A276 or ASTM A479/A479M, Type 304.

E. Aluminum Sheet: ASTM B209.

F. Extruded Aluminum: ASTM B221.

2.8 FABRICATION

A. Shop fabricate floor grilles to greatest extent possible in sizes as indicated.

B. Fabricate frame members in single lengths or, where frame dimensions exceed maximum available lengths, provide minimum number of pieces possible.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install recessed floor grilles and frames and drain pans to comply with manufacturer's written instructions at locations indicated and with top of floor grilles and frames in relationship to one another and to adjoining finished flooring as recommended by manufacturer. Set floor-grille tops at height for most effective cleaning action. Coordinate top of floor-grille surfaces with doors that swing across grilles to provide clearance under door.

3.2 PROTECTION

A. After completing frame installations, provide temporary filler of plywood or fiberboard in floor-grille recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Acceptance of Work

END OF SECTION 12 48 16

SECTION 21 05 00

COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 SUMMARY

A. The Work of this Section includes:

1. Sleeves without waterstop.
2. Sleeves with waterstop.
3. Sleeve-seal systems.
4. Grout.
5. Escutcheons.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of product, excluding motors which are included in Part 1 of the fire-suppression equipment Sections.

a. Include construction details, material descriptions, and dimensions of components.
b. Include operating characteristics and furnished accessories.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 SLEEVES AND SLEEVE SEALS

A. Sleeves without Waterstop:

1. Cast-Iron Pipe Sleeves: Cast or fabricated of cast or ductile iron, with plain ends.
2. Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, hot-dip galvanized, with plain ends.

B. Sleeves with Waterstop:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

a. Advance Products & Systems, LLC.
b. CALPICO, Inc.
c. GPT; a division of EnPRO Industries.
d. Metraflex Company (The).
e. Or equal.

2. Description: Manufactured PVC/HDPE, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall.

C. Sleeve-Seal Systems:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

a. Advance Products & Systems, LLC.
b. CALPICO, Inc.
c. GPT; a division of EnPRO Industries.
d. Metraflex Company (The).
e. Proco Products, Inc.
f. Or equal.

2. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

a. Hydrostatic Seal: 20 psig minimum.
b. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size.
c. Connecting Bolts and Nuts: Carbon steel, with ASTM B633 coating of length required to secure pressure plates to sealing elements.

D. Grout:

1. Description: Nonshrink, for interior and exterior sealing openings in non-fire-rated walls or floors.
2. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
3. Design Mix: 5000 psi, 28-day compressive strength.
4. Packaging: Premixed and factory packaged.

2.2 ESCUTCHEONS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. BrassCraft Manufacturing Co.; a Masco company.
2. Dearborn Brass.
3. ProFlo; a Ferguson Enterprises, Inc. brand.
4. Or equal.

B. Escutcheon Types:

1. One-Piece, Steel Type: With polished, chrome-plated finish and setscrew fastener.
2. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped steel with polished, chrome-plated finish and spring-clip fasteners.

C. Floor Plates:

1. Split Floor Plates: Steel with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPE LOOPS AND SWING CONNECTIONS

A. Install pipe loops and offsets in accordance with NFPA 13 requirements for expansion and contraction compensation.

3.2 INSTALLATION OF SLEEVES, GENERAL

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.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls.

1. 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.

2. Using grout, seal space outside of sleeves in floors/slabs/walls without sleeve-seal system. Select to maintain fire-resistance of floor/slab/wall.

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 that joint sealant manufacturer's literature indicates is appropriate for size, depth, and location of joint.

E. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials.

3.3 INSTALLATION OF SLEEVE-SEAL SYSTEMS

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building, and passing through exterior walls.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 INSTALLATION OF ESCUTCHEONS

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 piping and with OD that completely covers opening.

3.5 SLEEVES APPLICATION

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above and below Grade:

    a. Sleeves with waterstops.

        1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

2. Concrete Slabs-on-Grade:

    a. Sleeves with waterstops.

        1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Interior Walls and Partitions:

    a. Sleeves without waterstops.

3.6 ESCUTCHEONS APPLICATION

A. Escutcheons for New Piping and Relocated Existing Piping:

1. Piping with Fitting or Sleeve Protruding from Wall: One piece, deep pattern.
2. Bare Piping at Wall and Floor Penetrations in Finished Spaces:

    a. One piece, steel with polished, chrome-plated finish.

3. Bare Piping at Ceiling Penetrations in Finished Spaces:

a. One piece, steel with polished, chrome-plated finish.

4. Bare Piping in Unfinished Service Spaces:

a. One piece, steel with polished, chrome-plated finish.

5. Bare Piping in Equipment Rooms:

a. One piece, steel with polished, chrome-plated finish.

B. Install floor plates for piping penetrations of equipment room floors.

C. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping and Relocated Existing Piping: One piece, floor plate.

END OF SECTION 21 05 00

SECTION 21 05 53

IDENTIFICATION FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe labels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PIPE LABELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Actioncraft Products, Inc.; a division of Industrial Test Equipment Co., Inc.
2. Carlton Industries, LP.
3. Craftmark Pipe Markers.
4. Seton Identification Products.
5. Or equal.

B. General Requirements for Manufactured Pipe Labels: Preprinted, color coded, with lettering indicating service and showing flow direction in accordance with ASME A13.1.

C. Letter and Background Color: As indicated for specific application under Part 3.

D. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

E. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

F. Pipe-Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings. Also include the following:

1. Pipe size.
2. Flow-Direction Arrows: Include flow-direction arrows on distribution piping. Arrows may be either integral with label or applied separately.

3. Lettering Size: Size letters in accordance with ASME A13.1 for piping.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of incompatible primers, paints, and encapsulants, as well as dirt, oil, grease, release agents, and other substances that could impair bond of identification devices.

3.2 INSTALLATION GENERAL REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be installed.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

D. Locate identifying devices so that they are readily visible from the point of normal approach.

3.3 INSTALLATION OF PIPE LABELS

A. Install pipe labels showing service and flow direction with permanent adhesive on pipes.

B. Pipe-Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Within 3 ft. of each valve and control device.
2. At access doors, manholes, and similar access points that permit a view of concealed piping.
3. Within 3 ft. of equipment items and other points of origination and termination.
4. Spaced at maximum intervals of 25 ft. along each run. Reduce intervals to 10 ft. in areas of congested piping and equipment.

C. Flow- Direction Arrows: Provide arrows to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

D. Fire-Suppression Pipe Label Color Schedule:

1. Fire-Suppression Pipe Labels: White letters on an ANSI Z535.1 safety-red background.

END OF SECTION 21 05 53

SECTION 21 13 13

WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel pipe and fittings.
2. Specialty valves.
3. Sprinkler piping specialties.
4. Sprinklers.
5. Alarm devices.
6. Pressure gauges.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For wet-pipe sprinkler systems.

1. Include plans, elevations, sections, and attachment details.
2. Include diagrams for power, signal, and control wiring.

C. Delegated Design Submittals: For wet-pipe sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data, signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Sprinkler system plans and sections, or Building Information Model (BIM), drawn to scale, showing the items described in this Section and coordinated with all building trades.

B. Qualification Data: For qualified Installer and professional engineer.

C. Design Data: Approved sprinkler piping working plans, prepared according to NFPA 13, including documented approval by the State, and including hydraulic calculations if applicable.

D. Welding certificates.

E. Field Test Reports:

1. Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."
2. Fire-hydrant flow test report.

F. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wet-pipe sprinkler systems and specialties to include in emergency, operation, and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

1.6 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.

a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by qualified professional engineer.

B. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in California Electrical Code, by a qualified testing agency, and marked for intended location and application.

B. Sprinkler system equipment, specialties, accessories, installation, and testing to comply with NFPA 13.

C. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

D. Delegated Design: Engage a qualified professional engineer to design wet-pipe sprinkler systems.

E. Obtain documented approval of sprinkler system design from the State.

F. Seismic Performance: Sprinkler piping to withstand the effects of earthquake motions determined according to NFPA 13 and ASCE/SEI 7.

2.2 STEEL PIPE AND FITTINGS

A. Schedule 40 Steel Pipe: Black-steel pipe, ASTM A53/A53M, Type E, Grade B. Pipe ends may be factory or field formed to match joining method.

B. Steel Pipe Nipples: Black steel, ASTM A733, made of ASTM A53/A53M, schedule 40, seamless steel pipe with threaded ends.

C. Steel Couplings: Uncoated steel, ASTM A865/A865M, threaded.

D. Malleable- or Ductile-Iron Threaded Fittings: ASTM A197 or ASTM A534, with threaded ends conforming to ASME B1.20.1.

E. Malleable- or Ductile-Iron Unions: UL 860.

F. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.

1. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick.

    a. Class 125 and Class 250, Cast-Iron, Flat-Face Flanges: Full-face gaskets.

2. Metal, Pipe-Flange Bolts and Nuts: Carbon steel unless otherwise indicated.

G. Steel Welding Fittings: ASTM A234/A234M and ASME B16.9.

1. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

H. Grooved-Joint, Steel-Pipe Appurtenances:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Tyco Fire & Building Products LP.
    b. Victaulic Company.
    c. Or equal.

2. Pressure Rating: 175-psig minimum.
3. Grooved-End Fittings for Steel Piping: ASTM A47/A47M, malleable-iron casting or ASTM A536, ductile-iron casting, with dimensions matching steel pipe.
4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213 rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.3 SPECIALTY VALVES

A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

B. Pressure Rating:

1. Standard-Pressure Piping Specialty Valves: 175-psig minimum.

C. Body Material: Ductile iron.

D. Size: Same as connected piping.

E. End Connections: Flanged or grooved.

F. Automatic (Ball Drip) Drain Valves:

1. Standard: UL 1726.
2. Pressure Rating: 175-psig minimum.
3. Type: Automatic draining, ball check.
4. Size: NPS 3/4.
5. End Connections: Threaded.

2.4 SPRINKLER PIPING SPECIALTIES

A. Branch Outlet Fittings:

1. Standard: UL 213.
2. Pressure Rating: 175-psig minimum.
3. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
4. Type: Mechanical-tee and -cross fittings.
5. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
6. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
7. Branch Outlets: Grooved, plain-end pipe, or threaded.

B. Flow Detection and Test Assemblies:

1. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
2. Pressure Rating: 175-psig minimum.
3. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.

4. Size: Same as connected piping.
5. Inlet and Outlet: Threaded or grooved.

C. Branch Line Testers:

1. Standard: UL 199.
2. Pressure Rating: 175 psig.
3. Body Material: Brass.
4. Size: Same as connected piping.
5. Inlet: Threaded.
6. Drain Outlet: Threaded and capped.
7. Branch Outlet: Threaded, for sprinkler.

D. Sprinkler Inspector's Test Fittings:

1. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
2. Pressure Rating: 175-psig minimum.
3. Body Material: Ductile-iron housing with sight glass.
4. Size: Same as connected piping.
5. Inlet and Outlet: Threaded.

E. Adjustable Drop Nipples:

1. Standard: UL 1474.
2. Pressure Rating: 250-psig minimum.
3. Body Material: Steel pipe with EPDM-rubber O-ring seals.
4. Size: Same as connected piping.
5. Length: Adjustable.
6. Inlet and Outlet: Threaded.

F. Flexible Sprinkler Hose Fittings:

1. Standard: UL 1474.
2. Type: Flexible hose for connection to sprinkler, and with bracket for connection to ceiling grid.
3. Pressure Rating: 175-psig minimum.
4. Size: Same as connected piping, for sprinkler.

2.5 SPRINKLERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Tyco Fire & Building Products LP.
2. Victaulic Company.
3. Viking Corporation.
4. Or equal.

B. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

C. Pressure Rating for Automatic Sprinklers: 175-psig minimum.

D. Automatic Sprinklers with Heat-Responsive Element:

1. Nonresidential Applications: UL 199.
2. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

E. Sprinkler Finishes: Chrome plated.

F. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

1. Ceiling Mounting: Chrome-plated steel, one piece, flat.
2. Sidewall Mounting: Chrome-plated steel, one piece, flat.

G. Sprinkler Guards:

1. Standard: UL 199.
2. Type: Wire cage with fastening device for attaching to sprinkler.

2.6 ALARM DEVICES

A. Alarm-device types to match piping and equipment connections.

B. Water-Motor-Operated Alarm:

1. Standard: UL 753.
2. Type: Mechanically operated, with Pelton wheel.
3. Alarm Gong: Cast aluminum with red-enamel factory finish.
4. Size: 8-1/2-inches diameter.
5. Components: Shaft length, bearings, and sleeve to suit wall construction.
6. Inlet: NPS 3/4.
7. Outlet: NPS 1 drain connection.

C. Electrically Operated Notification Appliances:

1. Electric Bell:

a. Standard: UL 464.
b. Type: Vibrating, metal alarm bell.
c. Size: 6-inch minimum diameter.
d. Voltage: 120 V ac, 60 Hz, 1 phase or 24 V dc.
e. Finish: Red-enamel or polyester powder-coat factory finish, suitable for outdoor use with approved and listed weatherproof backbox.

2. Strobe/Horn:

a. Standard: UL 464.
b. Tone: Selectable, steady, Temporal-3 (T-3) in accordance with ISO 8201 and ANSI/ASA S3.41, 2400 Hz, electromechanical, broadband.
c. Voltage: 120 V ac, 60 Hz.
d. Effective Intensity: 110 cd.
e. Finish: Red, suitable for outdoor use with approved and listed weatherproof backbox. White letters on housing identifying device as for "Fire."
f. Sign, Integrated: Mount between backbox and strobe/horn with text visible on both sides, above and below strobe/horn. Housing to be shaped to cover surface-mounted weatherproof backbox. Sign is to consist of white lettering on red plastic identifying it as a "Sprinkler Fire Alarm" and instructing viewers to call 911, police, or fire department.

D. Water-Flow Indicators:

1. Standard: UL 346.
2. Water-Flow Detector: Electrically supervised.
3. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
4. Type: Paddle operated.
5. Pressure Rating: 250 psig.
6. Design Installation: Horizontal or vertical.

E. Pressure Switches:

1. Standard: UL 346.
2. Type: Electrically supervised water-flow switch with retard feature.
3. Components: Single-pole, double-throw switch with normally closed contacts.
4. Design Operation: Rising pressure signals water flow.

F. Valve Supervisory Switches:

1. Standard: UL 346.
2. Type: Electrically supervised.
3. Components: Single-pole, double-throw switch with normally closed contacts.
4. Design: Signals that controlled valve is in other than fully open position.
5. Electrical Components, Devices, and Accessories: Listed and labeled as defined in California Electrical Code, by a qualified testing agency, and marked for intended location and application.

2.7 PRESSURE GAUGES

A. Standard: UL 393.

B. Dial Size: 3-1/2- to 4-1/2-inch diameter.

C. Pressure Gauge Range: 0 to 300 psig.

D. Label: Include "WATER" label on dial face.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPING

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated on approved working plans.

1. Deviations from approved working plans for piping require written approval from the State. File written approval with the State before deviating from approved working plans.
2. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

B. Piping Standard: Comply with NFPA 13 requirements for installation of sprinkler piping.

C. Install seismic restraints on piping. Comply with NFPA 13 requirements for seismic-restraint device materials and installation.

D. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Install unions adjacent to each valve in pipes NPS 2 and smaller.

F. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

G. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.

H. Install sprinkler piping with drains for complete system drainage.

I. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.

J. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain in accordance with local code and with visible air gap.

K. Install alarm devices in piping systems.

L. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.

M. Install pressure gauges on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gauges with connection not less than NPS 1/4 and with soft-metal seated globe valve, arranged for draining pipe between gauge and valve. Install gauges to permit removal, and install where they are not subject to freezing.

N. Fill sprinkler system piping with water.

O. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 21 05 00 "Common Work Results for Fire Suppression."

P. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 21 05 00 "Common Work Results for Fire Suppression."

Q. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 21 05 00 "Common Work Results for Fire Suppression."

3.2 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

G. 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.

H. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.

I. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

3.3 INSTALLATION OF VALVES AND SPECIALTIES

A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and the State.

B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Specialty Valves:

1. Install valves in vertical position for proper direction of flow, in main supply to system.
2. Install alarm valves with bypass check valve and retarding chamber drain-line connection.

3.4 INSTALLATION OF SPRINKLERS

A. Install sprinklers in suspended ceilings in center of narrow dimension of acoustical ceiling panels.

B. Install sprinklers into flexible, sprinkler hose fittings, and install hose into bracket on ceiling grid.

3.5 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

B. Identify system components, wiring, cabling, and terminals.

3.6 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
4. Energize circuits to electrical equipment and devices.
5. Coordinate with fire-alarm tests. Operate as required.
6. Verify that equipment hose threads are same as local fire department equipment.

B. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.7 CLEANING

A. Clean dirt and debris from sprinklers.

B. Only sprinklers with their original factory finish are acceptable. Remove and replace any sprinklers that are painted or have any other finish than their original factory finish.

3.8 DEMONSTRATION

A. Train the State's maintenance personnel to adjust, operate, and maintain specialty valves.

3.9 PIPING SCHEDULE

A. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.

B. Standard-Pressure, Wet-Pipe Sprinkler System, to Be One of the Following:

1. Schedule 40, black-steel pipe with threaded ends; malleable- or ductile-iron threaded fittings; and threaded joints.
2. For Piping Larger than NPS 2: Schedule 40, black-steel pipe with cut- or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

3.10 SPRINKLER SCHEDULE

A. Use sprinkler types in subparagraphs below for the following applications:

1. Rooms without Ceilings: Upright sprinklers.
2. Rooms with Suspended Ceilings: Recessed sprinklers.
3. Wall Mounting: Sidewall sprinklers.

B. Provide sprinkler types in subparagraphs below with finishes indicated.

1. Recessed Sprinklers: Bright chrome, with bright chrome escutcheon.

2. Upright, Pendent, and Sidewall Sprinklers: Chrome plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes.

END OF SECTION 21 13 13

SECTION 22 05 00

COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves without waterstop.
2. Sleeves with waterstop.
3. Sleeve-seal systems.
4. Grout.
5. Escutcheons.
6. Pressure gauges, dial type, lead free.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of product which are included in Part 1 of the plumbing equipment Sections.

a. Include construction details, material descriptions, and dimensions of individual components, and finishes.
b. Include operating characteristics and furnished accessories.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of gauge to include in operation and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.

B. Pipe and Pressure-Vessel Welding Qualifications: Qualify procedures and operators in accordance with 2021 ASME Boiler and Pressure Vessel Code, Section IX.

PART 2 - PRODUCTS

2.1 SLEEVES AND SLEEVE SEALS

A. Sleeves without Waterstop:

1. Cast-Iron Pipe Sleeves: Cast or fabricated of cast or ductile iron, with plain ends.
2. Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, hot-dip galvanized, with plain ends.

B. Sleeves with Waterstop:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

    a. Advance Products & Systems, LLC.
    b. CALPICO, Inc.
    c. GPT; a division of EnPRO Industries.
    d. Metraflex Company (The).
    e. Or equal.

2. Description: Manufactured PVC/HDPE, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall.

C. Sleeve-Seal Systems:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

    a. Advance Products & Systems, LLC.
    b. CALPICO, Inc.
    c. GPT; a division of EnPRO Industries.
    d. Metraflex Company (The).
    e. Proco Products, Inc.
    f. Or equal.

2. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

    a. Hydrostatic Seal: 20 psig minimum.
    b. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size.
    c. Connecting Bolts and Nuts: Carbon steel, with ASTM B633 coating of length required to secure pressure plates to sealing elements.

D. Grout:

1. Description: Nonshrink, for interior and exterior sealing openings in non-fire-rated walls or floors.
2. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
3. Design Mix: 5000 psi, 28-day compressive strength.
4. Packaging: Premixed and factory packaged.

2.2 ESCUTCHEONS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. BrassCraft Manufacturing Co.; a Masco company.
2. Dearborn Brass.
3. ProFlo; a Ferguson Enterprises, Inc. brand.
4. Or equal.

B. Escutcheon Types:

1. One-Piece, Steel Type: With polished, chrome-plated finish and setscrew fastener.
2. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped steel with polished, chrome-plated finish and spring-clip fasteners.

C. Floor Plates:

1. Split Floor Plates: Steel with concealed hinge.

2.3 METERS AND GAUGES FOR PLUMBING PIPING

A. Pressure Gauges, Dial Type, Lead Free - Direct Mounted, Metal Case:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

a. Ashcroft Inc.
b. WATTS; A Watts Water Technologies Company.
c. Weiss Instruments, Inc.
d. Or equal.

2. Source Limitations: Provide dial-type, lead-free, direct-mounted, metal-case pressure gauges from single manufacturer.
3. Standard: ASME B40.100.
4. Case: Liquid-filled type(s); cast aluminum or drawn steel; 6-inch nominal diameter.
5. Pressure-Element Assembly: Lead-free Bourdon tube.
6. Pressure Connection: Lead-free brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
7. Movement: Mechanical, with link to pressure element and connection to pointer.

8. Dial: Nonreflective aluminum with permanent scale markings graduated in psi.
9. Pointer: Dark-colored metal.
10. Window: Glass.
11. Ring: Metal.
12. Accuracy: Grade A, plus or minus 1 percent of middle half of span.

PART 3 - EXECUTION

3.1 INSTALLATION OF EXPANSION JOINTS, GENERAL

A. Install expansion joints of sizes matching sizes of piping in which they are installed.

3.2 INSTALLATION OF SLEEVES - GENERAL

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.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls.

1. 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.

2. Using grout, seal space outside of sleeves in floors/slabs/walls without sleeve-seal system. Select to maintain fire-resistance of floor/slab/wall.

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 that joint sealant manufacturer's literature indicates is appropriate for size, depth, and location of joint.

3.3 INSTALLATION OF SLEEVES WITH WATERSTOP

A. Install sleeve with waterstop as new walls and slabs are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange centered across width of concrete slab or wall.

C. Using grout, seal space around outside of sleeves. Select to maintain fire resistance of floor/slab/wall.

3.4 INSTALLATION OF SLEEVE-SEAL SYSTEMS

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building, and passing through exterior walls.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. 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.

3.5 INSTALLATION OF ESCUTCHEONS

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.

3.6 INSTALLATION OF METERS AND GAUGES

A. Install direct-mounted pressure gauges in piping tees with pressure gauge located on pipe at most readable position.

B. Install valve and snubber in piping for each pressure gauge for fluids.

C. Install pressure gauges in the following locations:

1. Building water service riser for the building.

3.7 ADJUSTING

A. Adjust faces of meters and gauges to proper angle for best visibility.

3.8 SLEEVES APPLICATION

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above and below Grade:

a. Sleeves with waterstops.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

2. Concrete Slabs-on-Grade:

a. Sleeves with waterstops.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Interior Walls and Partitions:

a. Sleeves without waterstops.

3.9 ESCUTCHEONS APPLICATION

A. Escutcheons for New Piping and Relocated Existing Piping:

1. Piping with Fitting or Sleeve Protruding from Wall: One piece, deep pattern.
2. Bare Piping at Wall and Floor Penetrations in Finished Spaces:

a. One piece, steel with polished, chrome-plated finish.

3. Bare Piping at Ceiling Penetrations in Finished Spaces:

a. One piece, steel with polished, chrome-plated finish.

4. Bare Piping in Unfinished Service Spaces:

a. One piece, steel with polished, chrome-plated finish.

5. Bare Piping in Equipment Rooms:

a. One piece, steel with polished, chrome-plated finish.

B. Install floor plates for piping penetrations of equipment room floors.

C. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping and Relocated Existing Piping: One piece, floor plate.

3.10 PRESSURE-GAUGE APPLICATION

A. Pressure gauges at discharge of each water service into building are to be the following:

1. Liquid filled, direct mounted, metal case.

3.11 PRESSURE-GAUGE SCALE-RANGE APPLICATION

A. Scale Range for Domestic Water Piping:

1. 0 to 100 psi.

END OF SECTION 22 05 00

SECTION 22 05 23.12

BALL VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Brass ball valves.
2. Bronze ball valves.
3. Stainless steel ball valves.

1.2 DEFINITIONS

A. CWP: Cold working pressure.

B. RPTFE: Reinforced polytetrafluoroethylene.

C. WOG: Water, oil, gas.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Brass ball valves.
2. Bronze ball valves.
3. Stainless steel ball valves.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, and soldered ends.
3. Set ball valves open to minimize exposure of functional surfaces.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain each type of valve from single source from single manufacturer.

2.2 BRASS BALL VALVES

A. Brass Ball Valves, Two Piece with Full Port and Stainless Steel Trim, Threaded or Soldered Ends:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

    a. Apollo Valves; a part of Aalberts Integrated Piping Systems.
    b. Hammond Valve.
    c. WATTS; A Watts Water Technologies Company.
    d. Or equal.

2. Standard: MSS SP-110; MSS SP-145.
3. CWP Rating: 600 psig.
4. Body Design: Two piece.
5. Body Material: Forged brass.
6. Ends: Threaded or soldered.
7. Seats: PTFE.
8. Stem: Stainless steel.
9. Ball: Stainless steel, vented.
10. Port: Full.

2.3 BRONZE BALL VALVES

A. Bronze Ball Valves, Two Piece with Full Port and Stainless Steel Trim, Threaded or Soldered Ends:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

    a. Apollo Valves; a part of Aalberts Integrated Piping Systems.
    b. Hammond Valve.
    c. WATTS; A Watts Water Technologies Company.
    d. Or equal.

2. Standard: MSS SP-110; MSS SP-145.
3. CWP Rating: 600 psig.

4. Body Design: Two piece.
5. Body Material: Bronze.
6. Ends: Threaded or soldered.
7. Seats: PTFE.
8. Stem: Stainless steel.
9. Ball: Stainless steel, vented.
10. Port: Full.

2.4 STAINLESS STEEL BALL VALVES

A. Stainless Steel Ball Valves, Two Piece with Full Port, Threaded or Flanged Ends:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

    a. Apollo Valves; a part of Aalberts Integrated Piping Systems.
    b. WATTS; A Watts Water Technologies Company.
    c. Or equal.

2. Standard: MSS SP-110; MSS SP-145.
3. CWP Rating: 200 psig.
4. Body Design: Split body.
5. Body Material: Type 316 stainless steel.
6. Ends: Threaded or flanged.
7. Seats: PTFE.
8. Stem: Type 316 stainless steel.
9. Ball: Type 316 stainless steel.
10. Port: Full.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves. Remove defective valves from site.

3.2 INSTALLATION OF VALVES

A. Install valves with unions or flanges at each piece of equipment arranged to allow space for service, maintenance, and equipment removal without system shutdown.

B. Provide support to piping adjacent to valves such that no force is imposed upon valves.

C. Locate valves for easy access.

D. For valves in horizontal piping, install valves with stem at or above center of pipe.

E. Install valves in position to allow full valve actuation movement.

F. Adhere to manufacturer's written installation instructions. When soldering or brazing valves, do not heat valves above maximum permitted temperature. Do not use solder with melting point temperature above valve manufacturer's recommended maximum.

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 exhibiting leakage.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valves with specified CWP ratings are unavailable, provide the same types of valves with higher CWP ratings.

3.5 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Brass ball valves, two piece with full port, and stainless steel trim. Provide with solder-joint ends.
2. Bronze ball valves, two piece with full port, and stainless steel trim. Provide with solder-joint ends.

B. Pipe NPS 2-1/2 and Larger:

1. Stainless steel ball valves with flanged ends.

END OF SECTION 22 05 23.12

SECTION 22 05 29

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Steel pipe hangers and supports.
2. Metal framing systems.
3. Thermal-hanger shield inserts.
4. Fastener systems.
5. Equipment supports.

1.2 DEFINITIONS

A. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.3 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Thermal-hanger shield inserts.

PART 2 - PRODUCTS

2.1 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. Grinnell Corp.
3. Tolco Inc.
4. Or equal.

C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.2 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig-minimum, compressive-strength insulation insert encased in sheet metal shield.

B. Manufacturers:

1. Carpenter & Paterson, Inc.
2. PHS Industries, Inc.
3. Pipe Shields, Inc.
4. Rilco Manufacturing Company, Inc.
5. or equal.

C. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass with vapor barrier.

D. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass.

E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

G. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.3 FASTENER SYSTEMS

A. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:

a. B-Line Systems, Inc.; a division of Cooper Industries.

b. Hilti, Inc.
c. ITW Ramset/Red Head.
d. Or equal.

2.4 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.5 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified 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 padded hangers for piping that is subject to scratching.

F. 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. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F pipes, NPS 4 to NPS 16, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24, requiring clamp flexibility and up to 4 inches of insulation.

4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
5. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30.

G. 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 20.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.

H. 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.

I. 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. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. 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:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

J. 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.

K. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.

L. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel 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 building structure.

B. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

C. 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.

D. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

E. 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.

F. Install lateral bracing with pipe hangers and supports to prevent swaying.

G. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

H. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9 (for building services piping) are not exceeded.

I. Insulated Piping: Comply with the following:

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 according to 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.
3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
4. 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.

5. Insert Material: Length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 METAL FABRICATIONS

A. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

B. Field Welding: Comply with AWS D1.1 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 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.

3.5 PAINTING

A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 22 05 29

SECTION 22 05 53

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe labels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 PIPE LABELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Actioncraft Products, Inc.; a division of Industrial Test Equipment Co., Inc.
2. Carlton Industries, LP.
3. Craftmark Pipe Markers.
4. Seton Identification Products.
5. Or equal.

B. General Requirements for Manufactured Pipe Labels: Preprinted, color coded, with lettering indicating service and showing flow direction in accordance with ASME A13.1.

C. Letter and Background Color: As indicated for specific application under Part 3.

D. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

E. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

F. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings. Also include:

1. Pipe size.
2. Flow-Direction Arrows: Include flow-direction arrows on distribution piping. Arrows may be either integral with label or applied separately.

3. Lettering Size: Size letters in accordance with ASME A13.1 for piping.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of incompatible primers, paints, and encapsulants, as well as dirt, oil, grease, release agents, and other substances that could impair bond of identification devices.

3.2 INSTALLATION, GENERAL REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

D. Locate identifying devices so that they are readily visible from the point of normal approach.

3.3 INSTALLATION OF PIPE LABELS

A. Install pipe labels showing service and flow direction with permanent adhesive on pipes.

B. Pipe-Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Within 3 ft. of each valve and control device.
2. At access doors, manholes, and similar access points that permit view of concealed piping.
3. Within 3 ft. of equipment items and other points of origination and termination.
4. Spaced at maximum intervals of 25 ft. along each run. Reduce intervals to 10 ft. in areas of congested piping and equipment.

C. Flow-Direction Flow Arrows: Use arrows, in compliance with ASME A13.1, to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

D. Pipe-Label Color Schedule:

1. Domestic Cold-Water Piping: White letters on an ANSI Z535.1 safety-green background.
2. Domestic Hot-Water Piping: White letters on an ANSI Z535.1 safety-green background.
3. Sanitary Waste and Storm Drainage Piping: White letters on a black background.

END OF SECTION 22 05 53

SECTION 22 07 19

PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating the following plumbing piping services:

1. Condensate drain piping.
2. Domestic cold-water piping.
3. Domestic hot-water piping.
4. Supplies and drains for handicap-accessible lavatories and sinks.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).

B. Sustainable Design Submittals:

1. Product Data: For adhesives, mastics, and sealants, indicating VOC content.
2. Laboratory Test Reports: For adhesives, mastics, and sealants, indicating compliance with requirements for low-emitting materials.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation system materials are to be delivered to the Project site in unopened containers. The packaging is to include name of the manufacturer, fabricator, type, description, and size.

1.4 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."

1.5 SCHEDULING

A. Schedule insulation application after pressure testing systems. Insulation application may begin on segments that have satisfactory test results.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products in accordance with ASTM E84, by a testing agency acceptable to the State. Factory label insulation, jacket materials, adhesive, mastic, tapes, and cement material containers with appropriate markings of applicable testing agency.

1. All Insulation Installed Indoors and Outdoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

2.2 INSULATION MATERIALS

A. Products do not contain asbestos, lead, mercury, or mercury compounds.

B. Products that come into contact with stainless steel have a leachable chloride content of less than 50 ppm when tested in accordance with ASTM C871.

C. Insulation materials for use on austenitic stainless steel are qualified as acceptable in accordance with ASTM C795.

D. Flexible Elastomeric: Closed-cell or expanded-rubber materials; suitable for maximum use temperature between minus 70 deg F and 220 deg F. Comply with ASTM C534/C534M, Type I for tubular materials.

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

a. Aeroflex USA.
b. Armacell LLC.
c. Or equal.

2.3 ADHESIVES

A. Materials are compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Flexible Elastomeric and Polyolefin Adhesive: Solvent-based adhesive.

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

a. Aeroflex USA.
b. Armacell LLC.
c. Foster Brand; H. B. Fuller Construction Products.
d. Or equal.

2. Adhesive: As recommended by flexible elastomeric and polyolefin manufacturer and with a VOC content of 80 g/L or less.
3. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
4. Flame-spread index is 25 or less and smoke-developed index is 50 or less as tested in accordance with ASTM E84.
5. Wet Flash Point: Below 0 deg F.
6. Service Temperature Range: 40 to 200 deg F.
7. Color: Black.

C. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

    a. Johns Manville; a Berkshire Hathaway company.
    b. Proto Corporation.
    c. The Dow Chemical Company.
    d. Or equal.

2. Adhesive: As recommended by Adhesive - PVC Jacket manufacturer and with a VOC content of 50 g/L or less.
3. Verify adhesives and sealants comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.4 MASTICS AND COATINGS

A. Materials are compatible with insulation materials, jackets, and substrates.

1. Mastics: As recommended by insulation manufacturer and with a VOC content of 50 g/L or less.
2. Verify mastics comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Vapor-Retarder Mastic, Water Based: Suitable for indoor use on below-ambient services.

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

    a. Childers Products, Division of ITW; CP-35.
    b. Foster Products Corporation, H. B. Fuller Company; 30-90.
    c. Marathon Industries, Inc.; 590.
    d. Or equal.

2. Water-Vapor Permeance: Comply with ASTM E96/E96M or ASTM F1249.
3. Service Temperature Range: 0 to plus 180 deg F.
4. Color: White.

2.5 LAGGING ADHESIVES

A. Adhesives comply with MIL-A-3316C, Class I, Grade A, and are compatible with insulation materials, jackets, and substrates.

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

    a. Childers Brand; H. B. Fuller Construction Products.
    b. Foster Brand; H. B. Fuller Construction Products.
    c. Or equal.

2. Verify adhesive is as recommended by insulation manufacturer and has a VOC content of 50 g/L or less.
3. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
4. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
5. Service Temperature Range: 20 to plus 180 deg F.
6. Color: White.

2.6 SEALANTS

A. Materials are as recommended by the insulation manufacturer and are compatible with insulation materials, jackets, and substrates.

B. Joint Sealants:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

    a. Childers Brand; H. B. Fuller Construction Products.
    b. Foster Brand; H. B. Fuller Construction Products.
    c. Owens Corning.
    d. Or equal.

2. Permanently flexible, elastomeric sealant.
3. Service Temperature Range: Minus 58 to plus 176 deg F.
4. Color: White or gray.
5. Verify sealant has a VOC content of 420 g/L or less.
6. Verify sealant complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of

Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. ASJ Flashing Sealants and PVC Jacket Flashing Sealants:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

   a. Childers Brand; H. B. Fuller Construction Products.
   b. Foster Brand; H. B. Fuller Construction Products.
   c. Or equal.

2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: White.
5. Verify sealant has a VOC content of 420 g/L or less.
6. Verify sealant complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.7 FIELD-APPLIED JACKETS

A. Field-applied jackets comply with ASTM C1136, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

   a. Johns Manville; a Berkshire Hathaway company.
   b. Proto Corporation.
   c. Or equal.

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White.
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

   a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

2.8 TAPES

A. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

    a. 3M Industrial Adhesives and Tapes Division.
    b. Ideal Tape Co., Inc., an American Biltrite Company.
    c. Or equal.

2. Width: 2 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and of thicknesses required for each item of pipe system, as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, compress, or otherwise damage insulation or jacket.

D. Install insulation with longitudinal seams at top and bottom (12 o'clock and 6 o'clock positions) 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 storage, application, and finishing. Replace insulation materials that get wet during storage or in the installation process before being properly covered and sealed in accordance with Contract Documents.

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 attached to structure with vapor-barrier mastic.
3. Install insert materials and 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. Cut insulation in a manner to avoid compressing insulation.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. 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 in similar fashion to butt joints.

3.4 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.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. 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.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

3.5 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 below.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, Mechanical Couplings, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, mechanical couplings, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation made from same material and density as that of adjacent pipe insulation. Each piece is 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 of same material and thickness as that 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 of same material, density, and thickness as that used for adjacent pipe. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less

than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers, so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges, mechanical couplings, and unions, using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Stencil or label the outside insulation jacket of each union with the word "union" matching size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation conforms to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as that of adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union at least 2 times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.

2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as that of pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install sections of pipe insulation and miter if required in accordance with manufacturer's written instructions.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install prefabricated valve covers manufactured of same material as that of pipe insulation when available.
2. When prefabricated valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties, and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 INSTALLATION OF FIELD-APPLIED JACKETS

A. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

3.8 FINISHES

A. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

3.9 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections: Inspect pipe, fittings, strainers, and valves, randomly selected by the State, by removing field-applied jacket and insulation in layers in reverse order

of their installation. Extent of inspection is limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

C. All insulation applications will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.10 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.

3.11 INDOOR PIPING INSULATION SCHEDULE

A. Condensate Drain:

1. NPS 1 and Smaller: Insulation is the following:

a. Flexible Elastomeric: 1 inch thick.

2. NPS 1-1/4 and Larger: Insulation is the following:

a. Flexible Elastomeric: 1 inch thick.

B. Domestic Cold Water:

1. NPS 1 and Smaller: Insulation is the following:

a. Flexible Elastomeric: 1 inch thick.

2. NPS 1-1/4 and Larger: Insulation is the following:

a. Flexible Elastomeric: 1 inch thick.

C. Domestic Hot Water:

1. NPS 1 and Smaller: Insulation is the following:

a. Flexible Elastomeric: 1 inch thick.

2. NPS 1-1/4 and Larger: Insulation is the following:

a. Flexible Elastomeric: 1 inch thick.

3.12 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. Piping, Concealed:

1. None.

C. Piping, Exposed:

1. PVC: 20 mils thick.

END OF SECTION 22 07 19

SECTION 220800

COMMISSIONING OF PLUMBING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. System specific commissioning for Domestic Hot Water Systems, Pumps and Controls

B. Related Sections:

1. 019113 – General Commissioning Requirements
2. Division 22

1.2 DESCRIPTION OF WORK – REFER TO 019113

1.3 SUBMITTALS – REFER TO 019113

PART 2 - PRODUCTS – REFER TO 019113

PART 3 - EXECUTION

3.1 COMMISSIONING PROCESS AND PROCEDURES – REFER TO 019113

3.2 SYSTEM READINESS DOCUMENTATION

A. The Contractor shall review and complete all System Readiness documentation in accordance with Section 019113 and this Section 220800.

B. The Contractor shall submit the System Readiness Manual prior to Functional Performance Testing. When it is necessary to begin functional testing on a system (or systems) before the readiness of other systems can be documented, it may be acceptable to provide preliminary submittals of the System Readiness Manual for which checklists and forms have been completed only for the system(s) that are ready for testing. The System Readiness Manual shall include the following:

1. System Readiness Checklists – provided by the Commissioning Provider (CxP) to be compiled and completed by the Contractor.
2. Start-up and testing procedures and data forms for all equipment and systems within the commissioning scope of work, in accordance with the Contract Documents.
3. Testing, Adjusting and Balancing (TAB) reports.
4. Piping test reports.
5. Water treatment reports.

C. A sample System Readiness Checklist is provided at the end of this section. The final checklists will be drafted by the CxP after equipment submittals have been accepted.

D. A separate checklist shall be submitted and subsequently completed for each system and item of equipment within the commissioning scope of work as specified in Section 019113.

E. The System Readiness Checklists do not represent all of the Contract Document requirements for the associated equipment. Completion of the items on the checklists does not release the contractor from requirements specified elsewhere.

F. The Contractor's Commissioning Coordinator (CxC) shall verify completion of all documentation, sign the System Readiness Checklists and return the System Readiness Manual to the CxP as an indication of final completion of all installation criteria as specified in the Contract Documents.

3.3 FUNCTIONAL PERFORMANCE TESTING

A. The Functional Performance Test (FPT) procedures shall be developed, performed and demonstrated in accordance with Section 019113 and this Section 220800.

B. At a minimum, the contractors and equipment suppliers listed in the FPT Minimum Participants Table in this Section 220800 shall be required to participate in developing, performing and demonstrating the indicated FPTs.

C. A sample FPT is provided at the end of this section. The final FPTs will be drafted by the CxP after equipment submittals have been accepted.

D. The CxC shall, with the CxP's input, coordinate the subcontractors in developing, performing and demonstrating the FPTs.

E. Functional testing shall consist of the following:

1. Component testing:
   a. Component testing applies to all control input and output (I/O) devices, including those provided by the equipment suppliers and/or those provided with the Building Management System (BMS), as applicable. Examples include: sensor assemblies, detectors, relays and switches, valves, dampers, actuators, thermometers and gauges.
   b. Component testing consists of demonstrating field I/O calibration and operation, which may include sampled verification that:
      i. Sensor readings are reasonable and accurate within the design range as specified.
      ii. Actuators operate smoothly with their control signal over the full range of operation.
      iii. All components, values and alarms are correctly mapped to and reported at the operator interface.
2. System Testing – Operational Verification:
   a. After functional testing of the system components has been successfully completed, each aspect of the sequence of operation and control system function shall be functionally tested, including those provided by the equipment suppliers and those provided with the BMS. Each control loop shall be tested to verify stable control with the specified and appropriate responses.
3. System Testing – Integrated System Verification:
   a. After operational testing has successfully demonstrated that each system functions in accordance with the Contract Documents, functional testing shall occur to verify that the interaction between the systems is as required. Each interactive function shall be functionally tested, including those provided by the equipment suppliers and those provided with the BMS.
4. System Testing – Real Time Performance Analysis (Trend Logging):
   a. After operational testing has been successfully completed, real time performance testing shall be performed. The trend data collection shall be set up prior to demonstration of the FPTs and may be used during testing for

troubleshooting and to identify corrective actions. Trend data shall be logged for the intervals and periods specified in the FPT procedures. Unless otherwise specified in the FPTs, test periods shall include occupied, unoccupied and weekend schedules.

b. Analysis of real-time performance data shall demonstrate that that the systems operate in accordance with the acceptance criteria specified in the FPT procedures. The Contractor shall verify that such data demonstrates acceptable results before submitting for CxP review. If acceptable results are not demonstrated, re-testing, trouble-shooting and corrective actions shall be performed to provide resolution. Provisions for retesting, including back-charging as specified in Section 019113, shall apply to trend analysis.

3.4 SEASONAL FUNCTIONAL PERFORMANCE TESTING

A. Seasonal functional testing does not apply to the commissioned systems within this Division.

3.5 FPT DEMONSTRATION SAMPLING

A. When a functional test applies to many similar components or systems that are not a part of a life-safety system, the contractor may demonstrate a sampling of the FPTs to the CxP in accordance with Section 019113.

B. Demonstration Sampling will apply only for the components and systems as listed in the FPT Demonstration Sampling Table below.

SYSTEM	SAMPLE SIZE
Domestic Hot Water	20%

3.6 FPT MINIMUM PARTICIPANTS TABLE

A. At a minimum, the parties listed in the table below will participate in the functional testing process and in demonstrating successful FPTs to the CxP.

PARTICIPANTS
Commissioning Coordinator
Plumbing Contractor's Representative

3.7 SAMPLE SYSTEM READINESS CHECKLIST

A. The following sample checklist is included to provide the contractor with a representation of the level of rigor required.

Sample – Sample Project
Sample Building
SYSTEM READINESS CHECKLIST
P01 – Domestic Hot Water System

System Readiness

This completed form and the associated installation, start-up, and testing documentation comprise the System Readiness Manual section for the Domestic Hot Water System. Signing below and submitting this section formally certifies that pre-commissioning work has been successfully completed for this system and that all applicable components, equipment, sub-systems and controls are ready for functional performance testing.

Signed: _____ **Date:** _____

Sample – General Contractor's Commissioning Coordinator

Requested Documentation

- ☐ Equipment start-up form
- ☐ Contractor installation inspection form
- ☐ Piping flush and hydrostatic test report
- ☐ Water treatment system report
- ☐ Completed fixture temperature forms provided by CxP
- ☐ Successful FPT as completed by contractor

Functional Performance Test Readiness

- ☐ Completed copies of all required documentation noted above are included as part of the System Readiness Manual, either directly hereafter or as part of a larger report elsewhere (e.g. TAB report).
- ☐ Installation is complete and all requirements are satisfied per Contract Documents & manufacturer requirements
- ☐ All equipment is connected under permanent power.
- ☐ Gas is provided to the equipment at appropriate pressure.
- ☐ All equipment controls are completely installed and configured, including programming, setpoints, schedules, graphics, loop tuning, etc (as applicable).
- ☐ All outstanding issues have been corrected and/or recorded for future tracking and do not affect the safety or reliability of functional testing.
- ☐ EQUIPMENT IS READY FOR FUNCTIONAL PERFORMANCE TESTING (FPTs) – Preliminary testing has been performed by contractor(s) with acceptable results achieved and verified through successful completion of the FPT procedures. Any deviations from the specified Sequence of Operation have been documented for record.

Applicable Equipment

Water Heater

- ☐ WH-1
- ☐ WH-2

Circulation Pump

- ☐ CP-1

Sample – Sample Project
Sample Building
SYSTEM READINESS CHECKLIST
P01 – Domestic Hot Water System

Expansion Tank

- ☐ ET-1

Mixing Valve

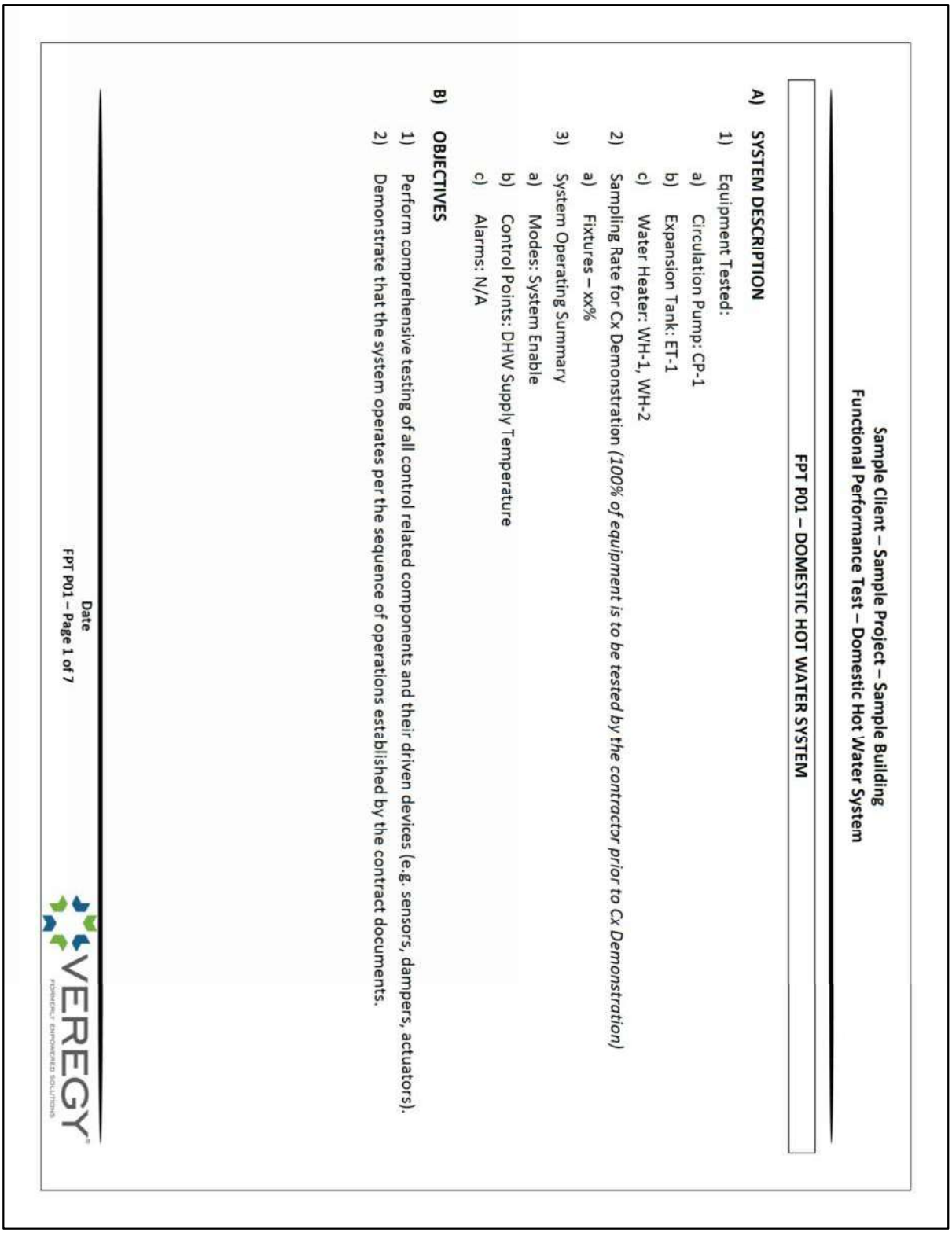
- ☐ MV

Date
P01 – Page 2 of 2

VEREGY
FORMERLY ENPOWERED SOLUTIONS

3.8 SAMPLE FUNCTIONAL PERFORMANCE TEST

A. The following functional test is included to provide the contractor with a representation of the level of rigor required.



Sample Client – Sample Project – Sample Building
Functional Performance Test – Domestic Hot Water System

FPT P01 – DOMESTIC HOT WATER SYSTEM

A) SYSTEM DESCRIPTION

1) Equipment Tested:
   a) Circulation Pump: CP-1
   b) Expansion Tank: ET-1
   c) Water Heater: WH-1, WH-2
2) Sampling Rate for Cx Demonstration *(100% of equipment is to be tested by the contractor prior to Cx Demonstration)*
   a) Fixtures – xx%
3) System Operating Summary
   a) Modes: System Enable
   b) Control Points: DHW Supply Temperature
   c) Alarms: N/A

B) OBJECTIVES

1) Perform comprehensive testing of all control related components and their driven devices (e.g. sensors, dampers, actuators).
2) Demonstrate that the system operates per the sequence of operations established by the contract documents.

Date
FPT P01 – Page 1 of 7

VEREGY
FORMERLY ENFORCED SOLUTIONS

C) SYSTEM SCHEMATIC & SEQUENCE OF OPERATION

[INSERT SOO HERE]

D) TESTING PREREQUISITES

1) Final installation of the system and all components is complete. System Readiness documentation is complete and submitted for Cx Review.
2) All controls related components and their driven devices (e.g. sensors, dampers, actuators, etc.) are installed, checked/calibrated, labeled, and operational.
3) All local controls system connections, programming and set-up are complete for the systems under test.
4) The systems and equipment under test, along with any supporting systems (e.g. those providing power, temperature controlled air/water, etc.), are operational and under automatic control.

E) REQUIRED TOOLS

1) The following test equipment is required for this testing procedure and shall be supplied by the contractor.
   a) Calibrated equipment must be capable of readings within the tolerance and accuracy specified per the contract documents, with calibration performed within the past year. Complete the following for each calibrated instrument below.

Test Instrument	Make	Model	Serial Number	Calibration Date
Temperature Meter				
Measuring Cup				
Stop Watch				

F) TESTING PARTICIPANTS

1) Record the following information from each individual present for the Cx Demonstration of the testing procedures.

Role	Name / Initials	Company	Email	Phone	Dates Present
Owner's Rep.					
Cx Coordinator					
Trade Contractor's Rep.					
Manufacturer's Rep.					
Controls Contractor's Rep.					
Cx Provider					

Sample Client – Sample Project – Sample Building
Functional Performance Test – Domestic Hot Water System

G) FIELD TESTING PROCEDURES

1) Water Heaters General Operation Test Date(s): _____ / Initials: _____
This test will validate that the system functionally operates to maintain the local setpoint.

a) Record the following as-found conditions:
(1) WH-1 Supply Temperature Setpoint: _____
(2) WH-2 Supply Temperature Setpoint: _____
(3) Verify all temperature setpoint is set as per the sequence of operations: ☐ P/ ☐ F/ _____

b) Override the local supply temperature setpoint for each water heater to a new value 5F greater than the current setpoint.
(1) Verify the water heaters both begin firing to generate warmer water: ☐ P/ ☐ F/ _____

c) Return the local supply temperature setpoints for each water heater to their original value.
(1) Verify the water heaters both cease firing: ☐ P/ ☐ F/ _____

d) Release all overrides and return the system to normal operation.

2) Circulation Pump Operation Test Date(s): _____ / Initials: _____
This test will validate that the pump operates per its local timeclock schedule.

a) Record the following as-found conditions:
(1) Pump schedule: _____

b) Temporarily override the timeclock schedule such that the pump is currently scheduled OFF.
(1) Verify the pump is disabled: ☐ P/ ☐ F/ _____

c) Temporarily override the timeclock schedule such that the pump is currently scheduled ON.
(1) Verify the pump is enabled: ☐ P/ ☐ F/ _____

d) Release all overrides and return the system to normal operation.

Sample Client – Sample Project – Sample Building
Functional Performance Test – Domestic Hot Water System

3) Fixture Temperature and Flow Test Date(s): _____ / Initials: _____

This test will validate that the flows and temperatures provided for a sampling of fixtures meets the established parameters and that any locally set thermostat mixing valves are properly set up.

a) Record the results of the test in the table provided below following this procedure and repeat for each fixture.

b) Place the measuring cup/container under the fixture, start the timer and activate the fixture sensor or turn on the fixture to receive hot water.

c) Allow the container to fill up, record the amount of time this took and the quantity of water collected. For timed fixtures, allow the water to run for the full length of the fixture cycle, typically 10 seconds.

d) Calculate and record the flow rate for the fixture (1 gallon = 16 cups).

e) Place the temperature probe in the water, wait for the reading to stabilize and record the temperature.

f) Indicate the Pass/Fail results based on the conditions outlined in the sequence of operations.

** - for spaces with multiple fixtures, fixtures numbers here are designated with #1 starting closest to the door

Floor	Room #	Space Type	Fixture Type	Fixture # **	DHW Flow			Temperature	Pass/Fail
					Volume	Time	Calculated Flow Rate		
									☐ P/ ☐ F/ _____
									☐ P/ ☐ F/ _____
									☐ P/ ☐ F/ _____
									☐ P/ ☐ F/ _____
									☐ P/ ☐ F/ _____
									☐ P/ ☐ F/ _____
									☐ P/ ☐ F/ _____
									☐ P/ ☐ F/ _____
									☐ P/ ☐ F/ _____

VEREGY
FORMERLY ENPOWERED SOLUTIONS

Sample Client – Sample Project – Sample Building
Functional Performance Test – Domestic Hot Water System

H) FIELD NOTES

OVERALL TEST STATUS

☐ COMPLETED ☐ DEFERRED ☐ DEFICIENT

☐ ISSUES NOTED?

NAME:_____ DATE: _____

Date

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VEREGY
FORMERLY EMPOWERED SOLUTIONS

END OF SECTION

SECTION 22 11 16

DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper tube and fittings - domestic water.
2. Piping joining materials - domestic water.
3. Transition fittings - domestic water.
4. Dielectric fittings - domestic water.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Copper tube and fittings - domestic water.
2. Piping joining materials - domestic water.
3. Transition fittings - domestic water.
4. Dielectric fittings - domestic water.

1.3 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report.

B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Potable-water piping and components are to comply with NSF 14, NSF 61, and NSF 372.

2.2 COPPER TUBE AND FITTINGS - DOMESTIC WATER

A. Drawn-Temper Copper Tube: ASTM B88, Type L.

B. Annealed-Temper Copper Tube: ASTM B88, Type L.

C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings. Do not use solder joints on pipe sizes greater than NPS 4.

D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, pressure fittings. Do not use solder joints on pipe sizes greater than NPS 4.

E. Cast 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. Do not use solder joints on pipe sizes greater than NPS 4.

F. Wrought Copper Unions: ASME B16.22. Do not use solder joints on pipe sizes greater than NPS 4.

2.3 PIPING JOINING MATERIALS - DOMESTIC WATER

A. Solder Filler Metals: ASTM B32, lead-free alloys.

B. Flux: ASTM B813, water flushable.

C. Brazing Filler Metals: AWS A5.8M/A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.4 DIELECTRIC FITTINGS - DOMESTIC WATER

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions - Domestic Water:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

    a. A.Y. McDonald Mfg. Co.
    b. WATTS; A Watts Water Technologies Company.
    c. Zurn Industries, LLC.
    d. Or equal.

2. Source Limitations: Obtain dielectric unions from single manufacturer.
3. Standard: ASSE 1079.
4. Pressure Rating: 125 psig minimum at 180 deg F.
5. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges - Domestic Water:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

    a. Capital Manufacturing Company.

b. WATTS; A Watts Water Technologies Company.
c. Zurn Industries, LLC.
d. Or equal.

2. Source Limitations: Obtain dielectric flanges from single manufacturer.
3. Standard: ASSE 1079.
4. Factory-fabricated, bolted, companion-flange assembly.
5. Pressure Rating: 125 psig minimum at 180 deg F.
6. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric Nipples - Domestic Water:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

a. Matco-Norca.
b. Sioux Chief Manufacturing Company, Inc.
c. Victaulic Company.
d. Or equal.

2. Source Limitations: Obtain dielectric nipples from single manufacturer.
3. Standard: IAPMO PS 66.
4. Electroplated steel nipple complying with ASTM F1545.
5. Pressure Rating and Temperature: 300 psig at 225 deg F.
6. End Connections: Male threaded or grooved.
7. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Under-building-slab, domestic water, building-service piping, NPS 3 and smaller is to be the following:

1. Annealed-temper copper tube, ASTM B88, Type L; wrought-copper, solder-joint fittings; and brazed joints.

D. Aboveground domestic water piping, NPS 2 and smaller is to be the following:

1. Drawn-temper copper tube, ASTM B88, Type L; cast- or wrought-copper, solder-joint fittings; and soldered joints.

E. Aboveground domestic water piping, NPS 2-1/2 to NPS 4 is to be the following:

1. Drawn-temper copper tube, ASTM B88, Type L; cast- or wrought-copper, solder-joint fittings; and soldered joints.

3.2 INSTALLATION OF PIPING

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 copper tubing under building slab in accordance with CDA's "Copper Tube Handbook."

C. Install underground copper tube in PE encasement in accordance with ASTM A674 or AWWA C105/A21.5.

D. Install valves in accordance with the following:

1. Section 22 05 23.12 "Ball Valves for Plumbing Piping."

E. Install domestic water piping level and plumb.

F. Rough-in domestic water piping for water-meter installation.

G. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

H. 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.

I. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

J. Install piping to permit valve servicing.

K. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

L. Install piping free of sags and bends.

M. Install fittings for changes in direction and branch connections.

N. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

O. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 22 05 00 "Common Work Results for Plumbing."

P. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 22 05 00 "Common Work Results for Plumbing."

Q. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 22 05 00 "Common Work Results for Plumbing."

3.3 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. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

D. Soldered Joints for Copper Tubing: Apply ASTM B813, water-flushable flux to end of tube. Join copper tube and fittings in accordance with ASTM B828 or CDA's "Copper Tube Handbook."

E. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts in accordance with ASME B31.9.

F. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.4 INSTALLATION OF TRANSITION FITTINGS

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:

1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.
2. Fittings for 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 INSTALLATION OF DIELECTRIC FITTINGS

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges or nipples.

3.6 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for hangers, supports, and anchor devices in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."

B. Install hangers for copper tube and pipe, with maximum horizontal spacing and minimum rod diameters, to comply with MSS SP-58, locally enforced codes, and the State requirements, whichever are most stringent.

C. Support horizontal piping within 12 inches of each fitting.

D. Support vertical runs of copper tube and pipe to comply with MSS SP-58, locally enforced codes, and the State requirements, whichever are most stringent.

3.7 PIPING CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
2. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.

3.8 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.9 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.

2. Use purging and disinfecting procedures prescribed by the State; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

    a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    b. Fill and isolate system in accordance with either of the following:

        1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
        2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

    c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
    d. Repeat procedures if biological examination shows contamination.

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.

3.10 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. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
4. Remove and clean strainer screens. Close drain valves and replace drain plugs.
5. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.11 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Piping Inspections:

    a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by the State.
    b. During installation, notify the State at least seven days before inspection must be made. Perform tests specified below in presence of the State:

        1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after installation and before setting fixtures.

2) Final Inspection: Arrange for the State to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.

c. Reinspection: If the State finds that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
d. Reports: Prepare inspection reports and have them signed by the State.

2. Piping Tests:

a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
c. 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.
d. 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 it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
f. 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.

END OF SECTION 22 11 16

SECTION 22 11 19

DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Outlet boxes.
2. Wall hydrants.
3. Water-hammer arresters.
4. Trap-seal primer device.
5. Water meters.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Test and inspection reports.

B. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Domestic water piping specialties intended to convey or dispense water for human consumption are to comply with the SDWA, requirements of the State, and NSF 61 and NSF 372, or to be certified in compliance with NSF 61 and NSF 372 by an American National Standards Institute (ANSI)-accredited third-party certification body that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

2.2 OUTLET BOXES

A. Icemaker Outlet Boxes, RCB-1:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

    a. LSP Products Group.
    b. Oatey Co.
    c. Sioux Chief Manufacturing Company, Inc.
    d. Or equal.

2. Mounting: Recessed.
3. Material and Finish: Plastic box and faceplate.
4. Faucet: Valved fitting complying with ASME A112.18.1. Include NPS 1/2 or smaller copper tube outlet.
5. Accessory: Water hammer arrestor.
6. Supply Shutoff Fitting: NPS 1/2 ball valve and NPS 1/2 copper, water tubing.

2.3 WALL HYDRANTS

A. Moderate-Climate Wall Hydrants, WH-1:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

    a. Jay R. Smith Mfg Co; a division of Morris Group International.
    b. WATTS; A Watts Water Technologies Company.
    c. Zurn Industries, LLC.
    d. Or equal.

2. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig.
4. Operation: Loose key.
5. Inlet: NPS 3/4.
6. Outlet, Concealed:

    a. With integral vacuum breaker or nonremovable hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052.
    b. Garden-hose thread complying with ASME B1.20.7.

7. Box: Deep, flush mounted with cover.
8. Box and Cover Finish: Stainless steel.
9. Nozzle and Wall-Plate Finish: Bronze.
10. Operating Key(s): One with each wall hydrant.

B. Moderate-Climate Wall Hydrants, WH-2:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

    a. Jay R. Smith Mfg Co; a division of Morris Group International.
    b. WATTS; A Watts Water Technologies Company.
    c. Zurn Industries, LLC.
    d. Or equal.

2. Standard: ASME A112.21.3M for exposed-outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig.
4. Operation: Loose key.
5. Inlet: NPS 3/4.
6. Outlet, Exposed:

    a. With integral vacuum breaker or nonremovable hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052.
    b. Garden-hose thread complying with ASME B1.20.7.

7. Nozzle and Wall-Plate Finish: Bronze.
8. Operating Key(s): One with each wall hydrant.

2.4 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters, WHA-1:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

    a. Jay R. Smith Mfg Co; a division of Morris Group International.
    b. Sioux Chief Manufacturing Company, Inc.
    c. Zurn Industries, LLC.
    d. Or equal.

2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Piston.
4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.5 TRAP-SEAL PRIMER DEVICE

A. Supply-Type, Trap-Seal Primer Device, TP-1:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

    a. Jay R. Smith Mfg Co; a division of Morris Group International.
    b. Sioux Chief Manufacturing Company, Inc.
    c. Zurn Industries, LLC.
    d. Or equal.

2. Standard: ASSE 1018.
3. Pressure Rating: 125 psig minimum.
4. Body: Bronze.
5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

2.6 WATER METERS

A. Ultrasonic-Type Water Meters:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

    a. Badger Meter, Inc.
    b. Master Meter, Inc.
    c. Onicon.
    d. Or equal.

2. Standard: Applicable portions of AWWA C700.
3. Pressure Rating: 150 psig working pressure.
4. Body Design: Ultrasonic open flow tube; totalization meter.
5. Registration: In gallons.

    a. Remote Registration System: Encoder type complying with AWWA C707; modified with signal-transmitting assembly, low-voltage connecting wiring, and analog output.

        1) System to be capable of transmitting data to building management system.

6. Case: Polycarbonate NEMA 4.
7. End Connections: Threaded or flanged.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPING SPECIALTIES

A. Outlet Boxes: Install boxes recessed in wall. Install 1-1/2-by-3-1/2-inch fire-retardant-treated-wood blocking, wall reinforcement between studs.

B. Water-Hammer Arresters: Install in water piping in accordance with PDI-WH 201.

C. Supply-Type, Trap-Seal Primer Device: Install 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 PIPING CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping specialties adjacent to equipment and machines, allow space for service and maintenance.

3.3 ELECTRICAL CONNECTIONS

A. Connect wiring in accordance with Division 26.

B. Ground equipment in accordance with Division 26.

3.4 CONTROL CONNECTIONS

A. Connect control wiring in accordance with Division 26.

3.5 IDENTIFICATION

A. Plastic Labels for Equipment: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:

1. Water meters.

END OF SECTION 22 11 19

SECTION 22 13 16

SANITARY WASTE AND VENT 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.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Hub-and-spigot, cast-iron soil pipe and fittings.
2. Hubless, cast-iron soil pipe and fittings.

1.3 QUALITY ASSURANCE

A. Provide materials bearing label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Piping materials to bear label, stamp, or other markings of specified testing agency.

B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings:

1. Marked with CISPI collective trademark.
2. Standard: ASTM A74.
3. Class: Service weight cast iron.

B. Gaskets: ASTM C564, rubber.

C. Caulking Materials: ASTM B29, pure lead and oakum or hemp fiber.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings:

1. Marked with CISPI collective trademark.
2. Standards: ASTM A888 or CISPI 301.

B. CISPI, Hubless-Piping Couplings:

1. Standards: ASTM C1277 and CISPI 310.
2. Description: Stainless steel corrugated shield with stainless steel bands and tightening devices; and ASTM C564, rubber sleeve with integral, center pipe stop.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPING

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.

B. Install piping as indicated unless deviations from layout are approved on coordination drawings.

C. Install piping in concealed locations.

1. Piping installed in equipment rooms, service areas, and where indicated may be exposed.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

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. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends.

1. 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.

2. 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.

    a. Straight tees, elbows, and crosses may be used on vent lines.

3. Do not change direction of flow more than 90 degrees.
4. Use proper size of standard increasers and reducers if pipes of different sizes are connected.

    a. Reducing size of waste piping in direction of flow is prohibited.

J. Lay buried building waste 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.

K. Install soil and waste and vent piping at the following minimum slopes unless otherwise indicated:

1. Building Sanitary Waste: Two 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 Sanitary Waste Piping: Two percent downward in direction of flow.
3. Vent Piping: One percent down toward vertical fixture vent or toward vent stack.

L. Install cast-iron soil piping in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

M. Plumbing Specialties:

1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary waste gravity-flow piping.

    a. Comply with requirements for cleanouts specified in Section 22 13 19 "Sanitary Waste Piping Specialties."

N. Do not enclose, cover, or put piping into operation until it is inspected and approved by the State.

O. Install sleeve seals for piping penetrations of concrete walls and slabs.

1. Comply with requirements for sleeve seals specified in Section 22 05 00 "Common Work Results for Plumbing."

3.2 JOINT CONSTRUCTION

A. Hub-and-Spigot, Cast-Iron Soil Piping Gasketed Joints: Join in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Hubless, Cast-Iron Soil Piping Coupled Joints: Join in accordance with CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

3.3 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for pipe hanger and support devices and installation specified in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment".

1. Install carbon-steel pipe hangers for horizontal piping.
2. Install carbon-steel pipe support clamps for vertical piping.
3. Vertical Piping: MSS Type 8 or Type 42 clamps.
4. 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.

5. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44 pipe rolls. Support pipe rolls on trapeze.
6. Base of Vertical Piping: MSS Type 52 spring hangers.

B. Install hangers for cast-iron soil piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS SP-58, locally enforced codes, and the State requirements, whichever are most stringent.

C. Support horizontal piping and tubing within 12 inches of each fitting and coupling.

D. Support vertical runs of cast-iron soil piping to comply with MSS SP-58, locally enforced codes, and the State requirements, whichever are most stringent.

3.4 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect waste and vent piping to the following:

1. Plumbing Fixtures: Connect waste piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by plumbing code.

3. Plumbing Specialties: Connect waste and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
5. Comply with requirements for cleanouts and drains specified in Section 22 13 19 "Sanitary Waste Piping Specialties."

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

3.5 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping.

B. Comply with requirements for identification specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.6 FIELD QUALITY CONTROL

A. During installation, notify the State at least 5 days before inspection must be made. Perform tests specified below in presence of the State.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by the State to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If the State finds that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by the State.

D. Test sanitary waste and vent piping in accordance with procedures of the State 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 waste and vent piping until it has been tested and approved.

    a. Expose work that was covered or concealed before it was tested.

3. Roughing-in Plumbing Test Procedure: Test waste and vent piping except outside leaders on completion of roughing-in.

a. Close openings in piping system and fill with water to point of overflow, but not less than 10 ft. head of water.
b. From 15 minutes before inspection starts to completion of inspection, water level must not drop.
c. Inspect joints for leaks.

4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight.

a. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1 inch wg.
b. Use U-tube or manometer inserted in trap of water closet to measure this pressure.
c. Air pressure must remain constant without introducing additional air throughout period of inspection.
d. Inspect plumbing fixture connections for gas and water leaks.

5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.7 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect sanitary waste and vent piping 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.

D. Repair damage to adjacent materials caused by waste and vent piping installation.

3.8 PIPING SCHEDULE

A. Aboveground, soil and waste piping NPS 4 and smaller are to be the following:

1. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.

B. Aboveground, vent piping NPS 4 is to be the following:

1. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.

C. Underground, soil, waste, and vent piping NPS 4 and smaller are to be the following:

1. Service cast-iron soil piping; gaskets; and gasketed joints.

END OF SECTION 22 13 16

SECTION 22 13 19

SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cleanouts.
2. Miscellaneous sanitary drainage piping specialties.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Cast-Iron Exposed Cleanouts, GCO-1:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

a. Jay R. Smith Mfg Co; a division of Morris Group International.
b. WATTS; A Watts Water Technologies Company.
c. Zurn Industries, LLC.
d. Or equal.

2. Standard: ASME A112.36.2M.
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, polished bronze plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Cast-Iron Exposed Floor Cleanouts, FCO-1:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

a. Jay R. Smith Mfg Co; a division of Morris Group International.
b. WATTS; A Watts Water Technologies Company.

c. Zurn Industries, LLC.
d. Or equal.

2. Standard: ASME A112.36.2M for adjustable housing cleanout.
3. Size: Same as connected branch.
4. Type: Adjustable housing.
5. Body or Ferrule: Cast iron.
6. Clamping Device: Required.
7. Outlet Connection: Inside calk.
8. Closure: Bronze plug with tapered threads.
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. Riser: ASTM A74, Service Class, cast-iron drainage pipe fitting and riser to cleanout.

C. Cast-Iron Wall Cleanouts, WCO-1:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

a. Jay R. Smith Mfg Co; a division of Morris Group International.
b. WATTS; A Watts Water Technologies Company.
c. Zurn Industries, LLC.
d. Or equal.

2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hubless, 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, stainless steel cover plate with screw.

2.2 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Floor-Drain, Trap-Seal Primer Fittings, FD-1:

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.

PART 3 - EXECUTION

3.1 INSTALLATION

A. 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.

B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

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 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.

3.2 PROTECTION

A. Protect drains during 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 14

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.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Hub-and-spigot, cast-iron soil pipe and fittings.
2. Hubless, cast-iron soil pipe and fittings.

1.3 QUALITY ASSURANCE

A. Provide materials bearing label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Piping materials to bear label, stamp, or other markings of specified testing agency.

B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings:

1. Marked with CISPI collective trademark and NSF certification mark.
2. Standard: ASTM A74.
3. Class: Service weight cast iron.

B. Gaskets: ASTM C564, rubber.

C. Caulking Materials: ASTM B29, pure lead and oakum or hemp fiber.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings:

1. Marked with CISPI collective trademark and NSF certification mark.
2. Standards: ASTM A888 and CISPI 301.

B. Standard, Hubless-Piping Couplings:

1. Marked with CISPI collective trademark and NSF certification mark.
2. Standards: ASTM C1277 and CISPI 310.
3. Description: Stainless steel corrugated shield with stainless steel bands and tightening devices; and ASTM C564, rubber sleeve with integral, center pipe stop.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPING

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.

B. Install piping as indicated unless deviations from layout are approved on coordination drawings.

C. Install piping in concealed locations.

1. Piping installed in equipment rooms, service areas, and where indicated may be exposed.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

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. 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.

J. 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.

K. Install piping at the following minimum slopes unless otherwise indicated.

1. Building Storm Drain: 1/4 inch per foot downward in direction of flow.
2. Horizontal Storm Drainage Piping: 1/4 inch per foot downward in direction of flow.

L. Install cast-iron soil piping in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Ch IV, "Installation of Cast Iron Soil Pipe and Fittings."

M. Plumbing Specialties:

1. Install cleanouts in storm drainage gravity-flow piping in accessible locations.

    a. Install cleanout fitting with closure plug inside the building in storm drainage force-main piping.
    b. Comply with requirements for cleanouts specified in Section 22 14 23 "Storm Drainage Piping Specialties."

N. Do not enclose, cover, or put piping into operation until it is inspected and approved by the State.

O. Install sleeves for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for sleeves specified in Section 22 05 00 "Common Work Results for Plumbing."

P. Install sleeve seals for piping penetrations of concrete walls and slabs.

1. Comply with requirements for sleeve seals specified in Section 22 05 00 "Common Work Results for Plumbing."

Q. Install escutcheons for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for escutcheons specified in Section 22 05 00 "Common Work Results for Plumbing."

3.2 JOINT CONSTRUCTION

A. Hub-and-Spigot, Cast-Iron Soil Piping Gasketed Joints: Join in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Hubless, Cast-Iron Soil Piping Coupled Joints: Join in accordance with 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 rigid sway bracing for pipe and fittings 4 inches and larger, upstream and downstream of all changes in direction 45 degrees and greater.

3.3 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for hangers, supports, and anchor devices specified in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."

1. Install carbon-steel pipe hangers for horizontal.
2. Install carbon-steel pipe support clamps for vertical piping.
3. Vertical Piping: MSS Type 8 or Type 42, clamps.
4. 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.

5. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
6. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Install hangers for cast-iron soil piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS SP-58, locally enforced codes, and the State requirements, whichever are most stringent.

C. Support horizontal piping and tubing within 12 inches of each fitting and coupling.

D. Support vertical cast-iron piping to comply with MSS SP-58, locally enforced codes, and the State 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.
2. Comply with requirements for cleanouts and drains specified in Section 22 14 23 "Storm Drainage Piping Specialties."

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

3.5 IDENTIFICATION

A. Identify exposed storm drainage piping.

B. Comply with requirements for identification specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.6 FIELD QUALITY CONTROL

A. During installation, notify the State at least 5 days before inspection must be made. Perform tests specified below in presence of the State.

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 the State to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If the State finds that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by the State.

D. Test storm drainage piping in accordance with procedures of the State 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 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.
c. From 15 minutes before inspection starts until completion of inspection, water level must not drop.
d. 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.

3.7 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

3.8 PROTECTION

A. Protect piping and drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

B. Place plugs in ends of uncompleted piping at end of day and when work stops.

C. Repair damage to adjacent materials caused by storm drainage piping installation.

3.9 PIPING SCHEDULE

A. Aboveground storm drainage piping NPS 6 and smaller is to be the following:

1. Hubless, cast-iron soil pipe and fittings; CISPI, hubless-piping couplings; and coupled joints.

B. Underground storm drainage piping NPS 6 and smaller shall be the following:

1. Service weight, cast-iron soil pipe and fittings; gaskets; and gasketed joints.

END OF SECTION 22 14 14

SECTION 22 14 23

STORM DRAINAGE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. General-purpose roof drains.
2. Cleanouts.

1.2 ACTION SUBMITTALS

A. Product Data:

1. General-purpose roof drains.
2. Cleanouts.

1.3 QUALITY ASSURANCE

A. Provide drainage piping specialties are to bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 GENERAL-PURPOSE ROOF DRAINS AND OVERFLOW DRAINS

A. Cast-Iron Roof Drains and Overflow Drains:

1. Cast-Iron, General-Purpose Roof Drains and Overflow Drains: RD-1.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Jay R. Smith Mfg Co; a division of Morris Group International.
2) Zurn Industries, LLC.
3) Or equal.

b. Standard: ASME A112.6.4.
c. Body Material: Cast iron.
d. Dimension of Body: Nominal 8-inch diameter.
e. Dome Material: Galvanized cast iron.
f. Combination flashing ring and gravel stop.

g. Outlet: Bottom.
h. Outlet Type: Speedi-Set no-hub.
i. Options:

1) Underdeck clamp.
2) Extension height for roof insulation.
3) Secondary flashing clamp.
4) Water Dam: 2 inches.

2.2 CLEANOUTS

A. Cast-Iron Cleanouts:

1. Cast-Iron Exposed Cleanouts:

a. Standard: ASME A112.36.2M.
b. Size: Same as connected branch.
c. Body Material: No-hub, cast-iron soil pipe test tee as required to match connected piping.

2. Cast-Iron Wall Cleanouts:

a. Standard: ASME A112.36.2M. Include wall access.
b. Size: Same as connected drainage piping.
c. Body: No-hub, cast-iron soil pipe test tee as required to match connected piping.
d. Closure Plug:

1) Material: Cast iron.
2) Head: Countersunk.
3) Drilled and threaded for cover attachment screw.
4) Size: Same as, or not more than, one size smaller than cleanout size.

e. Wall-Access Cover Plate: Round, stainless steel cover plate with screw.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install roof drains in accordance with roof membrane manufacturer's written installation instructions at low points of roof areas.

1. Install flashing collar or flange of roof drain to maintain integrity of waterproof membranes where penetrated.
2. 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 ft. for piping NPS 4 and smaller and 100 ft. for larger piping.
4. Locate cleanouts at base of each vertical storm piping conductor.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

E. Install wall cleanouts in vertical conductors. Install access door in wall if indicated.

3.2 CONNECTIONS

A. Comply with requirements for piping specified in Section 22 14 14 "Storm Drainage Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

3.3 CLEANING

A. Clean piping specialties during installation and remove dirt and debris as work progresses.

3.4 PROTECTION

A. Protect piping specialties during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic and construction work.

B. Place plugs in ends of uncompleted piping at end of each day and when work stops.

END OF SECTION 22 14 23

SECTION 22 33 00

ELECTRIC, DOMESTIC-WATER HEATERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Thermostat-control, electric, tankless, domestic-water heaters.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Thermostat-control, electric, tankless, domestic-water heaters.

B. Product Data Submittals: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

C. Shop Drawings:

1. Include diagrams for power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For electric, domestic-water heaters to include emergency, operation, and maintenance manuals.

1.4 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of electric, domestic-water heaters that fail in materials or workmanship within specified warranty period.

1. Warranty Periods: From date of Beneficial Occupancy.

a. Electric, Tankless, Domestic-Water Heaters: One year.

PART 2 - PRODUCTS

2.1 ELECTRIC, TANKLESS, DOMESTIC-WATER HEATERS

A. Flow-Control, Electric, Tankless, Domestic-Water Heaters:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

    a. Chronomite Laboratories, Inc; a division of Morris Group International.
    b. Eemax, Inc.; a Rheem brand.
    c. Or equal.

2. Source Limitations: Obtain domestic-water heaters from single source from single manufacturer.
3. Standard: UL 499 for electric, tankless, (domestic-water-heater) heating appliance.
4. Construction: Copper piping or tubing complying with NSF 61 and NSF 372 barrier materials for potable water, without storage capacity.

    a. Connections: ASME B1.20.1 pipe thread.
    b. Pressure Rating: 150 psig.
    c. Heating Element: Resistance heating system.
    d. Temperature Control: Flow-control fitting.
    e. Safety Control: High-temperature-limit cutoff device or system.
    f. Jacket: Aluminum or steel with enameled finish or plastic.

5. Support: Bracket for wall mounting.

PART 3 - EXECUTION

3.1 DOMESTIC-WATER HEATER INSTALLATION

A. Electric, Tankless, Domestic-Water Heater Mounting: Install electric, tankless, domestic-water heaters on wall bracket.

1. Maintain manufacturer's recommended clearances.
2. Arrange units so controls and devices that require servicing are accessible.
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 supported equipment.
5. Anchor domestic-water heaters to substrate.

3.2 PIPING CONNECTIONS

A. Comply with requirements for piping specified in Section 22 11 16 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to electric, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.4 DEMONSTRATION

A. Train the State's maintenance personnel to adjust, operate, and maintain tankless, electric, domestic-water heaters.

END OF SECTION 22 33 00

SECTION 22 42 13.13

COMMERCIAL WATER CLOSETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wall-mounted water closets.
2. Flushometer valves.
3. Toilet seats.
4. Supports.

1.2 DEFINITIONS

A. WaterSense Fixture: Water closet and/or flushometer valve/tank certified by the EPA to meet the WaterSense performance criteria.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for water closets.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: Include diagrams for power and control wiring.

C. Sustainable Design Submittals:

1. Plumbing Fixtures: Provide the following:

a. Manufacturer cut sheet indicating water consumption.
b. WaterSense certification for water closet flushometer valves.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flushometer valves and electronic sensors to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 WALL-MOUNTED WATER CLOSETS

A. Water Closets - Wall Mounted, Top Spud: WC-1.

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

a. American Standard.
b. Kohler Co.
c. Sloan Valve Company.
d. Or equal.

2. Source Limitations: Obtain water closets from single source from single manufacturer.
3. Bowl:

a. Material: Vitreous china.
b. Type: Siphon jet.
c. Style: Flushometer valve.
d. Mounting Height: ADA compliant.
e. Rim Contour: Elongated.
f. Water Consumption: 1.1 gal. per flush.
g. Spud Size and Location: NPS 1-1/2; top.
h. Color: White.

4. Flushometer Valve: WFV-1.
5. Toilet Seat: WTS-1.
6. Support: Water-closet carrier.

B. Water Closets - Wall Mounted, Top Spud: WC-2.

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

a. American Standard.
b. Kohler Co.
c. Sloan Valve Company.
d. Or equal.

2. Source Limitations: Obtain water closets from single source from single manufacturer.
3. Bowl:

a. Material: Vitreous china.
b. Type: Siphon jet.
c. Style: Flushometer valve.
d. Mounting Height: Standard.
e. Rim Contour: Elongated.

f. Water Consumption: 1.1 gal. per flush.
g. Spud Size and Location: NPS 1-1/2; top.
h. Color: White.

4. Flushometer Valve: WFV-1.
5. Toilet Seat: WTS-1.
6. Support: Water-closet carrier.

2.2 FLUSHOMETER VALVES

A. Flushometer Valves - Diaphragm, Solenoid Actuated: WFV-1.

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

a. Sloan Valve Company.
b. Zurn Industries, LLC.
c. Or equal.

2. Source Limitations: Obtain flushometer valve from single source from single manufacturer.
3. Minimum Pressure Rating: 125 psig.
4. Features: Include integral check stop and backflow-prevention device.
5. Material: Brass body with corrosion-resistant components.
6. Style: Exposed.
7. Exposed Flushometer-Valve Finish: Chrome-plated.
8. Actuator: Side mounted; listed and labeled as defined in California Electrical Code, by qualified testing agency, and marked for intended location and application.
9. Trip Mechanism: Hard-wired, control-voltage electronic sensor; listed and labeled as defined in California Electrical Code, by qualified testing agency, and marked for intended location and application.
10. Consumption: 1.1 gal. per flush.
11. Minimum Inlet: NPS 1.
12. Minimum Outlet: NPS 1-1/2.

2.3 TOILET SEATS

A. Toilet Seats: TS-1.

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

a. American Standard.
b. Bemis Manufacturing Company.
c. Or equal.

2. Source Limitations: Obtain toilet seat from single source from single manufacturer.

3. Material: Plastic.
4. Type: Commercial (Heavy duty).
5. Shape: Elongated rim, open front.
6. Hinge: Self-sustaining, check.
7. Hinge Material: Noncorroding metal.
8. Seat Cover: Not required.
9. Color: White.
10. Surface Treatment: Antimicrobial.

2.4 SUPPORTS

A. Water-Closet Carrier:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

a. Jay R. Smith Mfg Co; a division of Morris Group International.
b. WATTS; A Watts Water Technologies Company.
c. Zurn Industries, LLC.
d. Or equal.

2. Source Limitations: Obtain water-closet carrier from single source from single manufacturer.
3. Description: Waste-fitting assembly, as required to match drainage piping material and arrangement with faceplates, couplings gaskets, and feet; bolts and hardware matching fixture.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water-supply piping and sanitary drainage and vent piping systems to verify actual locations of piping connections before water-closet installation.

B. Examine walls and floors for suitable conditions where water closets will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Water-Closet Installation:

1. Install level and plumb.
2. Install accessible, wall-mounted water closets at mounting height in accordance with ICC A117.1.

B. Support Installation:

1. Use carrier supports with waste-fitting assembly and seal.
2. Install wall-mounted, back-outlet water-closet supports with waste-fitting assembly and waste-fitting seals; and affix to building substrate.
3. Measure support height installation from finished floor, not structural floor.

C. Flushometer-Valve Installation:

1. Install flushometer-valve, water-supply fitting on each supply to each water closet.
2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
3. Install lever-handle flushometer valves for accessible water closets with handle mounted on open side of water closet.
4. Install actuators in locations easily reachable for people with disabilities.

D. Install toilet seats on water closets.

E. Wall Flange and Escutcheon Installation:

1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations and within cabinets and millwork.
2. Install deep-pattern escutcheons if required to conceal protruding fittings.
3. Comply with escutcheon requirements specified in Section 22 05 00 "Common Work Results for Plumbing."

F. Joint Sealing:

1. Seal joints between water closets and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
2. Match sealant color to water-closet color.

3.3 PIPING CONNECTIONS

A. Connect water closets with water supplies and soil, waste, and vent piping. Use size fittings required to match water closets.

B. Comply with water piping requirements specified in Section 22 11 16 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 22 13 16 "Sanitary Waste and Vent Piping."

D. Where installing piping adjacent to water closets, allow space for service and maintenance.

3.4 ELECTRICAL CONNECTIONS

A. Connect wiring in accordance with Division 26.

B. Ground equipment in accordance with Division 26.

C. Install electrical devices furnished by manufacturer, but not factory mounted in accordance with California Electrical Code and NECA 1.

3.5 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Connect control wiring in accordance with Division 26.

3.6 ADJUSTING

A. Operate and adjust water closets and controls. Replace damaged and malfunctioning water closets, fittings, and controls.

B. Adjust water pressure at flushometer valves to produce proper flow.

3.7 CLEANING AND PROTECTION

A. Clean water closets and fittings with manufacturers' recommended cleaning methods and materials.

B. Do not allow use of water closets for temporary facilities unless approved in writing by the State.

END OF SECTION 22 42 13.13

SECTION 22 42 13.16

COMMERCIAL URINALS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wall-hung urinals.
2. Urinal flushometer valves.
3. Supports.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for urinals.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: Include diagrams for power, signal, and control wiring.

C. Sustainable Design Submittals:

1. Plumbing Fixtures: Provide the following:

a. Manufacturer cut sheet indicating water consumption.
b. WaterSense certification for urinal flushometer valves.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flushometer valves and electronic sensors to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 WALL-HUNG URINALS

A. Urinals - Wall Hung, Back Outlet, Washdown: Accessible, UR-1.

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

a. American Standard.
b. Kohler Co.
c. Sloan Valve Company.
d. Or equal.

2. Fixture:

a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5/CSA B45.15.
b. Material: Vitreous china.
c. Type: Washdown with extended shields.
d. Strainer or Trapway: Manufacturer's standard strainer with integral trap.
e. Water Consumption: 0.125 gpf.
f. Spud Size and Location: NPS 3/4, top.
g. Outlet Size and Location: NPS 2, back.
h. Color: White.

3. Flushometer Valve: UFV-1.
4. Waste Fitting:

a. Standard: ASME A112.18.2/CSA B125.2 for coupling.
b. Size: NPS 2.

5. Support: Type I urinal carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture. Include rectangular, steel uprights.
6. Urinal Mounting Height: Handicapped/elderly according to ICC A117.1.

2.2 URINAL FLUSHOMETER VALVES

A. Solenoid-Actuator, Diaphragm Flushometer Valves: UFV-1.

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

a. Sloan Valve Company.
b. Zurn Industries, LLC.
c. Or equal.

2. Standard: ASSE 1037/ASME 112.1037/CSA B125.37.
3. Minimum Pressure Rating: 125 psig.
4. Features: Include integral check stop and backflow-prevention device.
5. Material: Brass body with corrosion-resistant components.
6. Exposed Flushometer-Valve Finish: Chrome plated.
7. Style: Exposed.
8. Actuator: Solenoid complying with UL 1951; listed and labeled as defined in California Electrical Code, by a qualified testing agency; and marked for intended location and application.

9. Trip Mechanism: Hard-wired electronic sensor complying with UL 1951; listed and labeled as defined in California Electrical Code, by a qualified testing agency; and marked for intended location and application.
10. Consumption: 0.125 gal. per flush.
11. Minimum Inlet: NPS 3/4.
12. Minimum Outlet: NPS 3/4.

2.3 SUPPORTS

A. Type I Urinal Carrier:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

   a. Jay R. Smith Mfg Co; a division of Morris Group International.
   b. WATTS; A Watts Water Technologies Company.
   c. Zurn Industries, LLC, Z1222.
   d. Or equal.

2. Description: Plate type carrier system with floor-mounted carbon structural steel rectangular tubing uprights.
3. Standard: ASME A112.6.1M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before urinal installation.

B. Examine walls and floors for suitable conditions where urinals will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Urinal Installation:

1. Install urinals level and plumb according to rough-in drawings.
2. Install wall-hung, back-outlet urinals onto waste fitting seals and attached to supports.
3. Install accessible, wall-mounted urinals at mounting height for the handicapped/elderly, according to ICC A117.1.

B. Support Installation:

1. Install supports, affixed to building substrate, for wall-hung urinals.
2. Use off-floor carriers with waste fitting and seal for back-outlet urinals.

3. Use carriers without waste fitting for urinals with tubular waste piping.

C. Flushometer-Valve Installation:

1. Install flushometer-valve water-supply fitting on each supply to each urinal.
2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
3. Install lever-handle flushometer valves for accessible urinals with handle mounted on open side of compartment.

D. Wall Flange and Escutcheon Installation:

1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations.
2. Install deep-pattern escutcheons if required to conceal protruding fittings.
3. Comply with escutcheon requirements specified in Section 22 05 00 "Common Work Results for Plumbing."

E. Joint Sealing:

1. Seal joints between urinals and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
2. Match sealant color to urinal color.

3.3 PIPING CONNECTIONS

A. Connect urinals with water supplies and soil, waste, and vent piping. Use size fittings required to match urinals.

B. Comply with water piping requirements specified in Section 22 11 16 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 22 13 16 "Sanitary Waste and Vent Piping."

D. Where installing piping adjacent to urinals, allow space for service and maintenance.

3.4 ADJUSTING

A. Operate and adjust urinals and controls. Replace damaged and malfunctioning urinals, fittings, and controls.

B. Adjust water pressure at flushometer valves to produce proper flow.

3.5 CLEANING AND PROTECTION

A. Clean urinals and fittings with manufacturers' recommended cleaning methods and materials.

B. Do not allow use of urinals for temporary facilities unless approved in writing by the State.

END OF SECTION 22 42 13.16

SECTION 22 42 16.13

COMMERCIAL LAVATORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Enameled, cast-iron, counter-mounted lavatories.
2. Automatically operated lavatory faucets.
3. Supply fittings.
4. Waste fittings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for lavatories.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: Include diagrams for power, signal, and control wiring of automatic faucets.

C. Sustainable Design Submittals:

1. Plumbing Fixtures: Provide the following:

a. Manufacturer cut sheet indicating water consumption.
b. WaterSense certification for faucets.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted lavatories.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lavatories and faucets to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 ENAMELED, CAST-IRON, COUNTER-MOUNTED LAVATORIES

A. Lavatory - Enameled, Cast Iron, Undercounter Mounted, L-1:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

a. Kohler Co.
b. Or equal.

2. Fixture:

a. Standard: ASME A112.19.1/CSA B45.2.
b. Type: For undercounter mounting.
c. Nominal Size: Rectangular, 18-1/2 by 15-3/4 inches.
d. Faucet-Hole Punching: No holes.
e. Faucet-Hole Location: On countertop.
f. Drain: Grid with NPS 2 tailpiece and twist drain.
g. Color: White.
h. Mounting Materials: Sealant and undercounter mounting kit.

3. Faucet: LF-1.

2.2 AUTOMATICALLY OPERATED LAVATORY FAUCETS

A. Lavatory faucets intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act (SDWA), requirements of the State, and with NSF 61/NSF 372, or be certified in compliance with NSF 61/NSF 372 by an American National Standards Institute (ANSI) accredited third-party certification body, that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

B. Lavatory Faucets - Automatic Type: Hardwired Electronic Sensor Operated, Mixing, LF-1:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

a. American Standard.
b. Kohler Co.
c. Sloan Valve Company.
d. Or equal.

2. Standards: ASME A112.18.1/CSA B125.1 and UL 1951.
3. Electrical Components, Devices, and Accessories: Listed and labeled as defined in California Electrical Code, by a qualified testing agency, and marked for intended location and application.

4. General: Coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and fixture receptor.
5. Body Type: Single hole.
6. Body Material: Commercial, solid-brass, or die-cast housing with brazed copper and brass waterway.
7. Finish: Polished chrome plate.
8. Maximum Flow Rate: 0.35 gpm.
9. Mounting Type: Deck, concealed.
10. Spout: Rigid type.
11. Spout Outlet: Laminar flow.
12. Drain: Lavatory grid drain, not part of faucet.

2.3 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF 61 and NSF 372 for supply-fitting materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated-brass or stainless steel wall flange.

D. Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

E. Operation: Loose key.

F. Risers:

1. NPS 3/8.
2. Chrome-plated, rigid-copper-pipe and brass straight or offset tailpieces riser.

2.4 WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Grid type with NPS 1-1/4 offset and straight tailpiece.

C. Trap:

1. Size: NPS 1-1/2 by NPS 1-1/4.
2. Material:

a. Stainless steel, two-piece trap and swivel elbow with 0.012-inch thick stainless steel tube to wall, and stainless steel wall flange.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before lavatory installation.

B. Examine counters and walls for suitable conditions where lavatories will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install lavatories level and plumb in accordance with roughing-in drawings.

B. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 22 05 00 "Common Work Results for Plumbing."

C. Seal joints between lavatories, counters, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color.

D. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories. Comply with requirements in Section 22 07 19 "Plumbing Piping Insulation."

3.3 PIPING CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 22 11 16 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 22 13 16 "Sanitary Waste and Vent Piping."

3.4 ELECTRICAL CONNECTIONS

A. Connect wiring according to Division 26.

B. Ground equipment according to Division 26.

C. Install electrical devices furnished by manufacturer, but not factory mounted in accordance with California Electrical Code and NECA 1.

3.5 ADJUSTING

A. Operate and adjust lavatories and controls. Replace damaged and malfunctioning lavatories, fittings, and controls.

3.6 CLEANING AND PROTECTION

A. After completing installation of lavatories, inspect and repair damaged finishes.

B. Clean lavatories, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed lavatories and fittings.

D. Do not allow use of lavatories for temporary facilities unless approved in writing by the State.

END OF SECTION 22 42 16.13

SECTION 22 42 16.16

COMMERCIAL SINKS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Kitchen/utility sinks.
2. Mop sinks.
3. Sinks.
4. Manually operated sink faucets.
5. Supply fittings.
6. Grout.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for sinks.
2. Include rated capacities, operating characteristics**,** and furnished specialties and accessories.

B. Sustainable Design Submittals:

1. Plumbing Fixtures: Provide the following:

a. Manufacturer cut sheet indicating water consumption.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted sinks.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For sinks and faucets to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 KITCHEN/UTILITY SINKS

A. Kitchen/Utility Sinks - Stainless Steel, Counter Mounted: KS-1.

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

a. Elkay.
b. Just Manufacturing.
c. Or equal.

2. Source Limitations: Obtain sinks from single source from single manufacturer.
3. Fixture:

a. Standard: ASME A112.19.3/CSA B45.4.
b. Type: Stainless steel, self-rimming, sound-deadened unit with ledge back.
c. Number of Compartments: One.
d. Overall Dimensions: 22 by 19-1/2 inches.
e. Material: 18 gauge, Type 304 stainless steel.
f. Compartment:

1) Dimensions: 18 by 14 inches.
2) Drain: Basket strainer with NPS 2 tailpiece.
3) Drain Location: Rear center of compartment.
4) Depth: 5-1/2 inches, wheelchair accessible.

4. Faucet(s): SF-1.

a. Number Required: One.
b. Mounting: On ledge.

5. Supply Fittings:

a. Standard: ASME A112.18.1/CSA B125.1.
b. Supplies: Chrome-plated brass compression stop with inlet connection matching water-supply piping type and size.

1) Operation: Wheel handle.
2) Risers: NPS 1/2, chrome-plated, rigid-copper pipe.

6. Waste Fittings:

a. Standard: ASME A112.18.2/CSA B125.2.
b. Trap(s):

1) Size: NPS 2.
2) Material:

a) Stainless steel, two-piece trap and swivel elbow with 0.012-inch-thick stainless steel tube to wall; and stainless steel wall flange.

3) Material: Chrome-plated, 17-gauge brass tube.

7. Mounting: On counter with sealant.

2.2 MOP SINKS

A. Mop Sinks – Stainless Steel, Floor Mounted: MS-1.

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

   a. Elkay.
   b. Just Manufacturing.
   c. Or equal.

2. Fixture:

   a. Standard: ASME A112.19.3/CSA B45.4.
   b. Type: Stainless steel, corner mop sink, sides and bottom sound deadening pads.
   c. Shape: Five sided.
   d. Nominal Size: 33 by 33 inches.
   e. Height: 8 inches.
   f. Material: 14 gauge, Type 304 stainless steel.
   g. Splash Guard: On 2 sides, 22 inches high.
   h. Drain: Grid with NPS 2 outlet.

3. Mounting: On floor and flush to wall.
4. Faucet: MSF-1.

2.3 SINKS

A. Sinks - Stainless Steel, Counter Mounted: S-1.

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

   a. Elkay.
   b. Just Manufacturing.
   c. Or equal.

2. Source Limitations: Obtain sinks from single source from single manufacturer.
3. Fixture:

   a. Standard: ASME A112.19.3/CSA B45.4.

b. Type: Stainless steel, self-rimming, sound-deadened unit with ledge back.
c. Number of Compartments: One.
d. Overall Dimensions: 22 by 19-1/2 inches.
e. Material: 18 gauge, Type 304 stainless steel.
f. Compartment:

1) Dimensions: 18 by 44 inches.
2) Drain: Basket strainer with NPS 2 tailpiece.
3) Drain Location: Rear center of compartment.
4) Depth: 5-1/2 inches, wheelchair accessible.

4. Faucet(s): SF-1.

a. Number Required: One.
b. Mounting: On ledge.

5. Supply Fittings:

a. Standard: ASME A112.18.1/CSA B125.1.
b. Supplies: Chrome-plated brass compression stop with inlet connection matching water-supply piping type and size.

1) Operation: Wheel handle.
2) Risers: NPS 1/2, chrome-plated, rigid-copper pipe.

6. Waste Fittings:

a. Standard: ASME A112.18.2/CSA B125.2.
b. Trap(s):

1) Size: NPS 2.
2) Material:

a) Stainless steel, two-piece trap and swivel elbow with 0.012-inch-thick stainless steel tube to wall; and stainless steel wall flange.

3) Material: Chrome-plated, 17-gauge brass tube.

7. Mounting: On counter with sealant.

2.4 MANUALLY OPERATED SINK FAUCETS

A. Sink faucets intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act (SDWA), with requirements of the Authority Having Jurisdiction (AHJ), and with NSF 61 and NSF 372, or be certified in compliance with NSF 61 and NSF 372 by an ANSI-accredited third-party certification body, in that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

B. Commercial Sink Faucets - Manual Type: Two-handle mixing, SF-1.

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

   a. American Standard.
   b. Kohler Co.
   c. Zurn Industries, LLC.
   d. Or equal.

2. Source Limitations: Obtain sink faucets from single source from single manufacturer.
3. Standard: ASME A112.18.1/CSA B125.1.
4. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.
5. Body Type: Centerset.
6. Body Material: Commercial, solid brass, or die-cast housing with brazed copper and brass waterway.
7. Finish: Polished chrome plate.
8. Maximum Flow Rate: 1.5 gpm.
9. Mounting Type: Deck.
10. Valve Handle(s): Lever.
11. Spout Type: Swivel gooseneck.

C. Commercial Service Sink Faucets - Manual Type: MSF-1.

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

   a. American Standard.
   b. Kohler Co.
   c. Zurn Industries, LLC.
   d. Or equal.

2. Description: Wall/back mounted, brass body, with integral service stops, checks, spout with bucket/pail hook, 3/4-inch hose thread end, integral vacuum breaker, inlets 8 inches o.c., and two-handle mixing.
3. Faucet:

   a. Standards:

      1) CSA B64-01.
      2) ASSE 1001 (VB).

   b. Finish: Polished chrome plated.
   c. Handles: Lever.
   d. Cartridges: Ceramic.
   e. Brace: Adjustable top brace.

4. Vacuum Breaker: Required for hose outlet.

5. Spout Outlet: Laminar flow.

2.5 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF 61 and NSF 372 for supply-fitting materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Supply Piping: Chrome-plated brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated brass or stainless steel wall flange.

D. Supply Stops: Chrome-plated brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

E. Operation: Wheel handle.

F. Risers:

1. NPS 1/2.
2. Chrome-plated, rigid-copper pipe.

2.6 GROUT

A. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000 psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water-supply piping and sanitary drainage and vent piping systems to verify actual locations of piping connections before sink installation.

B. Examine walls, floors, and counters for suitable conditions where sinks will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install sinks level and plumb in accordance with rough-in drawings.

B. Set floor-mounted sinks in leveling bed of cement grout.

C. Install water-supply piping with stop on each supply to each sink faucet.

1. Install stops in locations where they can be easily reached for operation.

D. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 22 05 00 "Common Work Results for Plumbing."

E. Seal joints between sinks and counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color.

F. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible sinks. Comply with requirements in Section 22 07 19 "Plumbing Piping Insulation."

3.3 PIPING CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 22 11 16 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 22 13 16 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Operate and adjust sinks and controls. Replace damaged and malfunctioning sinks, fittings, and controls.

3.5 CLEANING AND PROTECTION

A. After completing installation of sinks, inspect and repair damaged finishes.

B. Clean sinks, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed sinks and fittings.

D. Do not allow use of sinks for temporary facilities unless approved in writing by the State.

END OF SECTION 22 42 16.16

SECTION 22 47 16

PRESSURE WATER COOLERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pressure water coolers.
2. Supports.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of pressure water cooler and bottle filling station.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Sustainable Design Submittals:

1. Plumbing Fixtures: Provide the following:

a. Manufacturer cut sheet indicating water consumption.

C. Shop Drawings:

1. Include diagrams for power wiring.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data: For pressure water coolers to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Standards:

1. Pressure water coolers and bottle filling stations intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act (SDWA), requirements of the State, and with NSF 61 or NSF 372, or be

certified in compliance with NSF 61 or NSF 372 by an ANSI-accredited third-party certification body, that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

2. Comply with ASHRAE 34 for water coolers. Provide HFC 134a (tetrafluoroethane) refrigerant unless otherwise indicated.
3. Comply with UL 399.
4. Comply with ASME A112.19.3/CSA B45.4.
5. Electrical Components, Devices, and Accessories: Listed and labeled as defined in California Electrical Code, by a qualified testing agency, and marked for intended location and application.
6. Comply with NSF 42 and NSF 53 for water filters for water coolers and bottle filling stations.
7. Comply with ICC A117.1 for accessible water coolers and bottle filling stations.

2.2 PRESSURE WATER COOLERS

A. Pressure Water Coolers - Surface Wall-Mounted, Stainless Steel: EWC-1, EWC-2.

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

    a. Elkay.
    b. Oasis International.
    c. Or equal.

2. Source Limitations: Obtain surface wall-mounted, stainless steel, pressure water coolers from single source from single manufacturer.
3. Bubbler: One, with adjustable stream regulator, located on each cabinet deck.
4. Control: Push bar.
5. Bottle Filler: Sensor activation: Fill rate 1.1 gpm.
6. Drain: Grid with NPS 1-1/2 tailpiece.
7. Supply: NPS 3/8 with shutoff valve.
8. Waste Fitting: ASME A112.18.2/CSA B125.2, NPS 1-1/2 brass P-trap.
9. Filter: One or more water filters with capacity sized for unit peak flow rate.
10. Cooling System: Electric, with hermetically sealed compressor, cooling coil, air-cooled condensing unit, corrosion-resistant tubing, refrigerant, corrosion-resistant-metal storage tank, and adjustable thermostat.
11. Support: In-wall water-cooler carrier.
12. Water-Cooler Mounting Height: High/low - standard/accessible in accordance with ICC A117.1.
13. Capacities and Characteristics:

    a. Cooled Water: 8 gph.
    b. Ambient-Air Temperature: 90 deg F.
    c. Inlet-Water Temperature: 80 deg F.
    d. Cooled-Water Temperature: 50 deg F.

2.3 SUPPORTS

A. Water-Cooler Carrier:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

a. Elkay.
b. Jay R. Smith Mfg Co; a division of Morris Group International.
c. Or equal.

2. Standard: ASME A112.6.1M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before fixture installation.

B. Examine walls and floors for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install fixtures level and plumb according to roughing-in drawings. For fixtures indicated for children, install at height required by the State.

B. Install off-the-floor carrier supports, affixed to building substrate, for wall-mounted fixtures.

C. Install water-supply piping with shutoff valve on supply to each fixture to be connected to domestic-water distribution piping. Use ball valve. Install valves in locations where they can be easily reached for operation. Valves are specified in Section 22 05 23.12 "Ball Valves for Plumbing Piping".

D. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.

E. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 22 05 00 "Common Work Results for Plumbing."

F. Seal joints between fixtures and walls using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color.

3.3 PIPING CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 22 11 16 "Domestic Water Piping."

C. Install ball shutoff valve on water supply to each fixture. Install valve upstream from filter for water cooler. Comply with valve requirements specified in Section 22 05 23.12 "Ball Valves for Plumbing Piping".

D. Comply with soil and waste piping requirements specified in Section 22 13 16 "Sanitary Waste and Vent Piping."

3.4 ELECTRICAL CONNECTIONS

A. Ground equipment according to Division 26.

B. Install electrical devices furnished by manufacturer, but not factory mounted, according to California Electrical Code and NECA 1.

3.5 ADJUSTING

A. Adjust fixture flow regulators for proper flow and stream height.

B. Adjust pressure water-cooler temperature settings.

3.6 CLEANING

A. After installing fixture, inspect unit. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

B. Clean fixtures, on completion of installation, according to manufacturer's written instructions.

C. Do not allow use of fixtures for temporary facilities unless approved in writing by the State.

END OF SECTION 22 47 16

SECTION 23 05 13

COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with requirements in this Section except when stricter requirements are specified in HVAC equipment schedules or Sections.

B. Comply with NEMA MG 1 unless otherwise indicated.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Premium Efficiency.

C. Service Factor: 1.15.

D. Multispeed Motors: Separate winding for each speed.

E. Rotor: Random-wound, squirrel cage.

F. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

G. Temperature Rise: Match insulation rating.

H. Insulation: Class F.

I. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split phase.
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 23 05 13

SECTION 23 05 29

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal framing systems.
2. Fastener systems.
3. Equipment supports.
4. Outdoor equipment stands.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

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. Pipe stands.
4. Equipment supports.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.4 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, Section IX.

PART 2 - PRODUCTS

2.1 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

a. B-Line Systems, Inc.; a division of Cooper Industries.
b. ERICO/Michigan Hanger Co.; ERISTRUT Div..
c. Unistrut Corp.; Tyco International, Ltd.
d. Or equal.

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 factory-fabricated components for field assembly.
4. Channels: Continuous slotted carbon-steel channel with inturned lips.
5. Channel Width: Selected for applicable load criteria.
6. Channel Nuts: Formed or stamped nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
7. Hanger Rods: Continuous-thread rod, nuts, and washer made of galvanized steel.
8. Metallic Coating: Hot-dip galvanized.

2.2 FASTENER SYSTEMS

A. Mechanical-Expansion Anchors: Insert-wedge-type anchors for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

a. B-Line Systems, Inc.; a division of Cooper Industries.
b. Hilti, Inc.
c. ITW Ramset/Red Head.
d. Or equal.

2. Indoor Applications: Zinc-plated or galvanized steel.
3. Outdoor Applications: Stainless steel.

2.3 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.4 OUTDOOR EQUIPMENT STANDS

1. Description: Individual foot supports with elevated adjustable channel cross bars and clamps/fasteners/bolts for ground or roof supported outdoor equipment components, without roof membrane penetration, in a pre-fabricated system that can be modularly-assembled on site.
2. Foot Material: Rubber or polypropylene.
3. Rails Material: Hot dip galvanized carbon steel.
4. Wind/Sliding Load Resistance: Up to 100 mph minimum.

2.5 MATERIALS

A. Carbon Steel: ASTM A1011/A1011M.

B. Structural Steel: ASTM A36/A36M, carbon-steel plates, shapes, and bars; galvanized.

C. Stainless Steel: ASTM A240/A240M.

D. Threaded Rods: Continuously threaded. Zinc-plated or galvanized steel for indoor applications and stainless steel for outdoor applications. Mating nuts and washers of similar materials as rods.

E. Grout: ASTM C1107/C1107M, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 APPLICATION

A. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

3.2 HANGER AND SUPPORT INSTALLATION

A. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled strut systems.

B. 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.

C. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

D. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor or roof.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 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.

3.5 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.

3.6 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. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780/A780M.

3.7 HANGER AND SUPPORT SCHEDULE

A. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

B. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

C. Use carbon-steel metal framing systems and attachments for general service applications.

D. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

E. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 23 05 29

SECTION 23 05 53

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment labels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

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.

D. Valve-numbering scheme.

E. Valve Schedules: Provide for each piping system. Include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

   a. Carlton Industries, LP.
   b. Craftmark Pipe Markers.
   c. Seton Identification Products; a Brady Corporation company.
   d. Or equal.

2. Material and Thickness: Stainless steel, 0.025-inch minimum thickness, with predrilled or stamped holes for attachment hardware.
3. Letter and Background Color: As indicated for specific application under Part 3.
4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

5. Minimum Letter Size: 3/8 inch.
6. Fasteners: Stainless steel rivets or self-tapping screws.
7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

   a. Carlton Industries, LP.
   b. Craftmark Pipe Markers.
   c. Seton Identification Products; a Brady Corporation company.
   d. Or equal.

2. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16-inch thick.
3. Letter and Background Color: As indicated for specific application under Part 3.
4. Minimum Label Size: Length and width vary for required label content, but not less than 2 by 1/2 inch.
5. Minimum Letter Size: 1/4 inch.
6. Fasteners: Stainless steel rivets or self-tapping screws.
7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of incompatible primers, paints, and encapsulants, as well as dirt, oil, grease, release agents, and other substances that could impair bond of identification devices.

3.2 INSTALLATION, GENERAL REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

D. Locate identifying devices so that they are readily visible from the point of normal approach.

3.3 INSTALLATION OF EQUIPMENT LABELS

A. Permanently fasten labels on each item of mechanical equipment.

B. Sign and Label Colors:

1. White letters on an ANSI Z535.1 safety-blue background.

C. Locate equipment labels where accessible and visible.

3.4 EQUIPMENT LABEL SCHEDULE

A. Exhaust Fan (EF-1, EF-2, EF-3, EF-4):

1. Metal label.

B. Outdoor Condensing Unit (CU-1):

1. Metal label.

C. Packaged Rooftop Unit (RTU-1, RTU-2, RTU-3, RTU-4, RTU-5, RTU-6, RTU-7):

1. Metal label.

D. Wall-Mounted Fan Coil (FC-1):

1. Plastic label.

END OF SECTION 23 05 53

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Balancing Air Systems:

a. Constant-volume air systems.

2. Testing, Adjusting, and Balancing Equipment:

1.2 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. TAB: Testing, adjusting, and balancing.

C. TAB Specialist: An entity engaged to perform TAB Work.

1.3 ACTION SUBMITTALS

A. Sustainable Design Submittals:

1. Air-Balance Report: Documentation indicating that Work complies with ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
2. TAB Report: Documentation indicating that Work complies with ASHRAE/IES 90.1, Section 6.7.2.3 - "System Balancing."

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures, as specified in "Preparation" Article.

C. Certified TAB reports.

D. Sample report forms.

E. Instrument calibration reports, to include the following:

1. Instrument type and make.
2. Serial number.
3. Application.
4. Dates of use.
5. Dates of calibration.

1.5 QUALITY ASSURANCE

A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC. TAB entity certified by NEBB or TABB will not be accepted.

1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC.
2. TAB Technician: Employee of the TAB contractor and who is certified by AABC as a TAB technician.

B. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

C. TAB Report Forms: Use standard TAB contractor's forms approved by the State.

D. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."

1. ASHRAE 62.1 Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

E. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.7.2.3 - "System Balancing."

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Section 23 31 13 "Metal Ducts" and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

J. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

K. Examine operating safety interlocks and controls on HVAC equipment.

L. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes the following:

1. Equipment and systems to be tested.
2. Strategies and step-by-step procedures for balancing the systems.
3. Instrumentation to be used.
4. Sample forms with specific identification for all equipment.

B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:

1. Airside:

a. Verify that leakage and pressure tests on air distribution systems have been satisfactorily completed.
b. Duct systems are complete with terminals installed.
c. Volume, smoke, and fire dampers are open and functional.
d. Clean filters are installed.
e. Fans are operating, free of vibration, and rotating in correct direction.
f. Variable-frequency controllers' startup is complete and safeties are verified.
g. Automatic temperature-control systems are operational.
h. Ceilings are installed.
i. Windows and doors are installed.
j. Suitable access to balancing devices and equipment is provided.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" and in this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 23 07 13 "Duct Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 TESTING, ADJUSTING, AND BALANCING OF HVAC EQUIPMENT

A. Test, adjust, and balance HVAC equipment, including, but not limited to, the following:

1. Exhaust fans.
2. Packaged rooftop heat-pump units.
3. Split-system heat pump.

3.5 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of air-handling-unit components.

K. Verify that air duct system is sealed as specified in Section 23 31 13 "Metal Ducts."

3.6 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

    a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
    b. Where duct conditions allow, measure airflow by main Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses close to the fan and prior to any outlets, to obtain total airflow.
    c. Where duct conditions are unsuitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.

2. Measure fan static pressures as follows to determine actual static pressure:

    a. Measure static pressure directly at the fan outlet or through the flexible connection.
    b. Measure static pressure directly at the fan inlet or through the flexible connection.

c. Measure static pressure across each component that makes up the air-handling system.
d. Report the cleanliness status of filters and the time static pressures are measured.

3. Obtain approval from the State for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in Division 23 Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
4. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust air inlets and outlets for each space to indicated airflows.

1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
2. Measure inlets and outlets airflow.
3. Adjust each inlet and outlet for specified airflow.
4. Re-measure each inlet and outlet after they have been adjusted.

C. Verify final system conditions.

1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to design if necessary.
2. Re-measure and confirm that total airflow is within design.
3. Re-measure all final fan operating data, speed, volts, amps, and static profile.
4. Mark all final settings.
5. Test system in economizer mode. Verify proper operation and adjust if necessary.
6. Measure and record all operating data.
7. Record final fan-performance data.

3.7 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Phase and hertz.
5. Efficiency rating.
6. Nameplate and measured voltage, each phase.
7. Nameplate and measured amperage, each phase.
8. Starter size and thermal-protection-element rating.
9. Service factor and frame size.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.8 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fan(s).

B. Measure and record entering- and leaving-air temperatures.

C. Measure and record entering and leaving refrigerant pressures.

D. Measure and record operating data of compressor(s), fan(s), and motors.

3.9 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each electric heating coil:

1. Nameplate data.
2. Airflow.
3. Entering- and leaving-air temperature at full load.
4. Air pressure drop.
5. Voltage and amperage input of each phase at full load.
6. Calculated kilowatt at full load.
7. Fuse or circuit-breaker rating for overload protection.

B. Measure, adjust, and record the following data for each refrigerant coil:

1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.
3. Airflow.
4. Air pressure drop.
5. Entering and leaving refrigerant pressure and temperatures.

3.10 TOLERANCES

A. Set HVAC system's air flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
2. Air Outlets and Inlets: Plus or minus 10 percent.

3.11 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.
3. Certify validity and accuracy of field data.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Fan curves.
2. Manufacturers' test data.
3. Field test reports prepared by system and equipment installers.
4. Other information relative to equipment performance; do not include Shop Drawings and Product Data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB specialist.
3. Project name.
4. Project location.
5. Contractor's name and address.
6. Report date.
7. Signature of TAB supervisor who certifies the report.
8. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
9. Summary of contents, including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

10. Nomenclature sheets for each item of equipment.
11. Notes to explain why certain final data in the body of reports vary from indicated values.
12. Test conditions for fans performance forms, including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings, including settings and percentage of maximum pitch diameter.
    f. Settings for pressure controller(s).
    g. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.

E. Air-Handling-Unit Test Reports: For air-handling units, include the following:

1. Unit Data:

    a. Unit identification.
    b. Location.
    c. Make and type.
    d. Model number and unit size.
    e. Manufacturer's serial number.
    f. Unit arrangement and class.
    g. Discharge arrangement.
    h. Number, type, and size of filters.

2. Motor Data:

    a. Motor make, and frame type and size.
    b. Horsepower and speed.
    c. Volts, phase, and hertz.
    d. Full-load amperage and service factor.

3. Test Data (Indicated and Actual Values):

    a. Total airflow rate in cfm.
    b. Total system static pressure in inches wg.
    c. Fan speed.
    d. Inlet and discharge static pressure in inches wg.
    e. For each filter bank, upstream and downstream static-pressure in inches wg.
    f. Cooling-coil static-pressure differential in inches wg.
    g. Heating-coil static-pressure differential in inches wg.
    h. List for each internal component with pressure-drop, static-pressure differential in inches wg.
    i. Outdoor airflow in cfm.
    j. Return airflow in cfm.
    k. Outdoor-air damper position.
    l. Return-air damper position.

F. Fan Test Reports: For supply, power exhaust (relief), and exhaust fans, include the following:

1. Fan Data:

    a. System identification.
    b. Location.
    c. Make and type.
    d. Model number and size.
    e. Manufacturer's serial number.
    f. Arrangement and class.

2. Motor Data:

    a. Motor make, and frame type and size.
    b. Horsepower and speed.

c. Volts, phase, and hertz.
d. Full-load amperage and service factor.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan speed.
d. Discharge static pressure in inches wg.
e. Suction static pressure in inches wg.

G. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

a. System fan and air-handling-unit number.
b. Location and zone.
c. Traverse air temperature in deg F.
d. Duct static pressure in inches wg.
e. Duct size in inches.
f. Duct area in sq. ft..
g. Indicated airflow rate in cfm.
h. Indicated velocity in fpm.
i. Actual airflow rate in cfm.
j. Actual average velocity in fpm.
k. Barometric pressure in psig.

H. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.12 VERIFICATION OF TAB REPORT

A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of the State.

B. The State shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to the lesser of either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.

C. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."

D. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the TAB shall be considered incomplete and shall be rejected.

E. If recheck measurements find the number of failed measurements noncompliant with requirements indicated, proceed as follows:

1. TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection. All changes shall be tracked to show changes made to previous report.
2. If the second final inspection also fails, the State may pursue others Contract options to complete TAB work.

F. Prepare test and inspection reports.

END OF SECTION 23 05 93

SECTION 23 07 13

DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating the following duct services:

1. Indoor, concealed supply and outdoor air.
2. Indoor, concealed return located in unconditioned space.

B. Related Requirements:

1. Section 23 31 13 "Metal Ducts" for duct liners.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).

B. Sustainable Design Submittals:

1. Product Data: For adhesives, coatings, and sealants, indicating VOC content.
2. Laboratory Test Reports: For adhesives, coatings, and sealants, indicating compliance with requirements for low-emitting materials.

1.3 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 23 05 29 "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.4 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products in accordance with ASTM E84, by a testing agency acceptable to the State. Factory label insulation, jacket materials, adhesive, mastic, tapes, and cement material containers with appropriate markings of applicable testing agency.

1. All Insulation Installed Indoors and Outdoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

2.2 INSULATION MATERIALS

A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials are to be applied.

B. Products do not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel have a leachable chloride content of less than 50 ppm when tested in accordance with ASTM C871.

D. Insulation materials for use on austenitic stainless steel are qualified as acceptable in accordance with ASTM C795.

E. Glass-Fiber Blanket: Glass fibers bonded with a thermosetting resin; suitable for maximum use temperature up to 450 deg F in accordance with ASTM C411. Comply with ASTM C553, Type II, and ASTM C1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

a. Certainteed; SAINT-GOBAIN.
b. Knauf Insulation.
c. Owens Corning.
d. Or equal.

2.3 ADHESIVES

A. Materials are compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Glass-Fiber and Mineral Wool Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Adhesive shall comply with the testing and product requirements of the California

Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.4 MASTICS AND COATINGS

A. Materials are compatible with insulation materials, jackets, and substrates.

1. VOC Content: 300 g/L or less.
2. Low-Emitting Materials: Mastic coatings shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Vapor-Retarder Mastic, Water Based, Interior Use: Suitable for indoor use on below ambient services.

1. Water-Vapor Permeance: Comply with ASTM C755, Section 7.2.2, Table 2, for insulation type and service conditions.
2. Service Temperature Range: Minus 20 to plus 180 deg F.
3. Color: White.

2.5 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Materials are compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: Aluminum.

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C1136, Type II.

2.7 TAPES

A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C1136.

1. Width: 4 inches.
2. Thickness: 6.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.8 SECUREMENTS

A. Bands:

1. Stainless Steel: ASTM A240/A240M, Type 316; 0.015 inch thick, 3/4 inch wide with wing seal or closed seal.

B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch diameter shank, length to suit depth of insulation indicated.

2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.

3. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

    a. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
    b. Spindle: Stainless steel, fully annealed, 0.106-inch diameter shank, length to suit depth of insulation indicated.
    c. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

4. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch thick, stainless steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

    a. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

C. Wire: 0.062-inch soft-annealed, stainless steel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct 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, compress, or otherwise damage insulation or jacket.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing. Replace insulation materials that get wet during storage or in the installation process before being properly covered and sealed in accordance with Contract Documents.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to

structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.

3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth, but not to the extent of creating wrinkles or areas of compression in the insulation.
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. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. 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.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

3.5 INSTALLATION OF GLASS-FIBER AND MINERAL-WOOL INSULATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

B. Comply with manufacturer's written installation instructions.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Impale insulation over pins and attach speed washers.
    f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect ductwork, randomly selected by the State, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection is limited to two location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.7 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply and outdoor air.
2. Indoor, concealed return located in unconditioned space.

3.8 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, round, supply-air duct insulation is the following:

1. Glass-Fiber Blanket: R-8.

B. Concealed, round, return-air duct insulation is the following:

1. Glass-Fiber Blanket: R-8.

C. Concealed, rectangular, supply-air duct insulation is the following:

1. Glass-Fiber Blanket: R-8.

D. Concealed, rectangular, transfer-air duct insulation is the following:

1. Duct Liner: See Section 23 31 13 “Metal Ducts”.

E. Concealed, rectangular, return-air duct insulation is the following:

1. Glass-Fiber Blanket: R-8.

3.9 ABOVEGROUND, OUTDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Exposed, rectangular, supply-air duct insulation is the following:

1. Duct Liner: See Section 23 31 13 “Metal Ducts”.

B. Exposed, rectangular, return-air duct insulation is the following:

1. Duct Liner: See Section 23 31 13 “Metal Ducts”.

END OF SECTION 23 07 13

SECTION 230800

COMMISSIONING OF MECHANICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. System specific commissioning for HVAC&R Systems
2. System specific commissioning for Building Management System

B. Related Sections:

1. 019113 – General Commissioning Requirements
2. Division 23

1.2 DESCRIPTION OF WORK – REFER TO 019113

1.3 SUBMITTALS – REFER TO 019113

PART 2 - PRODUCTS – REFER TO 019113

PART 3 - EXECUTION

3.1 COMMISSIONING PROCESS AND PROCEDURES – REFER TO 019113

3.2 SYSTEM READINESS DOCUMENTATION

A. The Contractor shall review and complete all System Readiness documentation in accordance with Section 019113 and this Section 230800.

B. The Contractor shall submit the System Readiness Manual prior to Functional Performance Testing. When it is necessary to begin functional testing on a system (or systems) before the readiness of other systems can be documented, it may be acceptable to provide preliminary submittals of the System Readiness Manual for which checklists and forms have been completed only for the system(s) that are ready for testing. The System Readiness Manual shall include the following:

1. System Readiness Checklists – provided by the Commissioning Provider (CxP) to be compiled and completed by the Contractor.
2. Start-up and testing procedures and data forms for all equipment and systems within the commissioning scope of work, in accordance with the Contract Documents.
3. Testing, Adjusting and Balancing (TAB) reports.
4. Piping test reports.
5. Water treatment reports.

C. A sample System Readiness Checklist is provided at the end of this section. The final checklists will be drafted by the CxP after equipment submittals have been accepted.

D. A separate checklist shall be submitted and subsequently completed for each system and item of equipment within the commissioning scope of work as specified in Section 019113.

E. The System Readiness Checklists do not represent all of the Contract Document requirements for the associated equipment. Completion of the items on the checklists does not release the contractor from requirements specified elsewhere.

F. The Contractor's Commissioning Coordinator (CxC) shall verify completion of all documentation, sign the System Readiness Checklists and return the System Readiness Manual to the CxP as an indication of final completion of all installation criteria as specified in the Contract Documents.

3.3 TAB REVIEW

A. TAB shall be provided by the Contractor in accordance with the contract documents. The TAB contractor shall support commissioning through:

1. Submission of the preliminary TAB data for CxP review.
2. Participation in the commissioning TAB Field Review where the TAB Contractor demonstrates specified results to the CxP after completion of final TAB, if required.

B. Equipment tested:

1. All HVAC systems & equipment

C. Demonstrations:

1. Determination of all final setpoints for pump and fan speed control per the Contract Documents and Associated Air Balance Council (AABC) standards.
2. Balance and adjustment of airflow rates per the Contract Documents and AABC standards.
   a. Demonstrate minimum outside air flow rates for all air handling equipment.
   b. Demonstrate all other measurements for equipment at the following sampling rates:
      i. Airside Mechanical Equipment – 20%
3. Balance and adjustment of hydronic system flow rates per the Contract Documents and AABC standards.

3.4 FUNCTIONAL PERFORMANCE TESTING

A. The Functional Performance Test (FPT) procedures shall be developed, performed and demonstrated in accordance with Section 019113 and this Section 230800.

B. At a minimum, the contractors and equipment suppliers listed in the FPT Minimum Participants Table in this Section 230800 shall be required to participate in developing, performing and demonstrating the indicated FPTs.

C. A sample FPT is provided at the end of this section. The final FPTs will be drafted by the CxP after equipment submittals have been accepted.

D. The CxC shall, with the CxP's input, coordinate the subcontractors in developing, performing and demonstrating the FPTs.

E. Functional testing shall consist of the following four phases:

1. Component testing:
   a. Component testing applies to all control input and output (I/O) devices, including those provided by the equipment suppliers and/or those provided with the Building Management System (BMS), as applicable. Examples include: sensor assemblies, detectors, relays and switches, valves, dampers, actuators, thermometers and gauges.

b. Component testing consists of demonstrating field I/O calibration and operation, which may include sampled verification that:
   i. Sensor readings are reasonable and accurate within the design range as specified.
   ii. Actuators operate smoothly with their control signal over the full range of operation.
   iii. All components, values and alarms are correctly mapped to and reported at the operator interface.

2. System Testing – Operational Verification:
   a. After functional testing of the system components has been successfully completed, each aspect of the sequence of operation and control system function shall be functionally tested, including those provided by the equipment suppliers and those provided with the BMS. Each control loop shall be tested to verify stable control with the specified and appropriate responses.
3. System Testing – Integrated System Verification:
   a. After operational testing has successfully demonstrated that each system functions in accordance with the Contract Documents, functional testing shall occur to verify that the interaction between the systems is as required. Each interactive function shall be functionally tested, including those provided by the equipment suppliers and those provided with the BMS.
4. System Testing – Real Time Performance Analysis (Trend Logging):
   a. After operational testing has been successfully completed, real time performance testing shall be performed. The trend data collection shall be set up prior to demonstration of the FPTs and may be used during testing for troubleshooting and to identify corrective actions. Trend data shall be logged for the intervals and periods specified in the FPT procedures. Unless otherwise specified in the FPTs, test periods shall include occupied, unoccupied and weekend schedules.
   b. Analysis of real-time performance data shall demonstrate that that the systems operate in accordance with the acceptance criteria specified in the FPT procedures. The Contractor shall verify that such data demonstrates acceptable results before submitting for CxP review. If acceptable results are not demonstrated, re-testing, trouble-shooting and corrective actions shall be performed to provide resolution. Provisions for retesting, including back-charging as specified in Section 019113, shall apply to trend analysis.
   c. In addition to the initial test period, data shall be logged during peak heating, peak cooling and/or transitional seasons as specified in the Seasonal Functional Performance Testing section below.

3.5 SEASONAL FUNCTIONAL PERFORMANCE TESTING

A. Perform seasonal testing in accordance with the Real Time Performance Analysis portion of System Testing as outlined earlier in this Section 230800.

B. Seasonal Testing as outlined in Section 019113 may apply for the components and systems as listed in the Seasonal FPT Table below. Note that W = winter/peak heating; SU = summer/peak cooling; SP = spring/transitional heating to cooling; F = fall/transitional cooling to heating.

SYSTEM	SEASON
N/A	

3.6 FPT DEMONSTRATION SAMPLING

A. When a functional test applies to many similar components or systems that are not a part of a life-safety system, the contractor may demonstrate a sampling of the FPTs to the CxP in accordance with Section 019113.

B. Demonstration Sampling will apply only for the components and systems as listed in the FPT Demonstration Sampling Table below.

SYSTEM	SAMPLE SIZE
Terminal Units (VAV Boxes, Fan-Powered Boxes, etc)	20%

3.7 FPT MINIMUM PARTICIPANTS TABLE

A. At a minimum, the parties listed in the table below will participate in the functional testing process and in demonstrating successful FPTs to the CxP.

PARTICIPANTS
Commissioning Coordinator
Mechanical Contractor's Representative
Controls Contractor's Representative

3.8 SAMPLE SYSTEM READINESS CHECKLIST

A. The following sample checklist is included to provide the contractor with a representation of the level of rigor required.

Sample – Sample Project
Sample Building
SYSTEM READINESS CHECKLIST
M01 – Air Handling Unit AC-1

System Readiness

This completed form and the associated installation, start-up, and testing documentation comprise the System Readiness Manual section for the Air Handling Unit AC-1. Signing below and submitting this section formally certifies that pre-commissioning work has been successfully completed for this system and that all applicable components, equipment, sub-systems and controls are ready for functional performance testing.

Signed: _____ **Date:** _____

Sample – General Contractor's Commissioning Coordinator

Requested Documentation

- ☐ Contractor installation inspection form
- ☐ Factory start-up form
- ☐ Sensor calibration documentation – BMS control sensors
- ☐ Sensor calibration documentation – Packaged system control sensors
- ☐ Point-to-point check-out forms (end device to graphics) – BMS control points
- ☐ Point-to-point check-out forms (end device to graphics) – BMS integration points
- ☐ Point-to-point check-out forms (end device to graphics) – AHU direct connection (fire alarm shutdown, etc.)
- ☐ Point-to-point check-out forms (end device to graphics) – Packaged system field installed equipment
- ☐ TAB report
- ☐ Successful FPT as completed by contractor

Functional Performance Test Readiness

- ☐ Completed copies of all required documentation noted above are included as part of the System Readiness Manual, either directly hereafter or as part of a larger report elsewhere (e.g. TAB report).
- ☐ Installation is complete and all requirements are satisfied per Contract Documents & manufacturer requirements
- ☐ All work is complete and the area and equipment are clean and clear of all debris.
- ☐ All equipment is connected under permanent power.
- ☐ All equipment controls are completely installed and configured, including programming, setpoints, schedules, graphics, loop tuning, etc (as applicable).
- ☐ Trend data collection has been established with points configured per the provided Functional Performance Test(s). Sample data has been reviewed and verified to be recording correctly at the specified intervals.
- ☐ All outstanding issues have been corrected and/or recorded for future tracking and do not affect the safety or reliability of functional testing.
- ☐ EQUIPMENT IS READY FOR FUNCTIONAL PERFORMANCE TESTING (FPTs) – Preliminary testing has been performed by contractor(s) with acceptable results achieved and verified through successful completion of the FPT procedures. Any deviations from the specified Sequence of Operation have been documented for record.

Date
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VEREGY
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Sample – Sample Project
Sample Building
SYSTEM READINESS CHECKLIST
M01 – Air Handling Unit AC-1

Applicable Equipment

Air Handling Unit

☐ AC-1

Date
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VEREGY
FORMERLY ENPOWERED SOLUTIONS

3.9 SAMPLE FUNCTIONAL PERFORMANCE TEST

A. The following functional test is included to provide the contractor with a representation of the level of rigor required.

Sample Client – Sample Project – Sample Building
Functional Performance Test – Air Handling Unit AC-1

FPT M01 – AIR HANDLING UNIT AC-1

A) SYSTEM DESCRIPTION

1) Equipment Tested:
   a) Air Handling Unit: AC-1
2) System Operating Summary
   a) Modes: Occupied, Unoccupied Heating, Unoccupied Cooling, Override, Warm-Up, Purge, Shelter-In-Place, Smoke Detection Shutdown
   b) Control Points: Supply Air Temperature, Mixed Air Temperature, Supply Duct Static Pressure, Building Static Pressure
   c) Alarms: AC Unit Failure, Fan Failure, Compressor Failure, Comm Failure, High/Low Mixed Air Temperature, High/Low Duct Static Pressure, High/Low Supply Air Temperature, High/Low Building Static Pressure, Economizer Failure, AC Unit Critical Fault, AC Unit General Fault, Economizer Cycling

B) OBJECTIVES

1) Perform comprehensive testing of all control related components and their driven devices (e.g. sensors, dampers, actuators).
2) Demonstrate that the system configuration, data points, and information per the contract documents are accurately represented by the Graphic User Interface(s).
3) Demonstrate that the system operates per the sequence of operations established by the contract documents.
4) Require that all controls points are commanded and/or viewed from the Graphic User Interface to confirm end-to-end communication between the local device/sensor and the graphics.

Date
FPT M01 – Page 1 of 19

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C) SYSTEM SCHEMATIC & SEQUENCE OF OPERATION

[INSERT SOO HERE]

D) TESTING PREREQUISITES

1) Final installation of the system and all components is complete. System Readiness documentation is complete and submitted for Cx Review.
2) All controls related components and their driven devices (e.g. sensors, dampers, actuators, etc.) are installed, checked/calibrated, labeled, and operational.
3) All controls system integrations and Graphic User Interfaces are complete for the systems under test.
4) All local controls system connections, programming and set-up are complete for the systems under test.
5) The systems and equipment under test, along with any supporting systems (e.g. those providing power, temperature controlled air/water, etc.), are operational and under automatic control.
6) The systems under test are able to be operated under loaded conditions and with energy exchange systems operational to reject any heating/cooling energy.

E) REQUIRED TOOLS

1) The following test equipment is required for this testing procedure and shall be supplied by the contractor.
   a) Calibrated equipment must be capable of readings within the tolerance and accuracy specified per the contract documents, with calibration performed within the past year. Complete the following for each calibrated instrument below.

Test Instrument	Make	Model	Serial Number	Calibration Date
Temperature Meter				
Differential Pressure Meter				
Squeeze Bulb & Pressure Gauge				

F) TESTING PARTICIPANTS

1) Record the following information from each individual present for the Cx Demonstration of the testing procedures.

Role	Name / Initials	Company	Email	Phone	Dates Present
Owner's Rep.					
Cx Coordinator					
Trade Contractor's Rep.					
Manufacturer's Rep.					
Controls Contractor's Rep.					
Cx Provider					

Sample Client – Sample Project – Sample Building
Functional Performance Test – Air Handling Unit AC-1

G) CONTROL DEVICE CHECKS – SENSORS (SEE SECTION 'C' FOR ANY REPRESENTATIVE SAMPLING RATES)

1) Sensor Calibration Verification Date(s): _____ / Initials: _____

This check will document the control system readings for each controlling sensor as compared to a calibrated handheld instrument to verify that the control system readings are within acceptable error limits.

Sensor ID	Controls Reading	Handheld Reading	Allowable Error	Observed Error	Error Acceptable?
Supply Air Temperature					☐ P/ ☐ F/ _____
Mixed Air Temperature					☐ P/ ☐ F/ _____
Supply Duct Static Pressure					☐ P/ ☐ F/ _____
Building Static Pressure					☐ P/ ☐ F/ _____

2) Device Operation Verification – Modulating Date(s): _____ / Initials: _____

This check will command the controlled device through a range of positions to verify that the physical positions observed match the commands without encountering any obstructions or failures.

Component ID	0% Command	50% Command	100% Command
Economizer Damper	☐ P/ ☐ F/ _____	☐ P/ ☐ F/ _____	☐ P/ ☐ F/ _____

H) SYSTEM GRAPHICS REVIEW

1) System Graphics Review — Dates(s): _____ / Initials: _____

This review will check whether the graphic user interface accurately represents the systems under test, with all applicable equipment and points identified.

a) Review the graphics to confirm the following:

(1) The schematic accurately represents the system, with all equipment and components included ☐ P/ ☐ F/ _____

(2) All points shown on the schematic are located correctly versus their physical location in the system ☐ P/ ☐ F/ _____

(3) All control device setpoints are shown, unless otherwise not required per the contract documents ☐ P/ ☐ F/ _____

(4) All integrated points from the local control system are correctly reported on the graphics, with the ability to write to any such indicated 'write' points confirmed: ☐ P/ ☐ F/ _____

Sample Client – Sample Project – Sample Building
Functional Performance Test – Air Handling Unit AC-1

I) FIELD TESTING PROCEDURES

1) Supply Air Temperature Setpoint Trim & Respond Reset Logic Test Dates(s): _____ / Initials: _____
This test will validate that the parameters used in the setpoint reset logic match the sequence of operations.

a) Review the Supply Air Temperature Setpoint Reset Logic to confirm the below sequence based on system requests.

(1) Verify the min setpoint is the design SAT (59.4F) ☐ P/ ☐ F/ _____

(2) Verify the max setpoint is 67F ☐ P/ ☐ F/ _____

(3) Verify the initial setpoint is 61F ☐ P/ ☐ F/ _____

(4) Verify the trim & respond logic begins after a 10 minute delay after the system is enabled ☐ P/ ☐ F/ _____

(5) Verify the trim & respond logic executes at each 10 minute time step ☐ P/ ☐ F/ _____

(6) Verify the setpoint is increased by the trim value +1F at every time step ☐ P/ ☐ F/ _____

(7) Verify the setpoint is decreased by the respond value -1F divided by 15% of the total VAV quantity (or 0.11), times the quantity of requests minus the quantity of ignored requests (2) at every time step, but by no more than the max respond value -2F ☐ P/ ☐ F/ _____

2) Duct Static Pressure Setpoint Trim & Respond Reset Logic Test Dates(s): _____ / Initials: _____
This test will validate that the parameters used in the setpoint reset logic match the sequence of operations.

a) Review the Duct Static Pressure Setpoint Reset Logic to confirm the below sequence based on system requests.

(1) Verify the min setpoint is 0.5" ☐ P/ ☐ F/ _____

(2) Verify the max setpoint is as determined by TAB, (____") ☐ P/ ☐ F/ _____

(3) Verify the initial setpoint is 0.75" ☐ P/ ☐ F/ _____

(4) Verify the trim & respond logic begins after a 10 minute delay after the system is enabled ☐ P/ ☐ F/ _____

(5) Verify the trim & respond logic executes at each 5 minute time step ☐ P/ ☐ F/ _____

(6) Verify the setpoint is decreased by the trim value -0.125" at every time step ☐ P/ ☐ F/ _____

(7) Verify the setpoint is increased by the respond value +0.125" divided by 15% of the total VAV quantity (or 0.01"), times the quantity of requests minus the quantity of ignored requests (2) at every time step, but by no more than the max respond value +0.25" ☐ P/ ☐ F/ _____

3) Unoccupied Heating & Cooling Test Dates(s): _____ / Initials: _____
This test will validate the operation of the unit in unoccupied heating and cooling modes , verifying the status of all components matches the sequence of operations.

a) Override the associated VAV schedules so that the AHU is OFF in unoccupied mode, and override the zone heating, cooling, warm-up and override request totals to zero.

(1) Verify the supply fans are stopped and statuses are OFF: ☐ P/ ☐ F/ _____

(2) Verify the power exhaust fans are stopped and statuses are OFF: ☐ P/ ☐ F/ _____

(3) Verify the Duct Static Control PID loop is disabled and set to zero: ☐ P/ ☐ F/ _____

(4) Verify the Building Static Control PID loop is disabled and set to zero: ☐ P/ ☐ F/ _____

(5) Verify the EA Dampers are commanded closed and status is closed: ☐ P/ ☐ F/ _____

(6) Verify the OA Dampers are commanded closed and statuses are closed: ☐ P/ ☐ F/ _____

(7) Verify the RA Damper is commanded open and status is open: ☐ P/ ☐ F/ _____

(8) Verify the DX cooling is disabled: ☐ P/ ☐ F/ _____

b) With the AC unit off, initiate unoccupied heating mode by overriding the zone heating request total to a value greater than 10% of total possible heating requests.

(1) Record the number of requests equivalent to 10%: _____

(2) Confirm the AHU is enabled and the supply fans start: ☐ P/ ☐ F/ _____

(3) Confirm the power exhaust fans start if necessary to maintain building static pressure at setpoint: ☐ P/ ☐ F/ _____

(4) Confirm the OA damper is commanded full closed and status is closed: ☐ P/ ☐ F/ _____

(5) Confirm the RA damper is commanded full open and status is open: ☐ P/ ☐ F/ _____

(6) Confirm the SAT setpoint is set to 78°F: ☐ P/ ☐ F/ _____

(7) Verify the DX cooling remains disabled: ☐ P/ ☐ F/ _____

c) Override the zone heating request total below 10% of total possible heating requests to disable unoccupied heating mode.
   (1) Confirm the AHU is disabled per the conditions at the beginning of this test for unoccupied mode: ☐ P/ ☐ F/ _____

d) With the AHU off, initiate unoccupied cooling mode by overriding the zone cooling request total to a value greater than 10% of total possible cooling requests.
   (1) Record the number of requests equivalent to 10%: _____
   (2) Confirm the AHU is enabled and the supply fans start: ☐ P/ ☐ F/ _____
   (3) Confirm the power exhaust fans start if necessary to maintain building static pressure at setpoint: ☐ P/ ☐ F/ _____
   (4) Confirm the SAT setpoint is set to 60°F: ☐ P/ ☐ F/ _____
   (5) Verify the DX cooling is enabled as required to meet the setpoint: ☐ P/ ☐ F/ _____
   (6) Confirm the economizer is enabled as required to meet the cooling setpoint: ☐ P/ ☐ F/ _____
   (7) Verify AHU is able to produce cold supply air (if necessary, override the SAT setpoint lower and/or disable the economizer: ☐ P/ ☐ F/ _____
      (a) Record the coldest supply air temperature provided: _____

e) Override the zone cooling request total below 10% of total possible cooling requests to disable unoccupied cooling mode.
   (1) Confirm the AHU is disabled per the conditions at the beginning of this test for unoccupied mode: ☐ P/ ☐ F/ _____

f) Retain the override on the AC unit to remain off if proceeding to the next test. Otherwise release all overrides and return the system to normal operation.

4) Unoccupied Override Test Dates(s): _____ / Initials: _____
This test will validate that the unit is enabled in Unoccupied Override mode via input from the zone level devices.

a) Select any one VAV at random and note its ID _____
b) Temporarily override the override countdown timer for the VAV to a shorter duration (e.g. 3 minutes).
c) With the AHU off, press the local override button on the VAV's thermostat.
   (1) Confirm the AHU is enabled with the countdown timer shown on the workstation: ☐ P/ ☐ F/ _____
   (2) Verify all other VAVs remain in unoccupied mode: ☐ P/ ☐ F/ _____
d) Wait for the override countdown timer to expire.

Sample Client – Sample Project – Sample Building
Functional Performance Test – Air Handling Unit AC-1

(1) Confirm the AHU is disabled per the conditions at the beginning of the 'Unoccupied Heating & Cooling Test' above for unoccupied mode: ☐ P/ ☐ F/ _____

(2) Verify the VAV returns to unoccupied mode: ☐ P/ ☐ F/ _____

e) Retain the override on the AC unit to remain off if proceeding to the next test. Otherwise release all overrides and return the system to normal operation.

5) Warm-up Mode Test Dates(s): _____ / Initials: _____

This test will validate the functional operation of the unit while in warm-up mode versus the sequence of operations. System performance during warm-up mode will not be evaluated here but is addressed elsewhere.

a) Override the associated VAV schedules so that the warm-up mode logic begins calculating in 5 minutes. With the AHU off, enable warm-up mode by overriding the warm-up request total to a value greater than 5% of the quantity of reheat VAVs.

(1) Record the number of requests equivalent to 5%: _____

(2) Confirm the AHU is enabled in warm-up mode once the warm-up mode logic is enabled: ☐ P/ ☐ F/ _____

(3) Confirm the AC unit graphic includes a status light to signify operating in warm-up mode: ☐ P/ ☐ F/ _____

(4) Confirm the OA damper is commanded full closed and status is closed: ☐ P/ ☐ F/ _____

(5) Confirm the RA damper is commanded full open and status is open: ☐ P/ ☐ F/ _____

(6) Confirm the SAT setpoint is set to 78°F: ☐ P/ ☐ F/ _____

(7) Confirm DX cooling is disabled: ☐ P/ ☐ F/ _____

(8) Confirm all reheat VAVs are placed into occupied mode: ☐ P/ ☐ F/ _____

(9) Confirm the HHW system is enabled: ☐ P/ ☐ F/ _____

(10) Confirm the HHW system supply temperature setpoint is locked at 140°F: ☐ P/ ☐ F/ _____

(11) Confirm the HHW system graphic includes a status light to signify operating in warm-up mode: ☐ P/ ☐ F/ _____

b) With the system operating in warm-up, override the warm-up request total to a value less than 5% of the quantity of reheat VAVs.

(1) Confirm warm-up mode is ended and the AHU operates per normal occupied mode: ☐ P/ ☐ F/ _____

(2) Confirm the VAVs are operated per normal occupied mode: ☐ P/ ☐ F/ _____

(3) Confirm the HHW system is operated per normal occupied mode: ☐ P/ ☐ F/ _____

c) Release all overrides and return system to normal operation.

6) Economizer Lockout & Limit Test Dates(s): _____ / Initials: _____

This test will validate the functional operation of the economizer and that the conditions that enable/disable it match the sequence of operations.

a) Review the economizer lockout logic and verify the following parameters are programmed:

(1) Verify the outside air high temperature lockout is 75F with 2F hysteresis: ☐ P/ ☐ F/ _____

(2) Verify the outside air high enthalpy lockout is 28 BTU/lb with 1 BTU/lb hysteresis: ☐ P/ ☐ F/ _____

(3) Verify either of the above conditions will disable the economizer: ☐ P/ ☐ F/ _____

b) Override the OAT reading to a value less than 73F and the OA enthalpy reading to a value less than 27 BTU/lb.

(1) Confirm the economizer is enabled & modulates to maintain the MAT at the current SAT setpoint: ☐ P/ ☐ F/ _____

c) Override the OAT reading to a value greater than 75F.

(1) Confirm the economizer is disabled and the OA damper goes to minimum position: ☐ P/ ☐ F/ _____

d) Override the OAT reading to 73F.

(1) Confirm the economizer is enabled: ☐ P/ ☐ F/ _____

e) Override the OA enthalpy reading to a value greater than 28 BTU/lb.

(1) Confirm the economizer is disabled and the OA damper goes to minimum position: ☐ P/ ☐ F/ _____

f) Override the OA enthalpy reading to 27 BTU/lb.

(1) Confirm the economizer is enabled: ☐ P/ ☐ F/ _____

g) Release all overrides and return the system to normal operation.

Sample Client – Sample Project – Sample Building
Functional Performance Test – Air Handling Unit AC-1

7) Local SA High Static Lockout Test — Date(s): _____ / Initials: _____
This test validate that the local high static switch disables the unit when triggered.

a) Record the local high static switch setpoint: _____

b) With the AHU in normal operating mode, use a squeeze bulb and pressure gauge to artificially raise the pressure sensed by the high static switch above the local setpoint (or if not possible, temporarily bridge the SA High Static relay to simulate a high static situation).

(1) Confirm the AHU is disabled and all conditions match those checked at the beginning of the 'Unoccupied Heating & Cooling Test' above for unoccupied mode: ☐ P/ ☐ F/ _____

(2) Confirm alarm issued at the workstation: ☐ P/ ☐ F/ _____

c) Release the squeeze bulb pressure (or otherwise return the SA High Static relay to normal) and clear all alarms.

(1) Verify the AHU is enabled resumes normal operation: ☐ P/ ☐ F/ _____

d) Release all overrides and return the system to normal operation.

Sample Client – Sample Project – Sample Building
Functional Performance Test – Air Handling Unit AC-1

8) Duct Static Pressure Control Test Dates(s): _____ / Initials: _____
This test will validate that the system maintains the pressure at setpoint as the setpoint is stepped to a new value.

a) Establish a trend graph of the duct static pressure and setpoint, with data collected every 10 seconds. Use this trend graph to fill out the below information and append to the end of this test for record.

b) Lock the duct static pressure setpoint at its current value and allow the system to stabilize if necessary.

c) With the system at steady-state, override the duct static pressure setpoint to a value +/-0.25" from the current setpoint and record the following:

(1) Static Pressure setpoint (" w.c.) _____
(2) Time to reach within +/-0.1" of setpoint (minutes) _____
(3) Initial overshoot of setpoint (" w.c.) _____
(4) Subsequent number of oscillations about setpoint exceeding +/-0.1" after initial overshoot _____
(5) Time to reach steady-state (i.e. no further oscillations exceeding +/-0.1") (minutes) _____
(6) Final Static Pressure (" w.c.) _____
(7) The duct static pressure should be controlled to setpoint within 10 minutes with an initial overshoot of less than 0.2" and fewer than 3 oscillations exceeding +/-0.1" about setpoint ☐ P/ ☐ F/ _____

d) With the system at steady-state, override the supply air temperature setpoint back to its original value and record the following:

(1) Static Pressure setpoint (" w.c.) _____
(2) Time to reach within +/-0.1" of setpoint (minutes) _____
(3) Initial overshoot of setpoint (" w.c.) _____
(4) Subsequent number of oscillations about setpoint exceeding +/-0.1" after initial overshoot _____
(5) Time to reach steady-state (i.e. no further oscillations exceeding +/-0.1") (minutes) _____
(6) Final Static Pressure (" w.c.) _____
(7) The duct static pressure should be controlled to setpoint within 10 minutes with an initial overshoot of less than 0.2" and fewer than 3 oscillations exceeding +/-0.1" about setpoint ☐ P/ ☐ F/ _____

e) Release all overrides and return the system to normal operation.

Sample Client – Sample Project – Sample Building
Functional Performance Test – Air Handling Unit AC-1

9) Building Static Pressure Control Test Dates(s): _____ / Initials: _____
This test will validate that the system maintains the pressure at setpoint as the system operation is changed.

a) Establish a trend graph of the building static pressure and setpoint, with data collected every 10 seconds. Use this trend graph to fill out the below information and append to the end of this test for record.

b) With the system at steady-state, override conditions in the building to yield a change in the building static pressure (e.g. override AHU economizer to 100% or lock out economizer, depending on current conditions). Record the following:

(1) Static Pressure setpoint (" w.c.) _____
(2) Time to reach within +/-0.01" of setpoint (minutes) _____
(3) Initial overshoot of setpoint (" w.c.) _____
(4) Subsequent number of oscillations about setpoint exceeding +/-0.01" after initial overshoot _____
(5) Time to reach steady-state (i.e. no further oscillations exceeding +/-0.01") (minutes) _____
(6) Final Static Pressure (" w.c.) _____
(7) The building static pressure should be controlled to setpoint within 10 minutes with an initial overshoot of less than 0.02" and fewer than 3 oscillations exceeding +/-0.01" about setpoint ☐ P/ ☐ F/ _____

c) With the system at steady-state, release the overridden conditions in the building to return to the original state and record the following:

(1) Static Pressure setpoint (" w.c.) _____
(2) Time to reach within +/-0.01" of setpoint (minutes) _____
(3) Initial overshoot of setpoint (" w.c.) _____
(4) Subsequent number of oscillations about setpoint exceeding +/-0.01" after initial overshoot _____
(5) Time to reach steady-state (i.e. no further oscillations exceeding +/-0.01") (minutes) _____
(6) Final Static Pressure (" w.c.) _____
(7) The building static pressure should be controlled to setpoint within 10 minutes with an initial overshoot of less than 0.02" and fewer than 3 oscillations exceeding +/-0.01" about setpoint ☐ P/ ☐ F/ _____

d) Release all overrides and return the system to normal operation.

Sample Client – Sample Project – Sample Building
Functional Performance Test – Air Handling Unit AC-1

J) ALARM TESTS

1) Critical Fault General Equipment Alarm Test — Dates(s): _____ / Initials: _____
This test will validate that a general equipment alarm, as received from the local controller, is displayed on the workstation.

a) With the unit operating, override as needed to generate an internal alarm that is output to the control system (or simulate receipt of the alarm if necessary).

(1) Confirm Level 2 Priority alarm is issued at workstation. ☐ P/ ☐ F/ _____

(2) Confirm specific description of the alarm is displayed on the graphics: ☐ P/ ☐ F/ _____

b) Clear the alarm, release all overrides and return the system to normal operation.

2) General Fault General Equipment Alarm Test — Dates(s): _____ / Initials: _____
This test will validate that a general equipment alarm, as received from the local controller, is displayed on the workstation.

a) With the unit operating, override as needed to generate an internal alarm that is output to the control system (or simulate receipt of the alarm if necessary).

(1) Confirm Level 3 High alarm is issued at workstation. ☐ P/ ☐ F/ _____

(2) Confirm specific description of the alarm is displayed on the graphics: ☐ P/ ☐ F/ _____

b) Clear the alarm, release all overrides and return the system to normal operation.

3) Unit Failure & Comm Loss Alarm Test — Dates(s): _____ / Initials: _____
This test will validate that the failure alarm is displayed at the workstation when equipment status is 'Off' while commanded 'On'.

a) With the unit operating, fail the unit by turning it 'Off' at the local disconnect switch.

(1) Verify the unit is stopped and status is 'Off' ☐ P/ ☐ F/ _____

(2) Confirm Level 3 High Unit Failure alarm is issued at workstation ☐ P/ ☐ F/ _____

(3) Confirm Level 2 Priority Comm Failure alarm is issued at workstation ☐ P/ ☐ F/ _____

b) Clear the alarm and return the unit to service by turning it 'On' at the local disconnect switch.

(1) Verify the unit starts and status is 'On' ☐ P/ ☐ F/ _____

c) Release all overrides and return the system to normal operation.

4) Compressor Failure Alarm Test Dates(s): _____ / Initials: _____
This test will validate that the failure alarm is displayed at the workstation when equipment status is 'Off' while commanded 'On'.

a) With the unit operating, override as needed to generate a compressor failure alarm.
(1) Confirm Level 3 High alarm is issued at workstation ☐ P/ ☐ F/ _____

b) Clear the alarm, release all overrides and return the system to normal operation.

5) Supply Fan Failure Alarm Test Dates(s): _____ / Initials: _____
This test will validate that the failure alarm is displayed at the workstation when equipment status is 'Off' while commanded 'On'.

a) With the unit operating, fail the unit by turning it 'Off' at the VFD.
(1) Verify the unit is stopped and status is 'Off' ☐ P/ ☐ F/ _____
(2) Confirm Level 3 High alarm is issued at workstation ☐ P/ ☐ F/ _____

b) Clear the alarm and return the unit to service by turning it 'On' at the VFD.
(1) Verify the unit starts and status is 'On' ☐ P/ ☐ F/ _____

c) Release all overrides and return the system to normal operation.

6) Power Exhaust Fan Failure Alarm Test Dates(s): _____ / Initials: _____
This test will validate that the failure alarm is displayed at the workstation when equipment status is 'Off' while commanded 'On'.

a) With the unit operating, fail the unit by turning it 'Off' at the VFD.
(1) Verify the unit is stopped and status is 'Off' ☐ P/ ☐ F/ _____
(2) Confirm alarm is issued at workstation ☐ P/ ☐ F/ _____

b) Clear the alarm and return the unit to service by turning it 'On' at the VFD.
(1) Verify the unit starts and status is 'On' ☐ P/ ☐ F/ _____

c) Release all overrides and return the system to normal operation.

7) Duct Static Pressure High Alarm Test Dates(s): _____ / Initials: _____
This test will validate that the stated alarm is displayed at the workstation when triggered per the alarm parameters.

a) Lock the setpoint at its current value and override the reading to a value more than 0.3" above the setpoint with fan ON.

(1) Confirm Level 2 Priority alarm is issued at workstation after 10 minutes. ☐ P/ ☐ F/ _____

b) Clear the alarm, release all overrides and return the system to normal operation.

8) Supply Air Temperature High Alarm Test Dates(s): _____ / Initials: _____
This test will validate that the stated alarm is displayed at the workstation when triggered per the alarm parameters.

a) Lock the setpoint at its current value and override the reading to a value more than 8 above the setpoint with cooling ON.

(1) Confirm Level 2 Priority alarm is issued at workstation after 15 minutes. ☐ P/ ☐ F/ _____

b) Clear the alarm, release all overrides and return the system to normal operation.

9) Duct Static Pressure Low Alarm Test Dates(s): _____ / Initials: _____
This test will validate that the stated alarm is displayed at the workstation when triggered per the alarm parameters.

a) Lock the setpoint at its current value and override the reading to a value more than 0.3" below the setpoint with fan ON.

(1) Confirm Level 3 High alarm is issued at workstation after 10 minutes. ☐ P/ ☐ F/ _____

b) Clear the alarm, release all overrides and return the system to normal operation.

10) Supply Air Temperature Low Alarm Test Dates(s): _____ / Initials: _____
This test will validate that the stated alarm is displayed at the workstation when triggered per the alarm parameters.

a) Lock the setpoint at its current value and override the reading to a value more than 8 below the setpoint with cooling ON.

(1) Confirm Level 3 High alarm is issued at workstation after 15 minutes. ☐ P/ ☐ F/ _____

b) Clear the alarm, release all overrides and return the system to normal operation.

Sample Client – Sample Project – Sample Building
Functional Performance Test – Air Handling Unit AC-1

11) Mixed Air Temperature High Alarm Test Dates(s): _____ / Initials: _____
This test will validate that the stated alarm is displayed at the workstation when triggered per the alarm parameters.

a) Override the reading to a value more than the alarm trigger, ___.

(1) Confirm Level 4 Medium alarm is issued at workstation after ___ minutes. ☐ P/ ☐ F/ _____

b) Clear the alarm, release all overrides and return the system to normal operation.

12) Building Static Pressure High Alarm Test Dates(s): _____ / Initials: _____
This test will validate that the stated alarm is displayed at the workstation when triggered per the alarm parameters.

a) Override the reading to a value more than the alarm trigger, +0.08"

(1) Confirm Level 2 Priority alarm is issued at workstation after 15 minutes. ☐ P/ ☐ F/ _____

b) Clear the alarm, release all overrides and return the system to normal operation.

13) Mixed Air Temperature Low Alarm Test Dates(s): _____ / Initials: _____
This test will validate that the stated alarm is displayed at the workstation when triggered per the alarm parameters.

a) Override the reading to a value less than the alarm trigger, ___.

(1) Confirm alarm is issued at workstation after ___ minutes. ☐ P/ ☐ F/ _____

b) Clear the alarm, release all overrides and return the system to normal operation.

14) Building Static Pressure Low Alarm Test Dates(s): _____ / Initials: _____
This test will validate that the stated alarm is displayed at the workstation when triggered per the alarm parameters.

a) Override the reading to a value less than the alarm trigger, -0.04"

(1) Confirm Level 3 High alarm is issued at workstation after 15 minutes. ☐ P/ ☐ F/ _____

b) Clear the alarm, release all overrides and return the system to normal operation.

Sample Client – Sample Project – Sample Building
Functional Performance Test – Air Handling Unit AC-1

K) FIELD NOTES

OVERALL TEST STATUS

☐ COMPLETED ☐ DEFERRED ☐ DEFICIENT

☐ ISSUES NOTED?

NAME: _____ DATE: _____

Date

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VEREGY
FORMERLY EMPOWERED SOLUTIONS

END OF SECTION

SECTION 23 09 00

CONTROLS AND INSTRUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Direct digital control (DDC) system.

1.2 ABBREVIATIONS

A. ACM: Ascent Control Module by Alerton. See Temperature Control Panel (TCP-1) on drawings.

B. DMV: The Department of Motor Vehicles.

C. DMV HQ: The Department of Motor Vehicles Headquarters in Sacramento.

D. EMS: Energy Management System.

E. PC: Personal or desktop computer.

1.3 RESPONSIBILITY

A. All necessary control components for the proper operation of the control systems as described, except where directly excluded or listed as work not included, shall be by a factory authorized controls contractor.

B. The final design, installation, programming, graphics and start-up shall be the responsibility of the controls contractor. The programming and graphics shall be done at the field office. All graphics shall match existing graphics on the Alerton Server at the DMV HQ.

C. The controls contractor is responsible for including the proper settings of each control loop (set point, throttling range, integral and derivative) as necessary to achieve system stability and control accuracy. The database shall have the capability of changing any or all of these settings by the operator at any time, as required.

D. The controls contractor shall be responsible for the installation and warranty of the control system and shall be responsible for the engineering, programming, graphics generation, system start-up and start-up reports and loading the system files and graphics on the following:

1. Existing Alerton Server at the DMV HQ.
2. Two DMV HVAC Alerton Ascent Compass laptops.
3. The DMV satellite Building Supervisor’s PC or laptop.

E. The controls contractor shall be responsible for providing installation and setup of all software, programming, graphics and cables necessary to direct connect the DMV HVAC Alerton Ascent Compass to all programmed controlling devices to allow viewing, controlling, program editing, program uploading and downloading, and controller setups.

F. The controls contractor shall install all programmable hardware/devices and programs to be flawless and seamless in communications, monitoring, control, editing, uploading and downloading, setting up and configuring from the Alerton Envision for BACtalk secure server at the DMV HQ to the new field office HVAC controls.

1.4 DESCRIPTION OF WORK

A. Provide a DDC control system as shown and described in this specification section. Provide seamless communications interface to the host server computer and interface all software required for control, programming, and design of the graphical interface. EMS strategies and graphics shall be consistent with existing format. The DDC control system will consist of conformance Level 3 controllers and communicate with the existing Server over the DMV Ethernet WAN.

B. All control wiring, regardless of voltage, shall be installed in conduit if the wiring will be exposed to potential damage consistent with Division 26 requirements. Control wiring installed above accessible ceiling areas may be installed with open plenum rated cabling if supported properly and identified as EMS communication cable or sensor wire.

C. DDC control system shall communicate with the DMV server located in Sacramento over the DMV Ethernet WAN. The Ethernet drop shall be installed by the controls contractor but not physically connected to the DMV network hub. The DMV HVAC Chief Engineer II or another DMV representative will do the final plug at the DMV network hub.

D. Controls contractor shall include all costs associated with providing the graphical software, training, graphics, control panels, system programming, and all control components required for a complete and functional control system as specified.

1.5 QUALITY ASSURANCE

A. The DDC control system shall be developed using existing proven equipment and must be readily available from inventory of the controls manufacturer or vendor at the time of bid. Controls contractor shall provide an ACM from Alerton to communicate through the existing Alerton EBT software with full administration rights. Nothing in this specification is intended to override this responsibility.

B. The basis of design for the DDC control system is Alerton Ascent Compass for NATIVE BACnet to match the existing DMV control network.

1. Controls contractor providing controls by a manufacturer other than the basis of design product shall arrange with the State to provide a mock up, at no cost to

the State, to demonstrate that the proposed controls will function as well as the basis of design product. The contractor shall demonstrate that the proposed system will integrate seamlessly with the existing DMV control network and that a seamless communications interface to the Alerton Server will be provided, including interface of all software required for control, programming, and design of the graphical interface. DDC control strategies and graphics shall be consistent with existing format.

C. Control diagrams show in general the equipment required for the control sequence specified. Variations in the selection of temperature control and DDC equipment that will produce the required control sequences and meet the quality assurance criteria shall be submitted for review.

1.6 WORK INCLUDED

A. DDC control systems shall include all relays, temperature sensors, and control devices required to control the mechanical equipment. Control devices shall be installed as required to perform the necessary functions and operate in the proper sequence.

B. Mechanical contractor shall be responsible for installing duct mounted smoke detectors and Electrical contractor or Fire Alarm vendor shall be responsible for interlocking the duct mounted smoke detectors to the smoke/fire dampers.

C. Control equipment, including control panels that are not factory mounted shall be furnished and installed by a representative of the DDC control system manufacturer who has been factory trained in the installation of the control system. Temperature control equipment, including panels but not including tubing, fittings, wire, conduit, non-automatic valves and other standards marketed apparatus, shall bear the nameplate of the manufacturer; and the entire system, including piping and wiring, shall be installed by qualified mechanics in the direct employment of the temperature control contractor.

D. Provide all interfaces, positioning and indicating devices for interface to the DDC control system.

E. All installation work, including wiring/piping of the control system and internal wiring of the temperature control panels, shall be done under this Section.

F. Provide all wiring, conduit, relays, time switches; BACnet based controllers, etc., for a complete and functional control system as shown on the control diagrams. Control wiring and conduit shall be installed in conformance to the requirements of local codes. Before ordering controls or authorizing the control installation, submit for the State's approval detailed control diagram showing all controls, wiring, piping, etc. Detailed wiring diagram for the various equipment interlocks shall be submitted to coordinate the overall system operation with the State's operating staff to insure proper operation of the entire system.

G. Secure complete wiring diagrams of the various pieces of equipment, such as packaged rooftop units, exhaust fans, etc. and incorporate into overall submittal drawings. Submittal drawings shall consist of actual fan system or mechanical system layouts on not less than 11 x 17 inch paper, complete in all details.

H. Adjust and Validate: Contractor shall adjust and validate the entire control system and demonstrate compliance to the system point's list and required diagnostics. Calibration, using signal simulation techniques, shall be considered adequate as the first level of adjustment. Final adjustment shall be performed dynamically on operating systems.

I. Training and Documentation:

1. A training session in the operation of the control system shall be conducted for the benefit of the State's operating personnel. Two (2) separate training sessions shall be conducted at the State's facility and each session shall last not less than four (4) hours or at the State's option provide equivalent intensive training for operators at control vendor's training facility.
2. Upon system completion, the contractor shall submit a letter stating that system adjustment and validation have been completed and that the State's operating personnel have been instructed in its use.

3. The contractor shall present the State with an acceptance statement for a signature. The statement shall verify that the State's operating staff has received both training and operations and maintenance information.

J. Warranty:

1. Controls contractor shall provide a (1) year warranty for both parts and labor on the DDC system from Beneficial Occupancy.

2. Warranty shall cover all costs for parts, labor, associated travel, and expenses for a period of one year from Beneficial Occupancy.

3. Hardware and software personnel supporting this warranty agreement shall provide on-site or off-site service in a timely manner after failure notification to the vendor. The maximum acceptable response time to provide this service at the site shall be 24 hours.

4. This warranty shall apply equally to both hardware and software.

K. All temperature control panels and control components that are not shipped directly to the air-handling unit manufacturer, shall be field mounted and wired and shall include properly labeled and marked terminal strips to enable easy field connection. All control panels for air-handling units shall be tested by controls contractor before shipping to air-handling unit manufacturer.

L. Furnish all remote field devices, except those specifically excluded, to assure a complete and operating system (sensors, wells, transmitters, power supplies, duct smoke detectors, CO2 sensors, damper actuators, control valves, etc.).

M. Include all necessary cables to connect DDC Building Ethernet Unit to host computer.

N. Provide complete start-up and field calibration of the control system. The set points shown are suggested starting points only. The controls contractor shall set the controls at the proper values to assure that all systems are stable, hold the required conditions,

and function as intended.

O. Provide factory-wired control panels that meet all codes. NEMA 1 for panels mounted indoors; NEMA 4 or NEMA-3R for panels mounted outdoors.

P. Provide complete engineering/detailed control drawings showing all devices, terminal numbers, schedules, legends, labels, etc., as required to properly display the system to be installed and to allow early trouble-shooting in the future. The diagrams shall also indicate set points, throttling range, ratios and all other switch settings and adjustments.

Q. Provide a detailed written sequence of operation that specifically describes the system operation in terms easily understandable by the State's operating staff and describes how the contractor's specific equipment will accomplish making the system operate as intended. This shall be more detailed than the State's sequences and specifically describe the operation of each device.

R. During start-up, the Contractor shall "tune the loops" as required to obtain stable operation, hold the required conditions, and maintain as tight control as possible. The controls contractor shall submit, as part of his operation and maintenance manuals, a listing of the final set-up values.

S. Exposed wiring connected to wall or column mounted space sensors will be concealed in wire mold.

1.7 DRAWINGS AND SUBMITTAL

A. Control drawings are diagrammatic and shall be used in conjunction with the points list and construction documents to design a complete and functional DDC control system.

B. Submittals shall illustrate point-to-point wiring terminations. As-Built drawings shall show interface terminations to Alerton, BACnet, Ethernet LAN and all wiring changes that occurred during construction.

PART 2 - PRODUCTS

2.1 GENERAL

A. DDC control system shall consist of three levels of controllers:

1. The existing Alerton Server at the DMV HQ.
2. The Alerton ACM BACnet Controller / routers.
3. The Alerton BACtalk Visual Logic Controllers.

B. The Alerton ACM BACnet Controller:

1. ACM shall be a 64-bit intelligent field panel that communicates over Ethernet, PTP, MS/TP physical layers as described in the ASHRAE 135 standard. The ACM scans all the VLC's to update information and coordinate global control

functions of the building. Multiple ACM's and PC workstations can be connected together over the Ethernet LAN.

C. The Alerton BACtalk Visual Logic Controllers (VLC's):

1. Unit control modules will be 16 bit intelligent stand alone control modules. VLC's will be conformance level three BACnet devices.

2. Provide new control devices that have been factory and field calibrated in perfect working order. Re-calibration, as required in the field, shall be performed at the time of start-up for proper sequence and operation of the control system.

3. All input/output devices, and sensors, etc. shall be compatible with the DDC Controller. Unless noted otherwise, signals shall be as follows:

a. Analog Input: 4-20 mA DC; 0-10 VDC, 0-20 V RTD; Thermistor; Balco.
b. Analog Output: 4-20 mA DC or 0-10 VDC.
c. Digital Input: Dry form "C" contacts.
d. Digital Output: 24 volts AC.
e. Pulsed Input: 0-5 VDC powered max; 36 events/ second.

D. HVAC Equipment Interface:

1. It shall be the responsibility of the controls contractor to obtain factory wiring diagrams of all HVAC equipment provided on this project to insure proper DDC interface without jeopardizing factory internal safeties of the equipment.

2.2 BUILDING LEVEL CONTROLLER

A. General:

1. ACM shall provide battery-backed real-time (hardware) clock functions. It shall also provide communications via BACnet standard protocols to all field controllers. ACM shall interface with operator terminal(s) via BACnet protocols for information display.

2. ACM shall incorporate as a minimum, the functions of a 3-way BACnet router. Controller shall route BACnet messages between the high-speed LAN (Ethernet), master slave token passing (MS/TP), and point-to-point (PTP). ACM shall have capability to easily function as a 4-way router with the addition of simple plug-in modules.

3. ACM shall be capable of deciding global strategies for the system based on information from any objects in the system regardless if the object is directly monitored by the controller or by another controller. The program that implements these strategies shall be completely flexible and user definable. Any systems utilizing factory pre-programmed global strategies that cannot be modified by field personnel on-site or downloaded via remote communications are not acceptable. Changing global strategies via firmware changes is also unacceptable. Program execution at ACM shall be a minimum of once per

second.

4. Programming shall be object-oriented using control program blocks. Documentation in flowchart form for all programming shall be provided as part of the final system as-built documentation. Samples of flowchart documentation shall be included in submittals. All flowcharts shall be generated and automatically downloaded to controller. No reentry of database information shall be necessary.

5. Provide means to graphically view inputs and outputs to each program block in real-time as program is executing. This function may be performed via the operator's terminal or field computer.

6. Controller shall have a minimum of 1GB battery-backed static RAM along with one removable microSD.

7. ACM shall include display for network setup and monitoring where shown.

B. BACnet Conformance:

1. ACM shall as a minimum, support BACnet Protocol on Ethernet, BACnet /IPv4, BACnet/IPv6 and MS/TP. It shall communicate directly via these BACnet LANs as a native BACnet device and shall support simultaneous routing functions between all supported LAN types. ACM shall be a BACnet conformance class 3 device and support all BACnet services necessary to provide the following BACnet functional groups:

   a. Clock Functional Group.
   b. COV Event Initiation.
   c. Files Functional Group.
   d. Device Communications Functional Group.
   e. Time Master.

2. Refer to ASHRAE Standard 135, Section 22.2, BACnet Functional Groups in the BACnet standard for a complete list of the services that must be directly supported to provide each of the functional groups listed above. All proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

3. Standard BACnet object types supported shall include as a minimum: Analog Value, Digital Value, Calendar, Command, Device, File, Group, Notification Class, Program and Schedule object types. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

C. Remote Communications:

1. Provide all functions that will allow remote communications via the DMV Ethernet WAN.

2. Load system file on DMV's Alerton Server and WEBtalk off-site computer that allows operator to view and change all information associated with system on color graphic displays. Operator shall be able to change all parameters in this section from off-site location.

3. The system server shall be able and programmed to send e-mail messages for critical alarm conditions.

D. Schedules:

1. Each ACM shall support a minimum of 380 BACnet Schedule Objects and 380 BACnet Calendar Objects.

2. Each schedule object (Weekly or Exception) shall be capable of performing an optimum start. Optimum start calculation shall be based on outside air temperature, zone air temperature, deviation from zones, daytime heating and cooling set point, and individual zone adaptive heating and cooling coefficients that are adjusted each day based on performance parameters of the individual zone.

E. Logging Capabilities:

1. Each ACM shall log as minimum 2000-user selectable object properties. Multiple properties may be logged for each object with a minimum of 100 samples per object property any object in the system (real or calculated) may be logged. Sample time interval shall be adjustable at the operator's terminal. Start of sampling may be by one of the following: Selectable log beginning and ending by using BACnet Calendar and Schedule Objects.

2. Object change of value (all types of analog objects)

3. Object change of state (all types of binary objects)

4. Logs may be viewed both on-site and off-site via remote communication.

5. ACM shall periodically upload trended data to operator's terminal for long term archiving if desired.

6. Archived data stored in database format shall be available for use in third-party spreadsheet or database programs.

F. Alarm Generation:

1. Object change of values and change of states may be identified as alarm conditions. When such conditions exist, the BCM identifies each alarm through BACnet Get Alarm Summary Service. This summary of active alarms (Event State property value not equal to NORMAL) is presented to and displayed at the operator's terminal for system user action.

2. Alarms may be generated within the system for any object change of value or state either real or calculated. This includes things such as analog object value

changes, binary object state changes, and various controller communication failures.

2.3 ROUTER, CONVERTER, REPEATER

A. Routing functions shall be performed using only BACnet standard protocols as defined by ANSI/ASHRAE Standard 135. The converter interconnects a standard computer serial port with an MS/TP LAN. Repeater functions shall be handled by a device designed to selectively interconnect 4 (four) portions of MS/TP LAN as a minimum.

2.4 LOGIC CONTROLLER

A. Provide native BACnet logic controller for each air handler and provide native BACnet logic controller(s) as needed to adequately cover all objects listed in object list. All controllers shall interface to ACM via MS/TP LAN using BACnet protocol. Gateways shall not be used. Controllers shall include input, output and self-contained logic program as needed for complete control of units. Controllers shall be fully programmable using graphical programming blocks. Auxiliary or non-BACnet controllers shall not be used.

B. BACnet Conformance:

1. Logic controllers shall as a minimum support MS/TP BACnet LAN types. They shall communicate directly via this BACnet LAN at 9.6, 19.2, 38.4 and 76.8 KBPS, as native BACnet devices. Logic controllers shall be of BACnet conformance class 3 and support all BACnet services necessary to provide the following BACnet functional groups:

    a. Files Functional Group.
    b. Reinitialize Functional Group.
    c. Device Communications Functional Group.

2. Refer ASHRAE 135, Section 22.2, BACnet Functional Groups in the BACnet standard for a complete list of the services that must be directly supported to provide each of the functional groups listed above. All proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

3. Standard BACnet object types supported shall include as a minimum—Analog Input, Analog Output, Analog Value, Digital Input, Digital Output, Digital Value, Device, File, Program and Schedule object types. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

C. Logic controllers shall include universal inputs with 10-bit resolution that accept 3K and 10K Thermistor, 0–10 VDC, 0–5 VDC, 4–20 mA and dry contact signals. Any input on controller may be either analog or digital. Controller shall also include support and

modifiable programming for interface to intelligent room sensor with digital display. Controller shall include binary and analog outputs on board. Analog outputs shall be switch selectable as either 0–10 VDC or 0–20 mA. Software shall include scaling features for analog outputs. Logic controller shall include 24 VDC voltage supply for use as power supply to external sensors.

D. All program sequences shall be stored on board logic controller in EEPROM. No batteries shall be needed to retain logic program. Controller shall execute all program sequences 10 times per second and capable of multiple PID loops for control of multiple devices. All calculations shall be completed using floating-point math and system shall support display of all information in floating-point nomenclature at operator's terminal.

E. Programming of logic controller shall be completely modifiable in the field over installed BACnet LANs or remotely via DMV Ethernet WAN. Operator shall program logic sequences by graphically moving function blocks on screen and tying blocks together on screen. Logic controller shall be programmed using programming tools as described in operator's terminal section.

F. All programming tools shall be provided as part of system. Provide documentation in flowchart form of all programming as part of the final system as-built documentation. Include samples of flowchart documentation in submittals.

G. Logic controller shall include software scheduling functions on board without depending on any external device. Scheduling shall be via a BACnet schedule object for seven-day of-the-week scheduling. Controller shall include interface capability for optional plug-in hardware clock with battery back-up. Provide optional hardware clock as shown on object list given in drawing set.

2.5 SENSORS AND MISCELLANEOUS DEVICES

A. Temperature Sensors: All temperature sensors to be solid state electronic, factory-calibrated to within 0.5°F, totally interchangeable. Duct sensors to be electronically identical, housing suitable for the application. Metal guards shall be provided.

B. Wall-mounted space temperature sensors shall be stainless steel plate type sensor. An override push button for after hour operation of the HVAC system(s) shall be provided where indicated.

2.6 MINIMUM CONTROL REQUIREMENTS

A. Factory Installation by AHU Manufacturer:

1. All controllers and devices.

2. Sensors, relays, switches.

3. Schematics.

B. Field Installation by Controls Manufacturer's Representative:

1. All zone, CO2, and duct supply sensors.

2. Time override switch(es).

3. Main Control Panel Enclosure to interface with existing Alerton controls.

   a. Manufacture by: Hoffman Medium Enclosures Type I or equal.

4. All control field wiring.

C. New DDC Control System: Controlling, Monitoring, and Alarming Points:

1. All input and output points shown.

2. Password Protection:

   a. Minimum 200 users with changeable levels of Security.
   b. Tracking users' logon and logoff, and changes made.

3. Trending (Vendors Initial Setup):

   a. Continuous Trending of all AI, AO, DI, and DO points at one minute intervals for a minimum of one year then Archiving to compact discs (CDs), digital video discs (DVDs), or universal serial bus (USB) for historical data.

D. Graphics (Minimum):

1. To match the layout, size, color, and control as the existing Alerton Envision for BACtalk.

2. Full control of all DO and AO points, schedule, lockouts, and settings.

E. Remote and Local Communications to the new DDC control system:

1. The new controls shall interfaced with the existing Alerton Envision for BACtalk Native BACnet DDC control Network system located at the DMV HQ.

   a. The new controls shall interface, be compatible, totally viewable and controllable through the DMV's existing network system.

F. Programs:

1. Controls contractor shall provide, configure and load five copies of all software on DMV laptops required for installing, programming, operating, and backing up all programmable controlling devices that DMV does not already have.

2. This includes all cables and devices needed for a direct connection to the new controlling devices.

3. Controls contractor shall provide DMV with a back up copy of all the sites

programs files and graphics.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence.

B. Notify the State in writing of conditions detrimental to the proper and timely completion of the work.

C. Do not begin work until all unsatisfactory conditions are resolved.

3.2 GENERAL INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide all miscellaneous devices, hardware, software, interconnections installation and programming required to ensure a complete operating system in accordance with the sequences of operation and point schedules.

C. All control wiring and conduit will be installed by controls contractor. All control wiring will be installed in EMT (electrical metallic tubing) conduit in dry locations and Rigid IMC (intermediate metal conduit) with seal tight connections in exposed locations. Control wiring installed above accessible ceilings will be allowed if installed in a neat and professional manner. All open wiring will be labels as EMS wiring every few feet.

3.3 LOCATION AND INSTALLATION OF COMPONENTS

A. Locate and install components for easy accessibility; in general, space sensors are to be mounted 48 inches above finished floor with a minimum of 3'-0" clear access space in front of sensors. Obtain approval on locations from the State prior to installation.

B. All instruments, switches, transmitters, etc., shall be suitably wired and mounted to protect them from vibration, moisture and high or low temperatures.

C. Identify all equipment and panels. Provide permanently mounted tags for all panels.

D. Provide stainless steel or brass thermo-wells suitable for respective application and for installation under other sections—sized to suit pipe diameter without restricting flow.

3.4 INTERLOCKING AND CONTROL WIRING:

A. Provide all interlock and control wiring. All wiring shall be installed neatly and professionally, in accordance with Division 26 and all national, State and local electrical codes. All 120 VAC interlock wiring shall be in conduit.

B. Provide wiring as required by functions as specified and as recommended by equipment manufacturers, to serve specified control functions.

C. Control wiring shall not be installed in power circuit raceways. Magnetic starters and disconnect switches shall not be used as junction boxes. Provide auxiliary junction boxes as required. Coordinate location and arrangement of all control equipment with the State's representative prior to rough-in.

D. Provide auxiliary pilot duty relays on motor starters as required for control function.

E. Provide power for all control components from nearest electrical control panel or as indicated.

F. All control wiring in the Mechanical, Fire Riser, Electrical, and Communication rooms to be installed in EMT Conduit. All other wiring to be installed neatly and inconspicuously per local code requirements.

3.5 FIELD SERVICES

A. Prepare and start DDC control system under provisions of this Section.

B. Start-up and commission systems. Allow sufficient time for start-up and commissioning prior to placing control systems in permanent operation.

C. Provide the State with spare parts list. Identify equipment critical to maintaining the integrity of the operating system.

3.6 COLOR GRAPHICS REQUIRED FOR PROJECT

A. Complete floor plan with all space temperatures and space temperature sensor locations.

B. Graphic of each RTU unit with all points listed in points list available on the graphic for control and diagnostic functions.

C. Graphics of all other ancillary systems such as exhaust fans, fan coil, water meter, etc. and all associated sensors and status points.

END OF SECTION 23 09 00

SECTION 23 31 13

METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Sheet metal materials.
4. Duct liner.
5. Sealants and gaskets.
6. Hangers and supports.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.

B. Sustainable Design Submittals:

1. Ventilation: Product Data for ventilation equipment, indicating compliance with ASHRAE 62.1, Section 5 - "Systems and Equipment."
2. Product Data: For adhesives and sealants, indicating VOC content.
3. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top and bottom of ducts.
5. Dimensions of all duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.

11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment.

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

1. Construct ducts of galvanized sheet steel unless otherwise indicated.

B. Transverse Joints: Fabricate joints in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. For ducts with longest side less than 36 inches, select joint types in accordance with Figure 2-1.
2. For ducts with longest side 36 inches or greater, use flange joint connector Type T-22, T-24, T-24A, T-25a, or T-25b. Factory-fabricated flanged duct connection system may be used if submitted and approved by the State.

C. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Construct ducts of galvanized sheet steel unless otherwise indicated.

B. Source Limitations: Obtain single-wall round ducts and fittings from single manufacturer.

C. Transverse Joints: Select joint types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

E. Tees and Laterals: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials are to be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A653/A653M.

1. Galvanized Coating Designation: G90.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Reinforcement Shapes and Plates: ASTM A36/A36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.4 DUCT LINER

A. Flexible Elastomeric Duct Liner: Preformed, cellular, closed-cell, sheet materials complying with ASTM C534/C534M, Type II, Grade 1; and with NFPA 90A or NFPA 90B.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Aeroflex USA, Breathe-EZ.
    b. Armacell LLC, AP/ArmaFlex Duct Liner.
    c. K-Flex USA, Duct Liner.
    d. Or equal.

2. Source Limitations: Obtain flexible elastomeric duct liner from single manufacturer.
3. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested in accordance with UL 723; certified by an NRTL.
4. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.

    a. Verify adhesive has a VOC content of 80 g/L or less.
    b. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch thick galvanized steel; with beveled edge sized as required to hold insulation securely in place, but not less than 1-1/2 inches in diameter.

C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."

1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
3. Butt transverse joints without gaps, and coat joint with adhesive.
4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.

7. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:

    a. Fan discharges.
    b. Intervals of lined duct preceding unlined duct.
    c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.

8. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.5 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets are to be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested in accordance with UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:

1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
2. Tape Width: 4 inches.
3. Sealant: Modified styrene acrylic.
4. Water resistant.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10 inch wg, positive and negative.
7. Service: Indoor and outdoor.
8. Service Temperature: Minus 40 to plus 200 deg F.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
10. Verify sealant has a VOC content of 420 g/L or less.
11. Verify sealant complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10 inch wg, positive and negative.

8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

2.6 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Galvanized-steel rods and nuts.

B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

C. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A603.

D. Steel Cable End Connections: Galvanized-steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

E. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and coordination drawings.

B. Install ducts in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install ducts in maximum practical lengths with fewest possible joints.

D. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

E. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

G. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

H. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

I. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

J. Install heating coils, cooling coils, air filters, dampers, and all other duct-mounted accessories in air ducts where indicated.

K. Protect duct interiors from moisture, construction debris and dust, and other foreign materials both before and after installation. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

L. Elbows: Use long-radius elbows wherever they fit.

1. Fabricate 90-degree rectangular mitered elbows to include turning vanes.
2. Fabricate 90-degree round stamped or welded elbows.

a. Where space constraints require non-standard fittings, request from the State's Engineer to use a minimum of five-segmented elbows.

M. Branch Connections: Use lateral for round ducts and lateral or conical for rectangular branch connections.

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

3.3 DUCTWORK EXPOSED TO WEATHER

A. All external joints are to be welded. Seal all openings to provide weatherproof construction.

B. Construct ductwork to resist external loads of wind, snow, ice, and other effects of weather. Provide necessary supporting structures.

C. Single Wall:

1. Ductwork is to be galvanized steel.

a. Protect outer surface with suitable paint.

3.4 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.6 DUCTWORK CONNECTIONS

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.7 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer.

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.
2. Test sections of metal duct system, chosen randomly by the State, for cleanliness in accordance with "Description of Method 3 - NADCA Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."

    a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media is to not exceed 0.75 mg/100 sq. cm.

C. Duct system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.9 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

1. Fabricate all ducts to achieve SMACNA pressure class, seal class, and leakage class as indicated below.

B. Supply Ducts:

1. Ducts Connected to Air-Handling Units:

    a. Pressure Class: Positive 2-inch wg.
    b. Minimum SMACNA Seal Class: A.

C. Return Ducts:

1. Ducts Connected to Air-Handling Units:

    a. Pressure Class: Positive or negative 2-inch wg.
    b. Minimum SMACNA Seal Class: A.

D. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:

a. Pressure Class: Negative 1-inch wg.
b. Minimum SMACNA Seal Class: C.

E. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:

1. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: A.

F. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel.

G. Liner:

1. Supply-Air Ducts: Flexible elastomeric, 2 inch thick.
2. Return-Air Ducts: Flexible elastomeric, 2 inch thick.
3. Transfer Ducts: Flexible elastomeric, 2 inch thick.

H. Elbow Configuration:

1. Rectangular Duct - Requirements for All Velocities: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."

a. Minimum Radius-to-Diameter Ratio: 1.5.
b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped.
c. Round Elbows, 14 Inches and Larger in Diameter: Stamped or welded.
d. Adjustable Gore: Not permitted.

I. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."

a. Rectangular Main to Rectangular Branch: 45-degree entry.
b. Rectangular Main to Round Branch: Conical spin in.

2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals."

a. All velocities: 45-degree lateral.

END OF SECTION 23 31 13

SECTION 23 33 00

AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manual volume dampers.
2. Remote damper operators.
3. Flexible connectors.
4. Duct accessory hardware.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product data showing compliance with ASHRAE 62.1.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 90A and NFPA 90B.

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. American Warming and Ventilating; a Mestek Architectural Group company.
    b. McGill AirFlow LLC.
    c. Ruskin Company.
    d. Or equal.

2. Performance:

    a. Leakage Rating Class III: Leakage not exceeding 40 cfm/sq. ft. against 1-inch wg differential static pressure.

3. Construction:

    a. Linkage out of airstream.
    b. Suitable for horizontal or vertical airflow applications.

4. Frames:

    a. Hat-shaped, 16-gauge thick, galvanized sheet steel.
    b. Mitered and welded corners.
    c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

    a. Multiple or single blade.
    b. Parallel- or opposed-blade design.
    c. Stiffen damper blades for stability.
    d. Galvanized steel; 16 gauge thick.

6. Blade Axles: Galvanized steel.
7. Bearings:

    a. Oil-impregnated bronze or molded synthetic.
    b. Dampers mounted with vertical blades to have thrust bearing at each end of every blade.

8. Tie Bars and Brackets: Galvanized steel.
9. Locking device to hold damper blades in a fixed position without vibration.

B. Jackshaft:

1. Size: 0.5-inch diameter.
2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

C. Damper Hardware:

1. Zinc-plated, die-cast core with dial and handle, made of 3/32-inch thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

2.3 REMOTE DAMPER OPERATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Metropolitan Air Technology, RT-WGA-P damper drive, rotary cable, and RT-CCM termination.
2. Young Regulator Company, Flexible Shaft Assembly.
3. Or equal.

B. Description: Cable system designed for remote manual damper adjustment.

C. Damper Drive Unit: Worm gear damper drive unit.

1. One-piece construction with mounting capabilities to accommodate damper shaft shape and size by others.
2. Bracket Construction: 14-gauge galvanized.
3. Worm: Nylon.
4. Worm Gear: Acetal.

D. Flexible Drive Cable: Rotary, galvanized steel or brass finish.

1. Cable Diameter: 1/4-inch diameter.
2. Strength: Capable of delivering more than 50-pound of torque without damage.
3. Length: Length to suit with a 4-inch minimum turn radius.
4. Outer Sheathing: Flexible metal conduit.

E. Termination: Galvanized steel mounting bracket.

1. Cap: Ceiling-mount, 1-inch diameter, nylon or galvanized steel cap.

2.4 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Ward Industries; a brand of Hart & Cooley, Inc.
4. Or equal.

B. Fire-Performance Characteristics: Adhesives, sealants, fabric materials, and accessory materials shall have flame-spread index not exceeding 25 and smoke-developed index not exceeding 50 when tested in accordance with ASTM E84.

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

D. Materials: Flame-retardant or noncombustible fabrics.

E. Coatings and Adhesives: Comply with UL 181, Class 1.

F. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch wide, 0.028-inch thick, galvanized sheet steel or 0.032-inch thick aluminum sheets. Provide metal compatible with connected ducts.

G. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd..
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

2.5 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories in accordance with applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116 for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts.

C. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.

D. Set dampers to fully open position before testing, adjusting, and balancing.

E. Install remote damper operators per manufacturer’s instructions.

1. For flexible drive cable more than 10 feet in length, install the entire flexible drive cable in flexible metal conduit.
2. Secure flexible drive cable or flexible metal conduit to ceiling joist per manufacturer's instructions.
3. Fasten termination bracket to stud above ceiling, adjacent to the associated supply diffuser, return register, or exhaust grille. Ensure termination of flexible drive cable is in an accessible location.
4. Paint termination cap to match adjacent ceiling color.

F. Install test holes at fan inlets and outlets and elsewhere as indicated and as needed for testing and balancing.

G. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION 23 33 00

SECTION 23 33 46

FLEXIBLE DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Flexible ducts, noninsulated.
2. Flexible ducts, insulated.
3. Flexible duct connectors.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Flexible ducts, noninsulated.
2. Flexible ducts, insulated.
3. Flexible duct connectors.

B. Product Data Submittals: For each type of product.

C. Sustainable Design Submittals:

1. Product data showing compliance with ASHRAE 62.1.
2. Product Data: For adhesives and sealants, indicating VOC content.
3. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.
4. Laboratory Test Reports: For insulation, indicating compliance with requirements for low-emitting materials.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Comply with NFPA 90A and NFPA 90B.

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials must be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

C. Comply with the Air Duct Council's (formerly, Air Diffusion Council) "ADC Flexible Air Duct Test Code - FD 72-R1" and "Flexible Duct Performance & Installation Standards."

D. Comply with ASTM E96/E96M.

2.2 FLEXIBLE DUCTS, NONINSULATED

A. Standard: Product is to be UL 181 listed and bearing the UL label.

B. Flexible Ducts, Noninsulated - Class 1, Two-Ply Vinyl or Polyethylene Film Supported by Helically Wound, Spring-Steel Wire:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Flexmaster U.S.A., Inc.
    b. JP Lamborn Co.
    c. Thermaflex; a Flex-Tek Group company.
    d. Or equal.

2. Pressure Rating: 10 inch wg positive and 1.0 inch wg negative.
3. Maximum Air Velocity: 4000 fpm.
4. Temperature Range: Minus 10 to plus 160 deg F.

2.3 FLEXIBLE DUCTS, INSULATED

A. Standard: Product is to be UL 181 listed and bearing the UL label.

B. Flexible Ducts, Insulated - Class 1, Two-Ply Vinyl Film Supported by Helically Wound, Spring-Steel Wire; Fibrous-Glass Insulation:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Flexmaster U.S.A., Inc.
    b. JP Lamborn Co.
    c. Thermaflex; a Flex-Tek Group company.
    d. Or equal.

2. Pressure Rating: 10 inch wg positive and 1.0 inch wg negative.
3. Maximum Air Velocity: 4000 fpm.
4. Temperature Range: Minus 10 to plus 160 deg F.
5. Insulation R-Value: R8.
6. Vapor-Barrier Film: Polyethylene.

2.4 FLEXIBLE DUCT CONNECTORS

A. Clamps: Stainless steel band with stainless steel or zinc-plated hex screw to tighten band with a worm-gear action or nylon strap in sizes 3 through 18 inches, to suit duct size.

PART 3 - EXECUTION

3.1 INSTALLATION OF FLEXIBLE DUCTS

A. Install flexible ducts in accordance with applicable details in the following publications:

1. ADC's "Flexible Duct Performance & Installation Standards" for flexible ducts.
2. NAIMA AH116.
3. SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts.
4. SMACNA's "Fibrous Glass Duct Construction Standards" for fibrous-glass ducts.

B. Install in indoor applications only. Do not install flexible duct in locations where it will be exposed to UV lighting.

C. Connect diffusers to ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.

D. Installation:

1. Install ducts fully extended.
2. Do not bend ducts across sharp corners.
3. Bends of flexible ducting must not exceed a minimum of one-duct diameter.
4. Avoid contact with metal fixtures, water lines, pipes, or conduits.
5. Install flexible ducts in a direct line, without sags, twists, or turns.
6. Install in accordance with ADC instructions.

E. Supporting Flexible Ducts:

1. Support flexible duct at manufacturer's recommended intervals, but at no greater distance than 4 ft.. Provide sufficient support so that maximum centerline sag is 1/2 in. per ft. between supports. A connection to rigid duct or equipment may be considered a support joint.
2. Install extra supports at bends placed approximately one-duct diameter from center line of the bend.
3. Ducts may rest on ceiling joists or truss supports. Spacing between supports must not exceed the maximum spacing in accordance with manufacturer's written installation instructions.
4. Vertically installed ducts must be stabilized by support straps at a maximum of 72 inches o.c.

END OF SECTION 23 33 46

SECTION 23 34 23

HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Centrifugal ventilators - roof upblast.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes for fans.
2. Rated capacities, operating characteristics, and furnished specialties and accessories.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Material thickness and finishes, including color charts.
5. Dampers, including housings, linkages, and operators.
6. Prefabricated roof curbs.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For HVAC power ventilators to include in normal and emergency operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 CENTRIFUGAL VENTILATORS - ROOF UPBLAST

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Greenheck Fan Corporation.
2. Loren Cook Company.
3. Or equal.

B. Configuration: Centrifugal roof upblast ventilator.

C. Housing: Removable spun aluminum; square, one-piece aluminum base with venturi inlet cone.

1. Upblast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains.

D. Fan Wheels: Aluminum hub and wheel with backward-inclined blades; spark-resistant construction classified in accordance with AMCA 99, Section 8.

E. Accessories:

1. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.
2. Bird Screens: Removable, 1/4-inch mesh, stainless steel.
3. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.

F. Prefabricated Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base.

1. Configuration: Built-in cant and mounting flange.
2. Overall Height: 16 inches.
3. Pitch Mounting: Manufacture curb for roof slope.
4. Metal Liner: Galvanized steel.

2.2 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements.

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Install power ventilators level and plumb.

B. Equipment Mounting:

1. Secure roof-mounted fans to roof curbs with zinc-plated hardware.

C. Install units with clearances for service and maintenance.

D. Label units according to requirements specified in Section 23 05 53 "Identification for HVAC Piping and Equipment."

3.2 ELECTRICAL CONNECTIONS

A. Connect wiring according to Division 26.

B. Ground equipment according to Division 26.

C. Install electrical devices furnished by manufacturer, but not factory mounted, according to California Electrical Code and NECA 1.

3.3 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Connect control wiring according to Division 26.

3.4 STARTUP SERVICE:

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks in accordance with manufacturer's written instructions.
2. Verify that shipping, blocking, and bracing are removed.
3. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
4. Verify that cleaning and adjusting are complete.
5. For direct-drive fans, verify proper motor rotation direction and verify fan wheel free rotation and smooth bearing operation.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual volume control in connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor and confirm proper motor rotation and unit operation, adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

3.5 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Lubricate bearings.

C. Comply with requirements in Section 23 05 93 "Testing, Adjusting, and Balancing for HVAC."

3.6 CLEANING

A. After completing system installation and testing, adjusting, and balancing and after completing startup service, clean fans internally to remove foreign material and construction dirt and dust.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections with the assistance of a factory-authorized service representative.

1. Fan Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Test and adjust controls and safeties.
3. Fans and components will be considered defective if they do not pass tests and inspections.
4. Prepare test and inspection reports.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train the State's maintenance personnel to adjust, operate, and maintain centrifugal fans.

END OF SECTION 23 34 23

SECTION 23 37 13

DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rectangular and square ceiling diffusers.
2. Registers and grilles.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.

PART 2 - PRODUCTS

2.1 RECTANGULAR AND SQUARE CEILING DIFFUSERS

A. Ceiling Diffusers, CD-1, TG-1:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

a. Krueger.
b. Titus, MCD.
c. Or equal.

2. Material: Steel.
3. Finish: Baked enamel, white.
4. Face Size: 24 by 24 inches.
5. Face Style: Louvered.
6. Mounting: T-bar.
7. Pattern: Adjustable.
8. Accessories:

a. Earthquake tabs.

B. Ceiling Diffusers, CD-2, TG-2:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

    a. Krueger.
    b. Titus, MCD.
    c. Or equal.

2. Material: Steel.
3. Finish: Baked enamel, white.
4. Face Size: Square.
5. Face Style: Louvered.
6. Mounting: Surface.
7. Pattern: Adjustable.
8. Accessories:

    a. Earthquake tabs.

2.2 REGISTERS AND GRILLES

A. Fixed Face Grille, RG-1, TG-3:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

    a. Krueger.
    b. Titus, 23RL.
    c. Or equal.

2. Material: Steel.
3. Finish: Baked enamel, white.
4. Face Blade Arrangement: Horizontal spaced 3/4 inch apart, 45-degree deflection.
5. Frame: 1-1/4 inches wide.
6. Mounting: Lay in.
7. Accessory:

    a. Earthquake tabs.

B. Fixed Face Grille, RG-2, TG-4:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

    a. Krueger.
    b. Titus, 23RL.
    c. Or equal.

2. Material: Steel.
3. Finish: Baked enamel, white.
4. Face Blade Arrangement: Horizontal spaced 3/4 inch apart, 45-degree deflection.
5. Frame: 1-1/4 inches wide.

6. Mounting: Surface.
7. Accessory:

    a. Earthquake tabs.

C. Exhaust Grille, EG-1:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

    a. Krueger.
    b. Titus, 23RS.
    c. Or equal.

2. Material: Steel.
3. Finish: Baked enamel, white.
4. Face Blade Arrangement: Horizontal spaced 3/4 inch apart, 45-degree deflection.
5. Frame: 1-1/4 inches wide.
6. Mounting: Lay in.
7. Accessory:

    a. Earthquake tabs.

D. Exhaust Grille, EG-2:

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

    a. Krueger.
    b. Titus, 23RS.
    c. Or equal.

2. Material: Steel.
3. Finish: Baked enamel, white.
4. Face Blade Arrangement: Horizontal spaced 3/4 inch apart, 45-degree deflection.
5. Frame: 1-1/4 inches wide.
6. Mounting: Surface.
7. Accessory:

    a. Earthquake tabs.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve

design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify State for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.2 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 23 37 13

SECTION 23 74 16.11

PACKAGED, SMALL-CAPACITY, ROOFTOP AIR-CONDITIONING UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Packaged, small-capacity, rooftop air-conditioning units (RTUs) with the following components:

1. Unit casings.
2. Fans, drives, and motors.
3. Coils.
4. Refrigerant circuit components.
5. Air filtration.
6. Dampers.
7. Electrical power connections.
8. Controls.
9. Roof curbs.
10. Accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each RTU.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include rated capacities, dimensions, required clearances, characteristics, and furnished specialties and accessories.
3. Include unit dimensions and weight.
4. Include cabinet material, metal thickness, finishes, insulation, and accessories.
5. Fans:

    a. Include certified fan-performance curves with system operating conditions indicated.
    b. Include certified fan-sound power ratings.
    c. Include fan construction and accessories.
    d. Include motor ratings, electrical characteristics, and motor accessories.

6. Include certified coil-performance ratings with system operating conditions indicated.
7. Include filters with performance characteristics.
8. Include dampers, including housings, linkages, and operators.

B. Sustainable Design Submittals:

1. Product data showing compliance with ASHRAE 62.1.

2. Product Data: For air filtration performance.
3. Product Data: For adhesives, mastics, and sealants, indicating VOC content.
4. Refrigerant: Product Data for refrigerants, indicating compliance with refrigerant management practices.

C. Shop Drawings: For each packaged, small-capacity, rooftop air-conditioning unit.

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

A. System startup reports.

B. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For RTUs to include in emergency, operation, and maintenance manuals.

1.5 WARRANTY

A. Warranty: Manufacturer agrees to repair or replace components of packaged, small-capacity, rooftop air-conditioning unit that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Three year(s) from date of Beneficial Occupancy.
2. Warranty Period for Compressor: Manufacturer’s standard, but not less than five years from date of Beneficial Occupancy.

1.6 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One set of filters for each unit.

PART 2 - PRODUCTS

2.1 PACKAGED, SMALL-CAPACITY, ROOFTOP AIR-CONDITIONING UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carrier Corporation.
2. Trane; American Standard Companies, Inc.
3. Or equal.

2.2 UNIT CASINGS

A. General Fabrication Requirements for Casings: Formed and reinforced double-wall insulated panels, fabricated to allow removal for access to internal parts and components, with joints between sections sealed.

B. Double-Wall Construction:

1. Outside Casing Wall: Galvanized steel, minimum 18 gauge thick with corrosion-resistant coating, with pitched roof panels and knockouts with grommet seals for electrical and piping connections and lifting lugs.
2. Inside Casing Wall: G90-coated galvanized steel, 0.034 inch thick.
3. Floor Plate: G90 galvanized steel, minimum 18 gauge thick.
4. Casing Insulation:

a. Materials: Injected polyurethane foam insulation.
b. Thermal Break: Provide continuity of insulation with no through-casing metal in casing walls, floors, or roof of unit.

C. Airstream Surfaces: Surfaces in contact with airstream to comply with requirements in ASHRAE 62.1.

D. Panels and Doors:

1. Panels:

a. Fabrication: Formed and reinforced with same materials and insulation thickness as casing.
b. Fasteners: Two or more camlock type for panel lift-out operation. Arrangement to allow panels to be opened against air-pressure differential.
c. Gasket: Neoprene, applied around entire perimeters of panel frames.
d. Size: Large enough to allow inspection and maintenance of air-handling unit's internal components.

2. Access Doors:

a. Hinges: A minimum of two ball-bearing hinges or stainless steel piano hinge and two wedge-lever-type latches, operable from inside and outside. Arrange doors to be opened against air-pressure differential.
b. Gasket: Neoprene, applied around entire perimeters of panel frames.
c. Size: Large enough to allow inspection and maintenance of air-handling unit's internal components.

E. Condensate Drain Pans:

1. Location: Each type of cooling coil.
2. Construction:

a. Single-wall, stainless steel sheet.

3. Drain Connection:

a. Located at lowest point of pan and sized to prevent overflow.

4. Slope: Minimum 0.125-in./ft. slope, to comply with ASHRAE 62.1, in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and from humidifiers and to direct water toward drain connection.
5. Length: Extend drain pan downstream from leaving face for distance to comply with ASHRAE 62.1.
6. Width: Entire width of water producing device.
7. Depth: A minimum of 2 inches deep.
8. Units with stacked coils must have an intermediate drain pan to collect condensate from top coil.

2.3 FANS, DRIVES, AND MOTORS

A. Fan and Drive Assemblies: Statically and dynamically balanced and designed for continuous operation at maximum-rated fan speed and motor horsepower.

B. Supply-Air Fans: Centrifugal, rated according to AMCA 210; galvanized or painted steel; mounted on solid-steel shaft.

1. Housings: Formed- and reinforced-steel panels to form curved scroll housings with shaped cutoff and spun-metal inlet bell.

a. Bracing: Steel angle or channel supports for mounting and supporting fan scroll, wheel, motor, and accessories.

2. Centrifugal Fan Wheels: Inlet flange, backplate, and shallow blades with inlet and tip curved forward in direction of airflow and mechanically fastened to flange and backplate; steel or aluminum hub swaged to backplate and fastened to shaft with setscrews.
3. Mounting: For internal vibration isolation and seismic control. Factory-mount fans with manufacturer's standard restrained vibration isolation mounting devices having a minimum static deflection of 1 inch.

4. Shaft Lubrication Lines: Extended to a location outside the casing.

C. Drives, Direct: Factory-mounted, direct drive.

D. Condenser-Coil Fan: Propeller, mounted on shaft of permanently lubricated multispeed motors.

E. Power Exhaust Fan: Forward curved, shaft mounted on permanently lubricated motor.

F. Motors:

1. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 23 05 13 "Common Motor Requirements for HVAC Equipment."
2. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
3. Efficiency: Premium efficient as defined in NEMA MG 1.
4. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.

2.4 COILS

A. General Requirements for Coils:

1. Comply with AHRI 410.
2. Fabricate coils section to allow for removal and replacement of coil for maintenance and to allow in-place access for service and maintenance of coil(s).
3. Coils to not act as structural component of unit.

B. Supply-Air Refrigerant Coil:

1. Tubes: Copper.
2. Fins: Aluminum.
3. Fin and Tube Joints: Mechanical bond.
4. Coatings: Corrosion-resistant coating.
5. Ratings: Designed, tested, and rated according to ASHRAE 33 and AHRI 410.

C. Electric-Resistance Heating Coils: Comply with UL 1995.

2.5 REFRIGERANT CIRCUIT COMPONENTS

A. Compressor: Hermetic, multi-speed scroll, mounted on vibration isolators; with internal overcurrent and high-temperature protection, internal pressure relief, and crankcase heater.

B. Refrigeration Specialties:

1. Refrigerant: R-454B.
2. Expansion valve with replaceable thermostatic element.

3. Refrigerant filter/dryer.
4. Manual-reset high-pressure safety switch.
5. Automatic-reset low-pressure safety switch.
6. Minimum off-time relay.
7. Automatic-reset compressor motor thermal overload.
8. Brass service valves installed in compressor suction and liquid lines.
9. Low-ambient kit high-pressure sensor.
10. Hot-gas reheat solenoid valve modulating with a replaceable magnetic coil.
11. Hot-gas bypass solenoid valve with a replaceable magnetic coil.
12. Four-way reversing valve with a replaceable magnetic coil, thermostatic expansion valves with bypass check valves, and a suction line accumulator.

2.6 AIR FILTRATION

A. Panel Filters:

1. Description: Pleated factory-fabricated, self-supported, disposable air filters with holding frames.
2. Filter Unit Class: UL 900.
3. Media: Interlaced glass, synthetic or cotton fibers coated with nonflammable adhesive and antimicrobial coating.
4. Filter-Media Frame: Beverage board with perforated metal retainer, or metal grid, on outlet side.

B. Adhesive, Sustainability Projects: As recommended by air-filter manufacturer and with a VOC content of 80 g/L or less.

2.7 DAMPERS

A. Outdoor- and Return-Air Dampers: Low-leakage, double-skin, airfoil-blade, galvanized-steel dampers with compressible jamb seals and extruded-vinyl blade edge seals in opposed-blade arrangement with zinc-plated steel operating rods rotating in sintered bronze or nylon bearings mounted in a single galvanized-steel frame, and with operating rods connected with a common linkage. Leakage rate must not exceed 4 cfm/sq. ft. at 1-inch wg and 8 cfm/sq. ft. at 4-inch wg rated in accordance with AMCA 500D.

B. Barometric relief dampers.

C. Electronic Damper Operators:

1. Direct-coupled type designed for minimum 60,000 full-stroke cycles at rated torque.
2. Electronic damper position indicator to have visual scale indicating percent of travel and 2- to 10-V dc, feedback signal.
3. Operator Motors:

a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 23 05 13 "Common Motor Requirements for HVAC Equipment."
b. Size to operate with sufficient reserve power to provide smooth modulating action or two-position action.
c. Permanent Split-Capacitor or Shaded-Pole Type: Gear trains completely oil immersed and sealed. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.

4. Nonspring-Return Motors for Dampers Larger Than 25 Sq. Ft.: Size for running torque of 150 in. x lbf and breakaway torque of 300 in. x lbf.
5. Spring-Return Motors for Dampers Larger Than 25 Sq. Ft.: Size for running and breakaway torque of 150 in. x lbf.
6. Size dampers for running torque calculated as follows:

a. Opposed-Blade Damper with Edge Seals: 5 inch-lb/sq. ft. of damper.
b. Opposed-Blade Damper without Edge Seals: 3 inch-lb/sq. ft. of damper.
c. Dampers with 2- to 3-Inch wg of Pressure Drop or Face Velocities of 1000 to 2500 fpm: Increase running torque by 1.5.

7. Coupling: V-bolt and V-shaped, toothed cradle.
8. Overload Protection: Electronic overload or digital rotation-sensing circuitry.
9. Fail-Safe Operation: Mechanical, spring-return mechanism with external, manual gear release on nonspring-return actuators.
10. Power Requirements (Modulating): Maximum 10 VA at 24 V ac or 8 W at 24 V dc.
11. Proportional Signal: 2 to 10 V dc or 4 to 20 mA, and 2- to 10-V dc position feedback signal.
12. Temperature Rating: Minus 22 to plus 122 deg F.
13. Run Time: 12 seconds open, 5 seconds closeds.

2.8 ELECTRICAL POWER CONNECTIONS

A. RTU to have a single connection of power to unit with unit-mounted disconnect switch accessible from outside unit and control-circuit transformer with built-in overcurrent protection.

2.9 CONTROLS

A. Control equipment and sequence of operation are specified in Section 23 09 00 "Controls and Instrumentation."

2.10 ROOF CURBS

A. Materials: Galvanized steel with corrosion-protection coating, watertight gaskets, and factory-installed wood nailer; complying with NRCA standards.

1. Curb Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.

    a. Materials: ASTM C1071, Type I or II.
    b. Thickness: 1 inch.

2. Application: Factory applied with adhesive and mechanical fasteners to the internal surface of curb.

    a. Liner Adhesive: Comply with ASTM C916, Type I.
    b. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in cabinet.
    c. Liner materials applied in this location to have airstream surface coated with a temperature-resistant coating or faced with a plain or coated fibrous mat or fabric depending on service air velocity.

B. Curb Dimensions: Height of 14 inches.

2.11 ACCESSORIES

A. Duplex, 115-V, ground-fault-interrupter outlet with 15-A overcurrent protection. Include transformer if required. Outlet is to be energized even if the unit main disconnect is open.

B. Remote potentiometer to adjust minimum economizer damper position.

C. Return-air bypass damper.

D. Factory- or field-installed, demand-controlled ventilation.

E. Safeties:

1. Smoke detector.

    a. UL 268A.
    b. Shall be approved and listed by the California State Fire Marshal.
    c. 24 VAC/DC or 120 VAC per Division 26.

2. Phase-loss protection.
3. High and low pressure control.
4. Electric coil airflow-proving switch.

F. Coil guards of painted, galvanized-steel wire.

G. Door switches to disable heating or reset set point when open.

H. Outdoor-air intake weather hood.

I. Service Lights and Switch: Factory installed in each accessible section with weatherproof cover. Factory wire lights to a single-point field connection.

2.12 MATERIALS

A. Galvanized Steel: ASTM A653/A653M.

B. Corrosion-Resistant Coating: Coat with a corrosion-resistant coating capable of withstanding a 3000-hour salt-spray test according to ASTM B117.

1. Standards:

a. ASTM B117 for salt spray.
b. ASTM D2794 for minimum impact resistance of 100 in-lb.
c. ASTM B3359 for cross-hatch adhesion of 5B.

2. Application: Spray.
3. Thickness: 1 mil.
4. Gloss: Minimum gloss of 60 on a 60-degree meter.

2.13 SOURCE QUALITY CONTROL

A. AHRI Compliance:

1. Comply with AHRI 210/240 for testing and rating energy efficiencies for RTUs.
2. Comply with AHRI 340/360 for testing and rating energy efficiencies for RTUs.
3. Comply with AHRI 270 for testing and rating sound performance for RTUs.
4. Comply with AHRI 1060 for testing and rating performance for air-to-air exchanger.

B. AMCA Compliance:

1. Comply with AMCA 11 and bear the AMCA-Certified Ratings Seal for air and sound performance according to AMCA 211 and AMCA 311.
2. Damper leakage tested according to AMCA 500-D.
3. Operating Limits: Classify according to AMCA 99.

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 RTUs.

B. Examine roughing-in for RTUs to verify actual locations of piping and duct connections before equipment installation.

C. Examine roofs for suitable conditions where RTUs will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Roof Curb: Install on roof structure, level and secure, according to NRCA's "NRCA Roofing Manual: Membrane Roof Systems." Install RTUs on curbs and coordinate roof penetrations and flashing with roof construction. Secure RTUs to upper curb rail, and secure curb base to roof framing or concrete base with anchor bolts. Coordinate sizes and locations of roof curbs with actual equipment provided.

3.3 PIPING CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to RTU, allow space for service and maintenance.

C. Connect condensate drain pans using NPS 3/4, ASTM B88, Type L copper tubing. Extend to nearest equipment or roof drain. Construct deep trap at connection to drain pan and install cleanouts at changes in direction.

3.4 DUCT CONNECTIONS

A. Comply with duct installation requirements specified in other HVAC Sections. Drawings indicate general arrangement of ducts. The following are specific connection requirements:

1. Install ducts to termination at top of roof curb.
2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
3. Connect supply ducts to RTUs with flexible duct connectors specified in Section 23 33 00 "Air Duct Accessories."
4. Install return-air duct continuously through roof structure.

3.5 ELECTRICAL CONNECTIONS

A. Connect electrical wiring according to Division 26.

B. Ground equipment according to Division 26.

C. Install electrical devices furnished by manufacturer, but not factory mounted, according to California Electrical Code and NECA 1.

3.6 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Connect control wiring according to Division 26.

3.7 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Inspect for visible damage to unit casing.
3. Inspect for visible damage to compressor, coils, and fans.
4. Inspect internal insulation.
5. Verify that labels are clearly visible.
6. Verify that clearances have been provided for servicing.
7. Verify that controls are connected and operable.
8. Verify that filters are installed.
9. Clean condenser coil and inspect for construction debris.
10. Remove packing from vibration isolators.
11. Inspect operation of barometric relief dampers.
12. Verify lubrication on fan and motor bearings.
13. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
14. Start unit according to manufacturer's written instructions.

    a. Start refrigeration system.
    b. Do not operate below recommended low-ambient temperature.
    c. Complete startup sheets and attach copy with Contractor's startup report.

15. Inspect and record performance of interlocks and protective devices; verify sequences.
16. Operate unit for an initial period as recommended or required by manufacturer.
17. Calibrate thermostats.
18. Adjust and inspect high-temperature limits.
19. Inspect outdoor-air dampers for proper stroke and interlock with return-air dampers.
20. Start refrigeration system and measure and record the following when ambient is a minimum of 15 deg F above return-air temperature:

    a. Coil leaving-air, dry- and wet-bulb temperatures.
    b. Coil entering-air, dry- and wet-bulb temperatures.
    c. Outdoor-air, dry-bulb temperature.
    d. Outdoor-air-coil, discharge-air, dry-bulb temperature.

21. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.
22. Measure and record the following minimum and maximum airflows. Plot fan volumes on fan curve.

a. Supply-air volume.
b. Return-air volume.
c. Relief-air volume.
d. Outdoor-air intake volume.

23. Simulate maximum cooling demand and inspect the following:

    a. Compressor refrigerant suction and hot-gas pressures.
    b. Short circuiting of air through condenser coil or from condenser fans to outdoor-air intake.

24. Verify operation of remote panel including pilot-light operation and failure modes. Inspect the following:

    a. Low-temperature safety operation.
    b. Filter high-pressure differential alarm.
    c. Economizer to minimum outdoor-air changeover.
    d. Power exhaust fan operation.
    e. Smoke and firestat alarms.

25. After startup and performance testing and prior to Beneficial Occupancy, replace existing filters with new filters.

3.8 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Comply with requirements in Section 23 05 93 "Testing, Adjusting, and Balancing for HVAC" for air-handling system testing, adjusting, and balancing.

3.9 CLEANING

A. After completing system installation and testing, adjusting, and balancing RTUs and air-distribution systems, clean RTUs internally to remove foreign material and construction dirt and dust. Clean fan wheels, cabinets, dampers, coils, and filter housings, and install new, clean filters.

3.10 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Tests and Inspections:

1. After installing RTUs and after electrical circuitry has been energized, test units for compliance with requirements.
2. Inspect for and remove shipping bolts, blocks, and tie-down straps.

3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. RTU will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.11 DEMONSTRATION

A. Engage a factory-authorized service representative to train the State's maintenance personnel to adjust, operate, and maintain RTUs.

END OF SECTION 23 74 16.11

SECTION 23 81 26

SPLIT-SYSTEM AIR-CONDITIONERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes split-system air-conditioning and heat-pump units consisting of separate evaporator-fan and compressor-condenser components.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. Sustainable Design Submittals:

1. Refrigerant: Product Data for refrigerants, indicating compliance with refrigerant management practices.
2. Product Data: For energy performance.

C. 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. Wiring Diagrams: For power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in California Electrical Code, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance:

1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - " Procedures," and Section 7 - "Construction and System Start-up."

C. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1.

1.6 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

1. Warranty Period:

a. For Compressor: One year from date of Beneficial Occupancy.
b. For Parts: One year from date of Beneficial Occupancy.
c. For Labor: One year from date of Beneficial Occupancy.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Mitsubishi Electric & Electronics USA, Inc.
2. Trane.
3. Or equal.

2.2 INDOOR UNITS (5 TONS OR LESS)

A. Wall-Mounted, Evaporator-Fan Components:

1. Cabinet: Enameled steel with removable panels on front and ends, and discharge drain pans with drain connection.
2. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
3. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements; with refractory ceramic support bushings, automatic-reset thermal cutout, built-in magnetic contactors, manual-reset thermal cutout, airflow proving device, and one-time fuses in terminal box for overcurrent protection.
4. Fan: Direct drive, centrifugal.
5. Fan Motors:

    a. Multitapped, multispeed with internal thermal protection and permanent lubrication.
    b. Enclosure Type: Totally enclosed, fan cooled.
    c. NEMA Premium (TM) efficient motors as defined in NEMA MG 1.
    d. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.
    e. Mount unit-mounted disconnect switches on exterior of unit.

6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
7. Condensate Drain Pans:

    a. Fabricated with one percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.

        1) Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1.
        2) Depth: A minimum of 1 inch deep.

    b. Single-wall, galvanized-steel sheet.
    c. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.

        1) Minimum Connection Size: NPS 3/4.

    d. Pan-Top Surface Coating: Asphaltic waterproofing compound.

8. Air Filtration Section:

    a. General Requirements for Air Filtration Section:

        1) Comply with NFPA 90A.
        2) Minimum Arrestance: According to ASHRAE 52.1 and MERV according to ASHRAE 52.2.
        3) Filter-Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lifted out from access plenum.

b. Disposable Panel Filters:

1) Factory-fabricated, viscous-coated, flat-panel type.
2) Merv according to ASHRAE 52.2: 5.
3) Media: Interlaced glass fibers sprayed with nonflammable adhesive.
4) Frame: Galvanized steel, with metal grid on outlet side, steel rod grid on inlet side, and hinged; with pull and retaining handles.

2.3 OUTDOOR UNITS (5 TONS OR LESS)

A. Air-Cooled, Compressor-Condenser Components:

1. Casing: Steel, finished with baked enamel, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
2. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

a. Compressor Type: Scroll.
b. Refrigerant: R-454B.
c. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with ARI 206/110.

3. Heat-Pump Components: Reversing valve and low-temperature-air cutoff thermostat.
4. Fan: Aluminum-propeller type, directly connected to motor.
5. Motor: Permanently lubricated, with integral thermal-overload protection.
6. Low Ambient Kit: Permits operation down to 45 deg F.
7. Mounting Base: Polyethylene.

2.4 ACCESSORIES

A. Thermostat: Low voltage with subbase to control compressor and evaporator fan.

B. Thermostat: Wireless infrared functioning to remotely control compressor and evaporator fan, with the following features:

1. Compressor time delay.
2. 24-hour time control of system stop and start.
3. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
4. Fan-speed selection including auto setting.

C. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

D. Drain Hose: For condensate.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install roof-mounted, compressor-condenser components on equipment supports. Anchor units to supports with removable, cadmium-plated fasteners.

D. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. 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.

C. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Remove and replace malfunctioning units and retest as specified above.

E. Prepare test and inspection reports.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train the State's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 23 81 26

SECTION 26 00 10

SUPPLEMENTAL REQUIREMENTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes requirements generally applicable to all electrical Work on the Project, including but not limited to Work specified in Divisions 26, 27, and 28.

1.2 REFERENCES

A. Abbreviations and Acronyms for Electrical Terms and Units of Measure:

1. 8P8C: An 8-position 8-contact modular jack.
2. A: Ampere, unit of electrical current.
3. AC or ac: Alternating current.
4. AFCI: Arc-fault circuit interrupter.
5. AGC: Automatic gain control.
6. AIC: Ampere interrupting capacity.
7. AL, Al, or ALUM: Aluminum.
8. ASD: Adjustable-speed drive.
9. ATP: Acceptance test procedure.
10. ATS: Automatic transfer switch.
11. A/V: Audio/visual.
12. AWG: American wire gauge; see ASTM B258.
13. BAS: Building automation system.
14. BDA: Bi-directional amplifier.
15. BIL: Basic impulse insulation level.
16. BIM: Building information modeling.
17. BMS: Building management system.
18. BNC: Bayonet Neill-Concelman - type of connector.
19. B/W: Black and white.
20. CAD: Computer-aided design or drafting.
21. CATV: Community antenna television.
22. CB: Circuit breaker.
23. CCD: Charge-coupled device.
24. CCTV: Closed-circuit television.
25. cd: Candela, the SI fundamental unit of luminous intensity.
26. CO/ALR: Copper-aluminum, revised.
27. COPS: Critical operations power system.
28. CU or Cu: Copper.
29. CU-AL or AL-CU: Copper-aluminum.
30. DACR: Digital alarm communicator receiver.
31. DACT: Digital alarm communicator transmitter.

32. DAS: Distributed antenna system.
33. dB: Decibel, a unitless logarithmic ratio of two electrical, acoustical, or optical power values.
34. dB(A-weighted) or dB(A): Decibel acoustical sound pressure level with A-weighting applied in accordance with IEC 61672-1.
35. dB(adjusted) or dBa: Decibel weighted absolute noise power with respect to 3.16 pW (minus 85 dBm).
36. dBm: Decibel absolute power with respect to 1 mW.
37. dBmV: Decibel absolute voltage with respect to 1 mV across identical impedance.
38. DC or dc: Direct current.
39. DCOA: Designated critical operations area.
40. DDC: Direct digital control (HVAC).
41. DGP: Data gathering panel.
42. DHCP: Dynamic host configuration protocol.
43. EGC: Equipment grounding conductor.
44. ELV: Extra-low voltage.
45. EMF: Electromotive force.
46. EMI: Electromagnetic interference.
47. EMP: Electrical maintenance program (operation and maintenance); electromagnetic pulse (transient analysis).
48. EPS: Emergency power supply.
49. EPSS: Emergency power supply system.
50. ERCES: Emergency responder communications enhancement system.
51. ESS: Energy storage system.
52. EV: Electric vehicle.
53. EVPE: Electric vehicle power export equipment.
54. EVSE: Electric vehicle supply equipment.
55. FACU: Fire-alarm control unit.
56. FAS: Fire-alarm system.
57. fc: Footcandle, an internationally recognized unit of illuminance equal to one lumen per square foot or 10.76 lx. The simplified conversion 1 fc = 10 lx in the Specifications is common practice and considered adequate precision for building construction activities. When there are conflicts, lux is the primary unit; footcandle is specified for convenience.
58. FCC: Federal Communications Commission; fire command center.
59. FLC: Full-load current.
60. ft: Foot.
61. ft-cd: Foot-candle, the antiquated U.S. standard unit of illuminance, equal to one international candle measured at a distance of one foot, that was superseded in 1948 by the unit "footcandle" when the SI unit candela (cd) replaced the international candle; see "fc."
62. FTP: File transfer protocol.
63. FXO: Foreign exchange office.
64. GEC: Grounding electrode conductor.
65. GFCI: Ground-fault circuit interrupter.
66. GFPE: Ground-fault protection of equipment.
67. GND: Ground.
68. GROL: General Radiotelephone Operator License (FCC).

69. H.323: Audio and video protocol.
70. HACR: Heating, air conditioning, and refrigeration.
71. HDPE: High-density polyethylene.
72. HID: High-intensity discharge.
73. HP or hp: Horsepower.
74. HVAC: Heating, ventilating, and air conditioning.
75. Hz: Hertz.
76. I&TFAS: Inspection and testing of fire-alarm system.
77. IB-PSC: In-building public safety communications.
78. IBT: Intersystem bonding termination.
79. ICT: Information and communications technology.
80. IDC: Initiating device circuit.
81. inch: Inch. To avoid confusion, the abbreviation "in." is not used.
82. I/O: Input/output.
83. IP: Ingress protection rating (enclosures); Internet protocol (communications).
84. IR: Infrared.
85. IS: Intrinsically safe.
86. IT&R: Inspecting, testing, and repair.
87. ITE: Information technology equipment.
88. kAIC: Kiloampere interrupting capacity.
89. kcmil or MCM: One thousand circular mils.
90. kV: Kilovolt.
91. kVA: Kilovolt-ampere.
92. kvar: Kilovolt-ampere reactive.
93. kW: Kilowatt.
94. kWh: Kilowatt-hour.
95. LAN: Local area network.
96. lb: Pound (weight).
97. lbf: Pound (force).
98. LCD: Liquid-crystal display.
99. LCDI: Leakage-current detector-interrupter.
100. LED: Light-emitting diode.
101. Li-ion: Lithium-ion.
102. lm: Lumen, the SI-derived unit of luminous flux.
103. LNG: Liquefied natural gas.
104. LP-Gas: Liquefied petroleum gas.
105. LRC: Locked-rotor current.
106. LTE: Long-term evolution (mobile device technology standard).
107. LV: Low voltage.
108. lx: Lux, the SI-derived unit of illuminance equal to one lumen per square meter.
109. m: Meter.
110. MATV: Master antenna television.
111. MCC: Motor-control center.
112. MDC: Modular data center.
113. MG set: Motor-generator set.
114. MIDI: Musical instrument digital interface.
115. MLO: Main lugs only.
116. MPEG: Moving Picture Experts Group.
117. MPEG-2: Abbreviation for the ISO/IEC Moving Picture Experts Group's standard

for generic coding of moving pictures and associated audio information (ISO/IEC 13818) released in 1995 and used for most over-the-air and satellite broadcast digital television.

118. MPEG-4: Abbreviation for the ISO/IEC Moving Picture Experts Group's standard framework for coding of audio-visual objects (ISO/IEC 14496) released in 1999, with digital rights management and more advanced compression algorithms than MPEG-2.
119. MOV: Metal-oxide varistor.
120. MV: Medium voltage.
121. MVA: Megavolt-ampere.
122. mW: Milliwatt.
123. MW: Megawatt.
124. MWh: Megawatt-hour.
125. NAC: Notification appliance circuit.
126. N.C.: Normally closed.
127. NFC: Near field communications.
128. Ni-Cd: Nickel-cadmium.
129. NICET: National Institute for Certification in Engineering Technologies, a division of the National Society of Professional Engineers.
130. Ni-MH: Nickel-metal hydride.
131. NIU: Network interface unit.
132. N.O.: Normally open.
133. NPT: National (American) standard pipe taper.
134. NTSC: National Television System Committee.
135. OCPD: Overcurrent protective device.
136. ONT: Optical network terminal.
137. PC: Personal computer.
138. PCS: Power conversion system.
139. PCU: Power-conditioning unit.
140. Percent obs/ft (percent obs/m): Percent obscuration per unit distance; unit of measure for sensitivity of smoke detectors.
141. PF or pf: Power factor.
142. PHEV: Plug-in hybrid electric vehicle.
143. PIR: Passive infrared.
144. PLC: Programmable logic controller.
145. PLFA: Power-limited fire alarm.
146. PoE: Power over Ethernet.
147. POTS: Plain old telephone service. See "public switched telephone network" definition.
148. PSTN: Public switched telephone network.
149. PTZ: Pan-tilt-zoom.
150. PV: Photovoltaic.
151. PVC: Polyvinyl chloride.
152. pW: Picowatt.
153. RAID: Redundant array of inexpensive disks; redundant array of independent disks.
154. RAM: Random-access memory.
155. RAT: Radio alarm transmitter.
156. REX: Request-to-exit.

157. RF: Radio frequency.
158. RFI: (electrical) Radio-frequency interference; (contract) Request for interpretation.
159. RMS or rms: Root-mean-square.
160. RPM or rpm: Revolutions per minute.
161. SCADA: Supervisory control and data acquisition.
162. SCCR: Short-circuit current rating.
163. SCR: Silicon-controlled rectifier.
164. SIP: Session initiation protocol.
165. SLC: Signaling-line circuit.
166. SPD: Surge protective device.
167. SPDT: Single pole, double throw.
168. sq.: Square.
169. SWD: Switching duty.
170. TCP/IP: Transmission Control Protocol/Internet Protocol.
171. TEFC: Totally enclosed fan-cooled.
172. TR: Tamper resistant.
173. TVSS: Transient voltage surge suppressor.
174. UHF: Ultra-high frequency.
175. UL: (standards) UL Standards & Engagement Inc.; (product categories) UL, LLC.
176. UL CCN: UL Category Control Number.
177. UPS: Uninterruptible power supply.
178. USB: Universal serial bus.
179. UTC: Coordinated universal time.
180. UV: Ultraviolet.
181. V: Volt, unit of electromotive force.
182. V(ac): Volt, alternating current.
183. V(dc): Volt, direct current.
184. VA: Volt-ampere, unit of complex electrical power.
185. VAR: Volt-ampere reactive, unit of reactive electrical power.
186. VFC: Variable-frequency controller.
187. VOM: Volt-ohm-multimeter.
188. VoIP: Voice over Internet Protocol.
189. VPN: Virtual private network.
190. VRLA: Valve regulated lead acid; also called "sealed lead acid (SLA)" or "valve regulated sealed lead acid."
191. VU: Volume unit.
192. W: Watt, unit of real electrical power.
193. WAN: Wide area network.
194. Wh: Watt-hour, unit of electrical energy usage.
195. WPT: Wireless power transfer.
196. WPTE: Wireless power transfer equipment.
197. WR: Weather resistant.

B. Abbreviations and Acronyms for Electrical Raceway Types:

1. EMT: Electrical metallic tubing.
2. EMT-A: Aluminum electrical metallic tubing.
3. EMT-S: Steel electrical metallic tubing.
4. EMT-SS: Stainless steel electrical metallic tubing.

5. ENT: Electrical nonmetallic tubing.
6. EPEC: Electrical HDPE underground conduit (thin wall).
7. EPEC-A: Type A electrical HDPE underground conduit.
8. EPEC-B: Type B electrical HDPE underground conduit.
9. ERMC: Electrical rigid metal conduit.
10. ERMC-A: Aluminum electrical rigid metal conduit.
11. ERMC-S: Steel electrical rigid metal conduit.
12. ERMC-S-G: Galvanized-steel electrical rigid metal conduit.
13. ERMC-S-PVC: PVC-coated-steel electrical rigid metal conduit.
14. ERMC-SS: Stainless steel electrical rigid metal conduit.
15. FMC: Flexible metal conduit.
16. FMC-A: Aluminum flexible metal conduit.
17. FMC-S: Steel flexible metal conduit.
18. FMT: Steel flexible metallic tubing.
19. FNMC: Flexible nonmetallic conduit. See "LFNC."
20. HDPE: HDPE underground conduit (thick wall).
21. HDPE-40: Schedule 40 HDPE underground conduit.
22. HDPE-80: Schedule 80 HDPE underground conduit.
23. IMC: Steel electrical intermediate metal conduit.
24. LFMC: Liquidtight flexible metal conduit.
25. LFMC-A: Aluminum liquidtight flexible metal conduit.
26. LFMC-S: Steel liquidtight flexible metal conduit.
27. LFMC-SS: Stainless steel liquidtight flexible metal conduit.
28. LFNC: Liquidtight flexible nonmetallic conduit.
29. LFNC-A: Layered (Type A) liquidtight flexible nonmetallic conduit.
30. LFNC-B: Integral (Type B) liquidtight flexible nonmetallic conduit.
31. LFNC-C: Corrugated (Type C) liquidtight flexible nonmetallic conduit.
32. PVC: Rigid PVC conduit.
33. PVC-40: Schedule 40 rigid PVC conduit.
34. PVC-80: Schedule 80 rigid PVC Conduit.
35. PVC-A: Type A rigid PVC concrete-encased conduit.
36. PVC-EB: Type EB rigid PVC concrete-encased underground conduit.
37. RGS: See ERMC-S-G.
38. RMC: See ERMC.
39. RTRC: Reinforced thermosetting resin conduit.
40. RTRC-AG: Low-halogen, aboveground reinforced thermosetting resin conduit.
41. RTRC-AG-HW: Heavy wall, low-halogen, aboveground reinforced thermosetting resin conduit.
42. RTRC-AG-SW: Standard wall, low-halogen, aboveground reinforced thermosetting resin conduit.
43. RTRC-AG-XW: Extra heavy wall, low-halogen, aboveground reinforced thermosetting resin conduit.
44. RTRC-BG: Low-halogen, belowground reinforced thermosetting resin conduit.

C. Abbreviations and Acronyms for Electrical Single-Conductor and Multiple-Conductor Cable Types:

1. AC: Armored cable.
2. CATV: Coaxial general-purpose cable.
3. CATVP: Coaxial plenum cable.

4. CATVR: Coaxial riser cable.
5. CI: Circuit integrity cable.
6. CL2: Class 2 cable.
7. CL2P: Class 2 plenum cable.
8. CL2R: Class 2 riser cable.
9. CL2X: Class 2 cable, limited use.
10. CL3: Class 3 cable.
11. CL3P: Class 3 plenum cable.
12. CL3R: Class 3 riser cable.
13. CL3X: Class 3 cable, limited use.
14. CM: Communications general-purpose cable.
15. CMG: Communications general-purpose cable.
16. CMP: Communications plenum cable.
17. CMR: Communications riser cable.
18. CMUC: Under-carpet communications wire and cable.
19. CMX: Communications cable, limited use.
20. DG: Distributed generation cable.
21. FC: Flat cable.
22. FCC: Flat conductor cable.
23. FPL: Power-limited fire-alarm cable.
24. FPLP: Power-limited fire-alarm plenum cable.
25. FPLR: Power-limited fire-alarm riser cable.
26. IGS: Integrated gas spacer cable.
27. ITC: Instrumentation tray cable.
28. ITC-ER: Instrumentation tray cable, exposed run.
29. MC: Metal-clad cable.
30. MC-FPL/FPLR/FPLP: Metal-clad cable containing FPL, FPLR, or FPLP.
31. MC-HL: Metal-clad cable, hazardous location.
32. MI: Mineral-insulated, metal-sheathed cable.
33. MTW: (machine tool wiring) Moisture-, heat-, and oil-resistant thermoplastic cable.
34. MV: Medium-voltage cable.
35. NM: Nonmetallic sheathed cable.
36. NMC: Nonmetallic sheathed cable with corrosion-resistant nonmetallic jacket.
37. NMS: Nonmetallic sheathed cable with signaling, data, and communications conductors, plus power or control conductors.
38. NPLF: Non-power-limited fire-alarm circuit cable.
39. NPLFP: Non-power-limited fire-alarm circuit cable for environmental air spaces.
40. NPLFR: Non-power-limited fire-alarm circuit riser cable.
41. NUCC: Nonmetallic underground HDPE conduit with conductors.
42. OFC: Conductive optical fiber general-purpose cable.
43. OFCG: Conductive optical fiber general-purpose cable.
44. OFCP: Conductive optical fiber plenum cable.
45. OFCR: Conductive optical fiber riser cable.
46. OFN: Nonconductive optical fiber general-purpose cable.
47. OFNG: Nonconductive optical fiber general-purpose cable.
48. OFNP: Nonconductive optical fiber plenum cable.
49. OFNR: Nonconductive optical fiber riser cable.
50. P: Marine shipboard cable.

51. PLTC: Power-limited tray cable.
52. PLTC-ER: Power-limited tray cable, exposed run.
53. PV: Photovoltaic cable.
54. RHH: (high heat) Thermoset rubber, heat-resistant cable.
55. RHW: Thermoset rubber, moisture-resistant cable.
56. SA: Silicone rubber cable.
57. SE: Service-entrance cable.
58. SER: Service-entrance cable, round.
59. SEU: Service-entrance cable, flat.
60. SIS: Thermoset cable for switchboard and switchgear wiring.
61. TBS: Thermoplastic cable with outer braid.
62. TC: Tray cable.
63. TC-ER: Tray cable, exposed run.
64. TC-ER-HL: Tray cable, exposed run, hazardous location.
65. THW: Thermoplastic, heat- and moisture-resistant cable.
66. THHN: Thermoplastic, heat-resistant cable with nylon jacket outer sheath.
67. THHW: Thermoplastic, heat- and moisture-resistant cable.
68. THWN: Thermoplastic, moisture- and heat-resistant cable with nylon jacket outer sheath.
69. TW: Thermoplastic, moisture-resistant cable.
70. UF: Underground feeder and branch-circuit cable.
71. USE: Underground service-entrance cable.
72. XHH: Cross-linked polyethylene, heat-resistant cable.
73. XHHW: Cross-linked polyethylene, heat- and moisture-resistant cable.

D. Abbreviations and Acronyms for Electrical Flexible Cord Types:

1. SEO: 600 V extra-hard-usage, hard-service cord with thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer covering for damp locations.
2. SEOW: 600 V extra-hard-usage, hard-service cord with thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer covering for damp or wet locations.
3. SEOO: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer covering for damp locations.
4. SEOOW: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer covering for damp or wet locations.
5. SJEO: 300 V hard-usage, junior hard-service cord with thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer cover for damp locations.
6. SJEOW: 300 V hard-usage, junior hard-service cord with thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer cover for damp or wet locations.
7. SJEOO: 300 V hard-usage, junior hard-service cord with oil-resistant thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer cover for damp locations.
8. SJEOOW: 300 V hard-usage, junior hard-service cord with oil-resistant thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer

cover for damp or wet locations.

9. SJO: 300 V hard-usage, junior hard-service cord with thermoset insulation and oil-resistant thermoset outer cover for damp locations.
10. SJOW: 300 V hard-usage, junior hard-service cord with thermoset insulation and oil-resistant thermoset outer cover for damp or wet locations.
11. SJOO: 300 V hard-usage, junior hard-service cord with oil-resistant thermoset insulation and oil-resistant thermoset outer cover for damp locations.
12. SJOOW: 300 V hard-usage, junior hard-service cord with oil-resistant thermoset insulation and oil-resistant thermoset outer cover for damp or wet locations.
13. SJTO: 300 V hard-usage, junior hard-service cord with thermoplastic insulation and oil-resistant thermoplastic outer cover for damp locations.
14. SJTOW: 300 V hard-usage, junior hard-service cord with thermoplastic insulation and oil-resistant thermoplastic outer cover for damp or wet locations.
15. SJTOO: 300 V hard-usage, junior hard-service cord with oil-resistant thermoplastic insulation and oil-resistant thermoplastic outer cover for damp locations.
16. SJTOOW: 300 V hard-usage, junior hard-service cord with oil-resistant thermoplastic insulation and oil-resistant thermoplastic outer cover for damp or wet locations.
17. SO: 600 V extra-hard-usage, hard-service cord with thermoset insulation and oil-resistant thermoset outer covering for damp locations.
18. SOW: 600 V extra-hard-usage, hard-service cord with thermoset insulation and oil-resistant thermoset outer covering for damp or wet locations.
19. SOO: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoset insulation and oil-resistant thermoset outer covering for damp locations.
20. SOOW: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoset insulation and oil-resistant thermoset outer covering for damp or wet locations.
21. STO: 600 V extra-hard-usage, hard-service cord with thermoplastic insulation and oil-resistant thermoplastic outer covering for damp locations.
22. STOW: 600 V extra-hard-usage, hard-service cord with thermoplastic insulation and oil-resistant thermoplastic outer covering for damp or wet locations.
23. STOO: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoplastic insulation and oil-resistant thermoplastic outer covering for damp locations.
24. STOOW: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoplastic insulation and oil-resistant thermoplastic outer covering for damp or wet locations.

E. Abbreviations for Communications Spaces:

1. EF: Entrance facility; generally serves campus or building. EF may include an ER.
2. ER: Equipment room; generally serves campus or building.
3. TE: Telecommunications enclosure; generally serves a single tenant or floor.
4. TR: Telecommunications room; generally serves a single tenant or floor.

F. Abbreviations for Communications Facilities:

1. HC: Horizontal cross-connect; also called "floor distributor" (FD).
2. IC: Intermediate cross-connect; also called "building distributor" (BD).
3. MC: Main cross-connect; also called "campus distributor" (CD).

G. Abbreviations for Grounding and Bonding:

1. BBC: Backbone bonding conductor, for connecting multiple TBBs serving the same floor.
2. PBB: Primary bonding busbar; located in main distribution frame room, ideally near electrical service entrance.
3. RBB: Rack bonding busbar; located in equipment cabinets and racks.
4. SBB: Secondary bonding busbar; located in intermediate distribution frame rooms.
5. TBB: Telecommunications bonding backbone, for connecting SBBs to PBB.
6. TBC: Telecommunications bonding conductor, for connecting PBB to intersystem bonding termination device or busbar at electrical service entrance.
7. TEBC: Telecommunications equipment bonding conductor, for connecting RBBs to SBBs or PBB.
8. UBC: Unit bonding conductor, for connecting individual communications equipment to RBBs or SBBs.

H. Definitions:

1. 8-Position 8-Contact (8P8C) Modular Jack: An unkeyed jack with up to eight contacts commonly used to terminate twisted pair and multiconductor Ethernet cable. Also called a "TIA-1096 miniature 8-position series jack" (8PSJ), or an "IEC 8877 8-pole jack."

    a. Be careful when suppliers use "RJ45" generically. Obsolete RJ45 jacks used for analog telephone cables have rejection keys. 8P8C jacks used for digital telephone cables and Ethernet cables do not have rejection keys.

2. Agile Receiver: A broadband receiver that can be tuned to any desired channel.
3. Backbone: Primary segment of ERCES between donor antenna and distribution cabling.
4. Basic Impulse Insulation Level (BIL): Reference insulation level expressed in impulse crest voltage with a standard wave not longer than 1.5 times 50 microseconds and 1.5 times 40 microseconds.
5. Broadband: For the purposes of this Section, wide bandwidth equipment or systems that can carry signals occupying in the frequency range of 54 to 1002 MHz. A broadband communication system can simultaneously accommodate television, voice, data, and many other services.
6. Broadcast Media: Loudspeakers, radios, cellular phones, and other media that will carry the selected message to the selected audience.
7. Cable: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "cable" is (1) a conductor with insulation, or a stranded conductor with or without insulation (single-conductor cable); or (2) a combination of conductors insulated from one another (multiple-conductor cable).
8. Carrier: A pure-frequency signal that is modulated to carry information. In the process of modulation, the signal is spread out over a wider band. The carrier frequency is the center frequency on any television channel.
9. Channels: Separate parallel signal paths, from sources to loudspeakers or loudspeaker zones, with separate amplification and switching that permit

selection between paths for speaker alternative program signals.

10. Communications Jack: A fixed connecting device designed for insertion of a communications cable plug.
11. Communications Outlet: One or more communications jacks, or cables and plugs, mounted in a box or ring, with a suitable protective cover.
12. Conductive Cable: Cable containing non-current-carrying electrically conductive members such as metallic strength members and metallic vapor barriers.
13. Conductor: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "conductor" is (1) a wire or combination of wires not insulated from one another, suitable for carrying an electric current; (2) (National Electrical Safety Code) a material, usually in the form of wire, cable, or bar, suitable for carrying an electric current; or (3) (general) a substance or body that allows a current of electricity to pass continuously along it.
14. Conduit: A structure containing one or more duct raceways.
15. Control Unit: A system component that monitors inputs and controls outputs through various types of circuits.

    a. Autonomous Control Unit (ACU): The primary control unit for an in-building mass notification system (MNS).
    b. Emergency Communications Control Unit (ECCU): A system capable of sending mass notification messages to individual buildings, zones of buildings, individual outdoor loudspeaker arrays, or zones of outdoor loudspeaker arrays; or a building, multiple buildings, outside areas, or a combination of these.
    c. Fire-alarm control unit (FACU).
    d. Wireless Control Unit: A component that transmits/receives and processes wireless signals.

16. Designated Seismic System: An architectural, electrical, or mechanical system and its components for which the component importance factor is greater than 1.0 when determined in accordance with applicable standards.
17. Direct Buried: Installed underground without encasement in concrete or other protective material.
18. Downlink: The signal from a base station to portable radios.
19. Duct Bank: An arrangement of conduit providing one or more continuous duct raceways between two points.
20. Duct Raceway: A single enclosed raceway for conductors or cable.
21. Electrical Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.
22. Emergency Communications System (ECS): A system for the protection of life by indicating the existence of an emergency situation and communicating information necessary to facilitate an appropriate response and action.

    a. Distributed Recipient Mass Notification System (DRMNS): A system meant to communicate directly to targeted individuals and groups that might not be in a contiguous area.
    b. Emergency Voice/Alarm Communications System (EVACS): Dedicated manual or automatic facilities for originating and distributing voice instructions, as well as evacuation signals pertaining to an emergency, to

the occupants of a building.

c. Mass Notification System (MNS): A system used to provide information and instructions to people in buildings or other spaces using intelligible voice communications and including visual signals, text, graphics, tactile, or other communication methods (in-building MNS); and could have the capability to provide real-time information to outdoor areas and to communicate with other notification systems provided for a campus, region, or global geographic setting (wide-area MNS).

23. Emergency Systems: Those systems legally required and classed as emergency by municipal, state, federal, or other codes, or by any governmental agency having jurisdiction that is designed to ensure continuity of lighting, electrical power, or both, to designated areas and equipment in the event of failure of the normal supply for safety of human life.
24. Enclosure: The case or housing of an apparatus, or the fence or wall(s) surrounding an installation, to prevent personnel from accidentally contacting energized parts or to protect the equipment from physical damage. Types of enclosures and enclosure covers include the following:

    a. Cabinet: An enclosure that is designed for either surface mounting or flush mounting and is provided with a frame, mat, or trim in which a swinging door or doors are or can be hung.
    b. Concrete Box: A box intended for use in poured concrete.
    c. Conduit Body: A means for providing access to the interior of a conduit or tubing system through one or more removable covers at a junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.
    d. Conduit Box: A box having threaded openings or knockouts for conduit, EMT, or fittings.
    e. Cover Plate: A cover designed for protecting wiring devices installed in flush-mounted device boxes while permitting their safe operation; also called a faceplate or wallplate.
    f. Cutout Box: An enclosure designed for surface mounting that has swinging doors or covers secured directly to and telescoping with the walls of the enclosure.
    g. Device Box: A box with provisions for mounting a wiring device directly to the box.
    h. Extension Ring: A ring intended to extend the sides of an outlet box or device box to increase the box depth, volume, or both.
    i. Floor Box: A box mounted in the floor intended for use with a floor box cover and other components to complete the floor box enclosure.
    j. Floor-Mounted Enclosure: A floor box and floor box cover assembly with means to mount in the floor that is sealed against the entrance of scrub water at the floor level.
    k. Floor Nozzle: An enclosure used on a wiring system, intended primarily as a housing for a receptacle, provided with a means, such as a collar, for surface-mounting on a floor, which may or may not include a stem to support it above the floor level, and is sealed against the entrance of scrub water at the floor level.
    l. Junction Box: A box with a blank cover that joins different runs of raceway

or cable and provides space for connection and branching of the enclosed conductors.

m. Outlet Box: A box that provides access to a wiring system having pryout openings, knockouts, threaded entries, or hubs in either the sides or the back, or both, for the entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting an outlet box cover, but without provisions for mounting a wiring device directly to the box.

n. Pedestal Floor Box Cover: A floor box cover that, when installed as intended, provides a means for typically vertical or near-vertical mounting of receptacle outlets above the floor's finished surface.

o. Pull Box: A box with a blank cover that joins different runs of raceway and provides access for pulling or replacing the enclosed cables or conductors.

p. Raised-Floor Box: A floor box intended for use in raised floors.

q. Recessed Access Floor Box: A floor box with provisions for mounting wiring devices below the floor surface.

r. Recessed Access Floor Box Cover: A floor box cover with provisions for passage of cords to recessed wiring devices mounted within a recessed floor box.

s. Ring: A sleeve, which is not necessarily round, used for positioning a recessed wiring device flush with the plaster, concrete, drywall, or other wall surface.

t. Ring Cover: A box cover, with raised center portion to accommodate a specific wall or ceiling thickness, for mounting wiring devices or luminaires flush with the surface.

u. Termination Box: An enclosure designed for installation of termination base assemblies consisting of bus bars, terminal strips, or terminal blocks with provision for wire connectors to accommodate incoming or outgoing conductors, or both.

25. Essential Electrical Systems: (healthcare facilities) Those systems designed to ensure continuity of electrical power to designated areas and functions of a healthcare facility during disruption of normal power sources, and also to minimize disruption within the internal wiring system.

26. Fault Limited: Providing or being served by a source of electrical power that is limited to not more than 100 W when tested in accordance with UL 62368-1.

    a. The term "fault limited" is intended to encompass most Class 1, 2, and 3 power-limited sources complying with Article 725 of NFPA 70; Class ES1 and ES2 electrical energy sources that are Class PS1 electrical power sources (e.g., USB); and Class ES3 electrical energy sources that are Class PS1 and PS2 electrical power sources (e.g., PoE). See UL 62368-1 for discussion of classes of electrical energy sources and classes of electrical power sources.

27. Headend: The control center of the MATV system, where incoming signals are amplified, converted, processed, and combined into a common cable along with any locally originated television signals, for transmission to user-interface points. It is also called the "central retransmission facility."

28. High-Performance Building: A building that integrates and optimizes on a life-cycle basis all major high-performance attributes, including energy conservation,

environment, safety, security, durability, accessibility, cost-benefit, productivity, sustainability, functionality, and operational considerations.

29. High Power Loudspeaker Array (HPLA): A product providing capability for voice and tone communication to large outdoor areas.
30. Jack: Also commonly called an "outlet," it is the fixed, female connector.
31. Jacket: A continuous nonmetallic outer covering for conductors or cables.
32. Local Operator Console (LOC): Equipment used by authorized personnel and emergency responders to activate and operate a mass notification system (MNS).
33. Luminaire: A complete lighting unit consisting of a light source such as a lamp, together with the parts designed to position the light source and connect it to the power supply. It may also include parts to protect the light source or the ballast or to distribute the light.
34. Master Control Unit: System component that accepts inputs from other control units and may also perform control-unit functions. The unit has limited capacity for the number of protected zones and is installed at an unattended location or at a location where it is not the attendant's primary function to monitor the security system.
35. Mode: The terms "Active Mode," "Off Mode," and "Standby Mode" are used as defined in the Energy Independence and Security Act (EISA) of 2007.
36. Monitoring: Acquisition, processing, communication, and display of system and equipment status data and event and alarm signals.
37. Monitoring Station: Facility that receives signals and has personnel in attendance at all times to respond to signals. A central station is a monitoring station that is listed.
38. Multi-Outlet Assembly: A type of surface, flush, or freestanding raceway designed to hold conductors, receptacles, and switches, assembled in the field or at the factory.
39. Nonsecure: Unlocked or open. (For doors and gates.)
40. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein. Also called "single-line diagram."
41. Plenum: A compartment or chamber to which one or more air ducts are connected and that forms part of the air distribution system.
42. Plug: Also commonly called a "connector," it is the removable, male telecommunications connector.
43. Protected Zone: A protected premises or an area within a protected premises that is provided with means to prevent an unwanted event.
44. Protective Device: A device that senses when an abnormal current flow, abnormal voltage potential, or other abnormal electrical waveform exists and then disconnects the affected portion of the circuit from the system. Common protective devices include fuses, circuit breakers, relays, ground-fault circuit interrupters, and arc-fault circuit interrupters.
45. Public Switched Telephone Network (PSTN): Analog telephone technology that uses twisted pair cables from a telephone-provider central office for the transmission medium. "PSTN" refers to the telephone network; "POTS" refers to the individual subscriber line.
46. Receptacle: A fixed connecting device arranged for insertion of a power cord plug. Also called a power jack.

47. Receptacle Outlet: One or more receptacles mounted in a box with a suitable protective cover.
48. Screen: A metallic layer, either a foil or braid, placed around a pair or group of conductors.
49. Secure: Closed and locked and with no unlock or open commands pending. (For doors and gates.)
50. Sheath: A continuous metallic covering for conductors or cables.
51. Shield: A metallic layer, either a foil or braid, placed around a pair or group of conductors.
52. Systems Integration: The bringing together of components of several systems containing interacting components to achieve indicated functional operation of combined systems.
53. UL Category Control Number (CCN): An alphabetic or alphanumeric code used to identify product categories covered by UL's Listing, Classification, and Recognition Services.
54. Uplink: The signal from a portable radio to the base station.
55. Voice over Internet Protocol (VoIP): Digital telephone packet technology that uses the internet for its transmission medium.
56. Voltage Class: For specified circuits and equipment, voltage classes are defined as follows:

    a. Control Voltage: Having electromotive force between any two conductors, or between a single conductor and ground, that is supplied from a battery or other Class 2 or Class 3 power-limited source.
    b. Line Voltage: (1) (controls) Designed to operate using the supplied low-voltage power without transformation. (2) (transmission lines, transformers, SPDs) The line-to-line voltage of the supplying power system.
    c. Extra-Low Voltage (ELV): Not having electromotive force between any two conductors, or between a single conductor and ground, exceeding 30 V(ac rms), 42 V(ac peak), or 60 V(dc).
    d. Low Voltage (LV): Having electromotive force between any two conductors, or between a single conductor and ground, that is rated above 30 V but not exceeding 1000 V.
    e. Medium Voltage (MV): Having electromotive force between any two conductors, or between a single conductor and ground, that is rated about 1 kV but not exceeding 69 kV.
    f. High Voltage: (1) (circuits) Having electromotive force between any two conductors, or between a single conductor and ground, that is rated above 69 kV but not exceeding 230 kV. (2) (safety) Having sufficient electromotive force to inflict bodily harm or injury.

57. Wire: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "wire" is a slender rod or filament of drawn metal. A group of small wires used as a single wire is properly called a "stranded wire." A wire or stranded wire covered with insulation is properly called an "insulated wire" or a "single-conductor cable." Nevertheless, when the context indicates that the wire is insulated, the term "wire" will be understood to include the insulation.
58. Zone. A defined area within a protected premises. It is a space or area for which an intrusion must be detected and uniquely identified. The sensor or group of

sensors must then be assigned to perform the detection, and any interface equipment between sensors and communication must link to master control unit.

1.3 COORDINATION

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by the State or others unless permitted under the following conditions:

1. Notify the State no fewer than fifteen days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without the State's written permission.
3. Coordinate interruption with systems impacted by outage including, but not limited to, the following:

a. Emergency lighting.
b. Fire-alarm systems.

B. Interruption of Existing Telephone Service: Do not interrupt telephone service to facilities occupied by the State or others unless permitted under the following conditions:

1. Notify the State no fewer than fifteen days in advance of proposed interruption of telephone service.
2. Do not proceed with interruption of telephone service without the State's written permission.

C. Interruption of Existing Internet Service: Do not interrupt internet service to facilities occupied by the State or others unless permitted under the following conditions:

1. Notify the State no fewer than fifteen days in advance of proposed interruption of telephone service.
2. Do not proceed with interruption of internet service without the State's written permission.

D. Interruption of Existing Security System: Do not interrupt security system to facilities occupied by the State or others unless permitted under the following conditions:

1. Notify the State no fewer than fifteen days in advance of proposed interruption of telephone service.
2. Do not proceed with interruption of security system without the State’s written permission.

E. Interruption of Existing Fire-Alarm System: Do not interrupt fire-alarm system to facilities occupied by the State or others unless permitted under the following conditions:

1. Notify the State no fewer than fifteen days in advance of proposed interruption of telephone service.

2. Do not proceed with interruption of fire-alarm system without the State's written permission.

1.4 PREINSTALLATION MEETINGS

A. Electrical Preconstruction Conference: Schedule conference with the State, not later than 10 days after Notice to Proceed. Agenda topics include, but are not limited to, the following:

1. Electrical installation schedule.
2. Status of power system studies.
3. Value analysis proposals and requests for substitution of electrical equipment.
4. Utility work coordination and class of service requests.
5. Commissioning activities.
6. Sustainability activities, including Measurement and Verification Plan.

B. Communications Preconstruction Conference: Schedule conference with the State not later than 10 days after Notice to Proceed. Agenda topics include, but are not limited to, the following:

1. Installation schedule for communications systems.
2. Value analysis proposals and requests for substitution of communications equipment.
3. Utility services work coordination and monitoring service requests.
4. Commissioning activities.
5. Sustainability activities.

C. Electronic Safety and Security Preconstruction Conference: Schedule conference with the State not later than 10 days after Notice to Proceed. Agenda topics include, but are not limited to, the following:

1. Installation schedule for security, fire-alarm, and other life-safety systems.
2. Value analysis proposals and requests for substitution of electronic safety and security equipment.
3. Monitoring services work coordination and monitoring service requests.
4. Commissioning activities.
5. Sustainability activities.

1.5 SEQUENCING

A. Conduct and submit results of power system studies before submitting product data and Shop Drawings for electrical equipment.

1.6 ACTION SUBMITTALS

A. Coordination Drawings for Structural Supports: Show coordination of structural supports for equipment and devices, including restraints and bracing for control of

seismic and wind loads, with other systems, equipment, and structural supports in the vicinity.

B. Coordination Drawings for Ceiling Areas: Where indicated, provide reflected ceiling plan(s), supplemented by sections and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Suspended ceiling components.
2. Structural members to which equipment and suspension systems will be attached.
3. Size and location of access panels on ceilings.
4. Elevation, size, and route of sprinkler piping.
5. Elevation, size, and route of plumbing piping.
6. Elevation, size, and route of ductwork.
7. Elevation, size, and route of cable tray.
8. Elevation, size, and route of conduit.
9. Elevation and size of wall-mounted and ceiling-mounted equipment.
10. Access panels.
11. Sprinklers.
12. Air inlets and outlets.
13. Control modules.
14. Luminaires.
15. Communications devices.
16. Speakers.
17. Security devices.
18. Fire-alarm devices.
19. Indicate clear dimensions for maintenance access in front of equipment.
20. Indicate dimensions of fully open access doors.

C. Coordination Drawings for Cable Tray Routing: Reflected ceiling plan(s), supplemented by sections and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Elevation, size, and route of cable trays.
2. Relationships between components and adjacent structural, electrical, and mechanical elements.
3. Vertical and horizontal offsets and transitions.
4. Elevation and size of sleeves for wall, ceiling, and floor cable penetrations.
5. Elevation of ceilings and size of ceiling tiles.
6. Locations of access panels on ceilings.
7. Locations where cable tray crosses or parallels sprinkler piping.
8. Locations where cable tray crosses plumbing piping.
9. Locations where cable tray crosses or parallels ductwork.
10. Locations of access panels on ductwork.
11. Locations where cable tray crosses conduit.
12. Items blocking access around cable trays, including the following:

    a. Light fixtures.
    b. Speakers.

c. Fire-alarm devices.
d. Power outlets.
e. Wall-mounted equipment.
f. Equipment racks.
g. Furniture.
h. Door swings.
i. Building features.

13. Indicate clear dimension between cable tray and walls or obstructions that are closer than 10 ft.
14. Highlight locations where cable tray is greater than 3 ft above ceilings. Explain how personnel access will be accommodated for cable tray maintenance.

D. Coordination Drawings for Conduit Routing: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of conduit groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

E. Coordination Drawings for Bus Assembly Routing: Floor plans and sections, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Scaled bus-assembly layouts and relationships between components and adjacent structural, mechanical, and electrical elements.
2. Vertical and horizontal enclosed bus-assembly runs, offsets, and transitions.
3. Clearances for access above and to the side of enclosed bus assemblies.
4. Vertical elevation of enclosed bus assemblies above the floor or bottom of structure.
5. Support locations, type of support, and weight on each support.
6. Location of adjacent construction elements, including luminaires, HVAC and plumbing equipment, fire sprinklers and piping, signal and control devices, and other equipment.

F. Coordination Drawings for Large Equipment Indoor Installations:

1. Location plan, drawn to scale, showing heavy equipment or truck access paths to loading dock or other freight access into building. Indicate available width and height of doors or openings.
2. Floor plan for entry floor and floor where equipment is located, drawn to scale, showing heavy equipment access paths for maintenance and replacement, with the following items shown and coordinated with each other, based on input from installers of the items involved:

a. Dimensioned concrete bases, outlines of equipment, conduit entries, and grounding equipment locations.
b. If freight elevator must be used, indicate width and height of door and depth of car. Indicate if large equipment must be tipped to use elevator.

c. Dimensioned working clearances and dedicated areas below and around electrical equipment where obstructions and tripping hazards are prohibited.

3. Reflected ceiling plans for entry floor and floor where equipment is located, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

a. Support locations, type of support, and weight on each support. Locate structural supports for structure-supported raceways, busways, and seismic bracing.
b. Location of lighting fixtures, sprinkler piping and sprinklers, ducts and diffusers, and other obstructions, indicating available overhead clearance.
c. Dimensioned working clearances and dedicated areas above and around electrical equipment where foreign systems and equipment are prohibited.

G. Coordination Drawings for Large Equipment Outdoor Installations:

1. Utilities site plan, drawn to scale, showing heavy equipment or truck access paths for maintenance and replacement, with the following items shown and coordinated with each other, based on input from installers of the items involved:

a. Fences and walls, dimensioned concrete bases, outlines of equipment, conduit entries, and grounding and bonding locations.
b. Indicate clear dimensions for fence gates and wall openings.
c. Indicate depth and type of ground cover, and locations of trees, shrubbery, and other obstructions in access path.
d. Indicate clear height below tree branches, overhead lines, bridges, and other overhead obstructions in access path, or where cranes and hoists will be needed to handle large electrical equipment.
e. Support locations, type of support, and weight on each support. Locate structural supports for structure-supported raceways, busways, and seismic bracing.
f. Dimensioned working clearances and dedicated areas around electrical equipment.

H. Coordination Drawings for Duct Banks:

1. Show duct profiles and coordination with other utilities and underground structures.
2. Include plans and sections, drawn to scale, and show bends and locations of expansion fittings.

1.7 INFORMATIONAL SUBMITTALS

A. Electrical Installation Schedule: At preconstruction meeting, and periodically thereafter as dates change, provide schedule for electrical installation Work to the State including, but not limited to, milestone dates for the following activities:

1. Submission of power system studies.
2. Submission of specified coordination drawings.
3. Submission of action submittals specified in Division 26.
4. Orders placed for major electrical equipment.
5. Arrival of major electrical equipment on-site.
6. Preinstallation meetings specified in Division 26.
7. Utility service outages.
8. Utility service inspection and activation.
9. Mockup reviews.
10. Closing of walls and ceilings containing electrical Work.
11. System startup, testing, and commissioning activities for major electrical equipment.
12. System startup, testing, and commissioning activities for emergency lighting.
13. System startup, testing, and commissioning activities for automation systems (SCADA, BMS, lighting, HVAC, fire alarm, fire pump, etc.).
14. Pouring of concrete housekeeping pads for electrical equipment and testing of concrete samples.
15. Requests for special inspections.
16. Requests for inspections by authorities having jurisdiction.

B. Installation Schedule for Communications Systems: At preconstruction meeting, and periodically thereafter as dates change, provide schedule for installation of the communications Work to the State including, but not limited to, milestone dates for the following activities:

1. Submission of specified coordination drawings.
2. Submission of action submittals specified in Division 27.
3. Orders placed for major equipment.
4. Arrival of major equipment on-site.
5. Preinstallation meetings specified in Division 27.
6. Telephone and internet service outages.
7. Telephone and internet service inspection and activation.
8. Mockup reviews.
9. Closing of walls and ceilings containing the communications Work.
10. System startup, testing, and commissioning activities for communications equipment.
11. System startup, testing, and commissioning activities for the Work specified in other divisions that depends on the Work specified in Division 27.
12. System startup, testing, and commissioning activities for automation systems (SCADA, BMS, lighting, HVAC, fire alarm, fire pump, etc.).
13. Requests for special inspections.
14. Requests for inspections by authorities having jurisdiction.

C. Installation Schedule for Security, Fire-Alarm, and Other Life-Safety Systems: At preconstruction meeting, and periodically thereafter as dates change, provide schedule for installation of security, fire-alarm, and the other life-safety Work to the State including, but not limited to, milestone dates for the following activities:

1. Submission of specified coordination drawings.
2. Submission of action submittals specified in Division 28.

3. Orders placed for major equipment.
4. Arrival of major equipment on-site.
5. Preinstallation meetings specified in Division 28.
6. Security and fire-alarm system outages.
7. Security and fire-alarm system inspection and activation.
8. Mockup reviews.
9. Closing of walls and ceilings containing the security and fire-alarm Work.
10. System startup, testing, and commissioning activities for security and fire-alarm equipment.
11. System startup, testing, and commissioning activities for fire-alarm interfaces with the Work specified in other divisions.
12. System startup, testing, and commissioning activities for automation systems (SCADA, BMS, lighting, HVAC, fire alarm, fire pump, etc.).
13. Requests for special inspections.
14. Requests for inspections by authorities having jurisdiction.

D. Welding certificates.

E. Qualification Statements:

1. For qualified regional manufacturer.
2. For structural professional engineer.
3. For electrical professional engineer.
4. For lighting professional engineer.
5. For EPM specialist.
6. For welder.
7. For ERMC-S-PVC raceway Installer.
8. For medium-voltage cable Installer.
9. For medium-voltage duct Installer.
10. For medium-voltage equipment Installer.
11. For electrical power monitoring Installer.
12. For switchboard Installer.
13. For EVSE Installer.
14. For generator set Installer.
15. For lightning protection system Installer.
16. For theatrical lighting Installer.
17. For exterior athletic lighting Installer.
18. For power quality specialist.
19. For electrical testing and inspecting agency and its on-site electrical testing supervisor.
20. For structural testing and inspecting agency.
21. For outdoor pole testing and inspecting agency.
22. For luminaire photometric testing laboratory.
23. For lighting testing and inspecting agency.
24. For communications design professional.
25. For communications cable Installer.
26. For communications testing and inspecting agency and its on-site communications testing supervisor.
27. For nurse call/code blue system Installer.
28. For security design professional.

29. For fire-alarm system design professional.
30. For mass notification design professional.
31. For IB-PSC design professional.
32. For general radiotelephone operator license (GROL) designer.
33. For emergency communications design professional.
34. For fire-alarm cable Installer and its on-site fire-alarm cable installation supervisor.
35. For security testing and inspecting agency and its on-site security testing supervisor.
36. For intrusion detection systems installer.
37. For perimeter security systems integrator.
38. For fire-alarm testing agency and its on-site fire-alarm testing supervisor.
39. For detention electronics systems Installer.
40. For detention electronics systems integrator.
41. For detention electronics systems testing and inspecting agency.

1.8 CLOSEOUT SUBMITTALS

A. Facility EMP Binders:

1. Complete Set: On USB media that is clearly and permanently labeled with attached placard on lanyard to prevent misplacement.
2. Volumes 2 and 8: Reproducible hardcopy on archival quality, 28 lb, acid-free, bond paper.

B. Operation and Maintenance Data:

1. Provide emergency operation, normal operation, and preventive maintenance manuals for each system, equipment, and device listed below:

    a. All Division 26 materials, in particular equipment and devices.

2. Include the following information:

    a. Manufacturer's operating specifications.
    b. User's guides for software and hardware.
    c. Schedule of maintenance material items recommended to be stored at the Project site.
    d. Detailed instructions covering operation under both normal and abnormal conditions.
    e. Time-current curves for overcurrent protective devices and manufacturer's written instructions for testing and adjusting their settings.
    f. List of load-current and overload-relay heaters with related motor nameplate data.
    g. List of lamp types and photoelectric relays used on the Project, with ANSI and manufacturers' codes.
    h. Manufacturer's instructions for setting field-adjustable components.
    i. Manufacturer's instructions for testing, adjusting, and reprogramming microprocessor controls.

j. EPSS: Manufacturer's system checklists, maintenance schedule, and maintenance log sheets in accordance with NFPA 110.
k. Exterior pole inspection and repair procedures.

C. Software and Firmware Operational Documentation: Provide software and firmware operational documentation in Facility EPM Binders, including the following:

1. Software operating and upgrade manuals.
2. Names, versions, and website addresses for locations of installed software.
3. Device address list.
4. Printout of software application and graphic screens.
5. Testing and adjusting of panic and emergency power features.
6. For lighting controls, include the following:

a. Adjustments of scene preset controls, adjustable fade rates, and fade overrides.
b. Operation of adjustable zone controls.

D. Software:

1. Program Software Backup: Provide USB media that is clearly and permanently labeled with attached placard on lanyard to prevent misplacement.
2. Provide to the State upgrades and unrestricted licenses for Government use for installed and backup software, including operating systems and programming tools required for operation and maintenance.

1.9 MOCKUPS

A. Simple Mockups for Coordinating Accessibility of Electrical Devices around Fixed Furnishings and Equipment:

1. Build simple mockups using art supplies and other inexpensive materials for verification of general arrangement, actual dimensions, and accessibility by the State prior to fabrication and installation of Work. Depict products from all Divisions requiring coordination, including, but not limited to, fixed furnishings, casework, outlet covers and plates, HVAC controls, exposed raceway, exposed plumbing, equipment, and signage.

B. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless the State specifically approves such deviations by Change Order.

PART 2 - PRODUCTS

2.1 SUBSTITUTION LIMITATIONS FOR ELECTRICAL EQUIPMENT

A. Substitution requests for electrical equipment will be entertained under the following

conditions:

1. Substitution requests may be submitted for consideration prior to the Electrical Preconstruction Conference if accompanied by value analysis data indicating that substitution will comply with the Project performance requirements while significantly increasing value for the State throughout life of facility.
2. Substitution requests may be submitted for consideration concurrently with submission of power system study reports when those reports indicate that substitution is necessary for safety of maintenance personnel and facility occupants.
3. Contractor is responsible for sequencing and scheduling power system studies and electrical equipment procurement. After the Electrical Preconstruction Conference, insufficient lead time for electrical equipment delivery will not be considered a valid reason for substitution.

2.2 SUBSTITUTION LIMITATIONS FOR COMMUNICATIONS EQUIPMENT

A. Substitution requests for communications equipment will be entertained under the following conditions:

1. Substitution requests may be submitted for consideration prior to the Communications Preconstruction Conference if accompanied by value analysis data indicating that substitution will comply with the Project performance requirements while significantly increasing value for the State throughout life of facility.
2. Contractor is responsible for sequencing and scheduling equipment procurement. After the Communications Preconstruction Conference, insufficient lead time for equipment delivery will not be considered a valid reason for substitution.

2.3 SUBSTITUTION LIMITATIONS FOR ELECTRONIC SAFETY AND SECURITY EQUIPMENT

A. Substitution requests for electronic safety and security equipment will be entertained under the following conditions:

1. Substitution requests may be submitted for consideration prior to the Electronic Safety and Security Preconstruction Conference if accompanied by value analysis data indicating that substitution will comply with the Project performance requirements while significantly increasing value for the State throughout life of facility.
2. Contractor is responsible for sequencing and scheduling equipment procurement. After the Electronic Safety and Security Preconstruction Conference, insufficient lead time for equipment delivery will not be considered a valid reason for substitution.

2.4 FACILITY ELECTRICAL MAINTENANCE PROGRAM (EMP) BINDERS

A. Description: Set of binders containing operation and maintenance data for facility's electrical equipment that was compiled during analysis of installed electrical Work for Facility EMP development.

B. Applicable Standards:

1. Regulatory Requirements: Comply with requirements in NFPA 70B.
2. General Characteristics:

a. Volume 1 - Introduction:

1) Summarize how Facility EMP analysis was performed, how data were collected, and how volumes are organized.
2) Describe Facility EMP and provide recommended policies and procedures for implementing the program and keeping it current.
3) Provide place for the State to identify contact information for employees responsible for implementing and maintaining Facility EMP.

b. Volume 2 - Facility Safety, Hazards Awareness, and Emergency Procedures:

1) Include training requirements for employees and contractors.
2) Include list of known facility hazards impacting IT&R activities.
3) Include approval and permitting procedures for IT&R activities.
4) Include incident emergency response procedures.
5) Include emergency shutdown procedures.
6) Include electrical disaster recovery procedures.
7) Include procedures for investigating the following incidents:

a) Electrical safety incidents.
b) Equipment malfunctions.
c) Unintended operations or alarms.
d) Operation of protective devices.

c. Volume 3 - Operating Procedures for Electrical Equipment and Controls:

1) Provide Operating Procedures for the Electrical Equipment and Control installed as part of Division 26.

d. Volume 4 - Facility Diagrams and Schedules:

1) Include single-line diagrams.
2) Include grounding and bonding diagrams.
3) Include essential wiring diagrams.
4) Include system automation diagrams (SCADA, BMS, lighting, HVAC, etc.).
5) Include records of switchgear, switchboard, and panelboard

schedules.
6) Include time-current curves for overcurrent protective devices.
7) Include list of load-current and overload-relay heaters with related motor nameplate data.

e. Volume 5 - Inventory of Facility Equipment Using Electrical Power:

1) Include simplified floor plans showing equipment locations.
2) Identify critical equipment (electrical or otherwise).
3) Include identifying designations and nameplate data.
4) Include warranty and maintenance contract information.

f. Volume 6 - Inventory of Facility Tools, Supplies, and Personnel Protective Equipment:

1) Include schedules of maintenance material items recommended to be stored at facility.
2) Include list of lamp types and photoelectric relays used in facility with ANSI and manufacturers' codes.
3) Include calibration and servicing data for each item.

g. Volume 7 - Inspection, Testing, and Repair (IT&R) Plan:

1) Include tables showing frequency of activities for each item.
2) Include annual schedule with activities mapped to specific days of the year.
3) Include exterior pole inspection and repair procedures.

h. Volume 8 - Inspection, Testing, and Repair (IT&R) Forms:

1) Coordinate with the the State to include the latest IT&R forms. Include industry standard IT&R Forms in the absence of such forms that are typically used by the the State.

i. Volume 9 - Inspection, Testing, and Repair (IT&R) Procedures:

1) Coordinate with the the State to include the latest IT&R Procedures. Include industry standard IT&R Procedures in the absence of such forms that are typically used by the the State.

j. Volume 10 - Spare Parts List:

1) Include list of all parts required to perform IT&R procedures.
2) Identify quantities of which parts are recommended to be stored on-site.
3) Include source contact information and budget cost for each item.

k. Volume 11 - Construction Project Closeout Record Documentation:

1) Include records of power system studies and photometric studies.

2) Include records of risk assessment studies.
3) Include records of electrical system startup and commissioning activities.
4) Include records of baseline inspections and tests.
5) Include records of baseline infrared photographs with normal light photographs showing the location, direction, angle, and conditions necessary for reproducing each infrared photograph.
6) Include records of baseline settings for adjustable equipment and devices.

PART 3 - EXECUTION

3.1 DEVELOPMENT OF FACILITY ELECTRICAL MAINTENANCE PROGRAM (EMP)

A. Facility EMP must be developed by qualified EMP specialist.

B. Conduct Facility EMP analysis in accordance with NFPA 70B requirements.

1. Renovation Projects:

a. Facility diagrams must include connected existing equipment for entire facility where known. Areas of uncertainty should be clearly indicated.
b. Obtain copies of existing operation and maintenance data and existing Facility EMP information from the State.
c. Facility EMP analysis should identify existing equipment that does not have available operation and maintenance data, and should explain the State's risks because this equipment is not included in Facility EMP.
d. Data for existing equipment outside scope of the Project may be inserted in Facility EMP Binders without analysis.
e. Data for existing equipment impacted by scope of the Project should be analyzed and documented similar to the Project's new equipment data as much as possible.

C. Compile operation and maintenance data from Facility EMP analysis and submit Facility EMP Binders.

3.2 INSTALLATION OF ELECTRICAL WORK

A. Unless more stringent requirements are specified in the Contract Documents or manufacturers' written instructions, comply with California Electrical Code (CEC) and NECA NEIS 1 for installation of electrical Work on the Project. Consult the State for resolution of conflicting requirements.

3.3 CLEANING

A. Electrical or Electronic Waste Management

3.4 CLOSEOUT ACTIVITIES

A. Training:

1. With assistance from factory-authorized service representatives, train the State's maintenance personnel on the following topics:

    a. How to implement Facility EMP.

2. Provide video recordings of training sessions to the State.

END OF SECTION 26 00 10

SECTION 26 00 11

FACILITY PERFORMANCE REQUIREMENTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Field conditions and other facility performance requirements applicable to Work specified in Division 26.

1.2 FIELD CONDITIONS

A. Seismic Hazard Design Loads:

1. Unless otherwise indicated on Contract Documents, specified Work must withstand seismic hazard design loads determined in accordance with requirements specified in this Section, adjusted for installed elevation above or below grade.

a. The term "withstand" means "unit must remain in place without separation of parts from unit when subjected to specified seismic hazard design loads and unit must be fully operational after seismic event."

2. Perform calculations to obtain force information necessary to properly select seismic-restraint devices, fasteners, and anchorage. Perform calculations using methods acceptable to applicable code authorities and as presented in ASCE/SEI 7-05 Where "ASCE/SEI 7" is used throughout this Section, it must be understood that the edition referred to in this subparagraph is the edition intended as reference throughout the Section Text.

a. Data indicated below to be determined by Delegated Design Contractor must be obtained by Contractor and must be included in individual component submittal packages.
b. Coordinate seismic design calculations with wind-load calculations for equipment mounted outdoors.

B. Wind Hazard Design Loads:

1. Perform calculations to obtain force information necessary to properly select wind-load restraint devices, fasteners, and anchorage. Perform calculations using methods acceptable to applicable code authorities and as presented in ASCE/SEI 7-05 . Where "ASCE/SEI 7" is used throughout this Section, it must

be understood that the edition referred to in this subparagraph is intended as referenced throughout the Section Text unless otherwise indicated.

a. Coordinate design wind-load calculations with seismic-load calculations for equipment requiring both seismic- and wind-load reinforcement. Comply with requirements in other Sections in addition to those in this Section.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 26 00 11

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper building wire.
2. Fire-alarm wire and cable.
3. Connectors and splices.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Copper building wire.
2. Connectors and splices.

B. Product Schedule: Indicate type, use, location, and termination locations.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Sustainable Design Submittals:

1. Product Data: For each conductor and cable indicating lead content.
2. Product Data: For recycled content, indicating percentage of postconsumer and preconsumer recycled content and cost.
3. Product Data: For solvents and adhesives, indicating VOC content.
4. Laboratory Test Reports: For solvents and adhesives, indicating compliance with requirements for low-emitting materials.

C. Field quality-control reports.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Manufacturers:

1. Southwire.
2. Alpha Wire.
3. General Cable.
4. Or approved equal.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.

E. Conductor Insulation:

1. Type THHN and Type THWN-2. Comply with UL 83.
2. Type XHHW-2. Comply with UL 44.

2.2 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Manufacturers:

1. 3M.
2. NSi Industries.
3. ILSCO.
4. O-Z/Gedney.
5. Or approved equal.

C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.

1. Material: Copper.
2. Type: Two hole with long barrels.
3. Termination: Crimp.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders:

1. Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits:

1. Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

C. ASD Output Circuits Cable: Extra-flexible stranded for all sizes.

D. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

B. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway.

C. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.

D. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway.

3.3 INSTALLATION, GENERAL

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points in accordance with Section 26 05 33 FL “Raceway and Boxes for Electrical Systems” prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 26 05 29 "Hangers and Supports 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-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 26 05 53 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 07 84 13 "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

A. 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.

    a. Branch circuit for control systems

2. Perform each of the following visual and electrical tests:

    a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.

b. Test bolted connections for high resistance using one of the following:

1) A low-resistance ohmmeter.
2) Calibrated torque wrench.
3) Thermographic survey.

c. Inspect compression-applied connectors for correct cable match and indentation.
d. Inspect for correct identification.
e. Inspect cable jacket and condition.
f. Insulation-resistance test on each conductor for ground and adjacent conductors. Apply a potential of 500 V(dc) for 300 V rated cable and 1000 V(dc) for 600 V rated cable for a one-minute duration.
g. Continuity test on each conductor and cable.

B. Uniform resistance of parallel conductors. Cables will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports to record the following:

1. Procedures used.
2. Results that comply with requirements.
3. Results that do not comply with requirements, and corrective action taken to achieve compliance with requirements.

END OF SECTION 26 05 19

SECTION 26 05 23

CONTROL-VOLTAGE ELECTRICAL POWER CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Backboards.
2. Category 6a balanced twisted pair cable.
3. Control cable.
4. Control-circuit conductors.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Backboards.
2. Category 6a balanced twisted pair cable.
3. Control cable.
4. Control-circuit conductors.
5. Fire-alarm wire and cable.

B. Sustainable Design Submittals:

1. Product Data: For each conductor and cable indicating lead content.
2. Environmental Product Declaration: For each product.
3. Health Product Declaration: For each product.
4. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.
5. Environmental Product Declaration: For each product.
6. Environmental Product Declaration: For each product.
7. Environmental Product Declaration: For each product.
8. Third-Party Certifications: For each product.
9. Third-Party Certified Life Cycle Assessment: For each product.

1.3 INFORMATIONAL SUBMITTALS

A. Source quality-control reports. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Flame Travel and Smoke Density in Plenums: As determined by testing identical products according to NFPA 262, by a qualified testing agency. Identify products for installation in plenums with appropriate markings of applicable testing agency.

1. Flame Travel Distance: 60 inch or less.
2. Peak Optical Smoke Density: 0.5 or less.
3. Average Optical Smoke Density: 0.15 or less.

C. Flame Travel and Smoke Density for Riser Cables in Non-Plenum Building Spaces: As determined by testing identical products according to UL 1666.

D. Flame Travel and Smoke Density for Cables in Non-Riser Applications and Non-Plenum Building Spaces: As determined by testing identical products according to UL 1685.

2.2 BACKBOARDS

A. Description: Plywood, fire-retardant treated, 3/4 by 48 by 96 inch. Comply with requirements for plywood backing panels in Section 06 10 00 "Rough Carpentry."

B. Painting: Paint plywood on all sides and edges with eggshell black latex paint. Comply with requirements in Section 09 91 23 "Interior Painting."

2.3 CATEGORY 6a BALANCED TWISTED PAIR CABLE

A. Description: Four-pair, balanced-twisted pair cable, with internal spline, certified to meet transmission characteristics of Category 6a cable at frequencies up to 500 MHz.

B. Standard: Comply with TIA-568-C.2 for Category 6a cables.

C. Conductors: 100 ohm, No. 23 AWG solid copper.

D. Shielding/Screening: Unshielded twisted pairs (UTP).

E. Cable Rating: Plenum.

F. Jacket: Thermoplastic. Confirm color with the State.

2.4 BALANCED TWISTED PAIR CABLE HARDWARE

A. Description: Hardware designed to connect, splice, and terminate balanced twisted pair copper communications cable.

B. General Requirements for Balanced Twisted Pair Cable Hardware:

1. Comply with the performance requirements of Category 6a.
2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
3. Cables must be terminated with connecting hardware of same category or higher.

C. Source Limitations: Obtain balanced twisted pair cable hardware from single source from single manufacturer.

D. Connecting Blocks: 110-style IDC for Category 6. Provide blocks for the number of cables terminated on the block, plus 25 percent spare, integral with connector bodies, including plugs and jacks where indicated.

E. Patch Panel: Modular panels housing numbered jack units with IDC-type connectors at each jack location for permanent termination of pair groups of installed cables.

1. Features:

a. Universal T568A and T568B wiring labels.
b. Labeling areas adjacent to conductors.
c. Replaceable connectors.
d. 24 or 48 ports.

2. Construction: 16-gauge steel and mountable on 19 inch equipment racks.
3. Number of Jacks per Field: One for each four-pair cable indicated.

F. Patch Cords: Factory-made, four-pair cables in 36 inch lengths; terminated with an eight-position modular plug at each end.

1. Patch cords must have bend-relief-compliant boots and color-coded icons to ensure performance. Patch cords must have latch guards to protect against snagging.

G. Plugs and Plug Assemblies:

1. Male; eight position; color-coded modular telecommunications connector designed for termination of a single four-pair 100 ohm unshielded or shielded balanced twisted pair cable.
2. Comply with IEC 60603-7-1, IEC 60603-7-2, IEC 60603-7-3, IEC 60603-7-4, and IEC 60603-7.5.
3. Marked to indicate transmission performance.

H. Jacks and Jack Assemblies:

1. Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair 100 ohm unshielded or shielded balanced twisted pair cable.
2. Designed to snap-in to a patch panel or faceplate.
3. Standards:

    a. Category 6a, unshielded balanced twisted pair cable must comply with IEC 60603-7-41.
    b. Category 6a, shielded balanced twisted pair cable must comply with IEC 60603-7.51.

I. Faceplate:

1. Two port, vertical single-gang faceplates designed to mount to single-gang wall boxes.
2. Eight port, vertical double-gang faceplates designed to mount to double-gang wall boxes.
3. Plastic Faceplate: High-impact plastic. Coordinate color with Section 26 05 33.16 "Boxes and Covers for Electrical Systems."
4. Metal Faceplate: Stainless steel, complying with requirements in Section 26 05 33.16 "Boxes and Covers for Electrical Systems."
5. For use with snap-in jacks accommodating any combination of balanced twisted pair, optical fiber, and coaxial work area cords.

    a. Flush mounting jacks, positioning the cord at a 45-degree angle.

J. Legend:

1. Machine printed, in the field, using adhesive-tape label.
2. Snap-in, clear-label covers and machine-printed paper inserts.

2.5 CONTROL CABLE

A. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

1. Multi**-**pair, twisted, No. 16 AWG, stranded (19x29**)** tinned-copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with NFPA 262.

2.6 CONTROL-CIRCUIT CONDUCTORS

A. Class 1 Control Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.

B. Class 2 Control Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.

C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.

D. Class 2 Control Circuits and Class 3 Remote-Control and Signal Circuits That Supply Critical Circuits: Circuit Integrity (CI) cable.

1. Smoke control signaling and control circuits.

2.7 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory test twisted pair cables according to TIA-568-C.2.

C. Cable will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Test cables on receipt at Project site.

1. Test each pair of twisted pair cable for open and short circuits.

3.2 INSTALLATION OF RACEWAYS AND BOXES

A. Comply with requirements in Section 26 05 33 "Raceway and Boxes for Electrical Systems" for raceway selection and installation requirements for conduits as supplemented or modified in this Section.

B. Comply with requirements in Section 26 05 33.16 "Boxes and Covers for Electrical Systems" for raceway selection and installation requirements for boxes as supplemented or modified in this Section.

1. Outlet boxes for cables must be no smaller than 4 inch square by 2-1/8 inch deep with extension ring sized to bring edge of ring to within 1/8 inch of the finished wall surface.
2. Flexible metal conduit must not be used.

C. Comply with TIA-569-D for pull-box sizing and length of conduit and number of bends between pull points.

D. Install manufactured conduit sweeps and long-radius elbows if possible.

E. Raceway Installation in Equipment Rooms:

1. Position conduit ends adjacent to a corner on backboard if a single piece of plywood is installed, or in the corner of the room if multiple sheets of plywood are installed around perimeter walls of the room.
2. Install cable trays to route cables if conduits cannot be located in these positions.
3. Secure conduits to backboard if entering the room from overhead.
4. Extend conduits 3 inch above finished floor.
5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

F. Backboards: Install backboards with 96 inch dimension vertical. Butt adjacent sheets tightly and form smooth gap-free corners and joints.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA-568-C Series of standards.
2. Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems."
3. Install wiring in raceways.
4. Terminate all conductors; cable must not contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
5. Cables may not be spliced and must be continuous from terminal to terminal. Do not splice cable between termination, tap, or junction points.
6. Cables serving a common system may be grouped in a common raceway. Install network cabling and control wiring and cable in separate raceway from power wiring. Do not group conductors from different systems or different voltages.
7. Secure and support cables at intervals not exceeding 30 inch and not more than 6 inch from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
8. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Install lacing bars and distribution spools.
9. Do not install bruised, kinked, scored, deformed, or abraded cable. Remove and discard cable if damaged during installation and replace it with new cable.
10. Cold-Weather Installation: Bring cable to room temperature before dereeling. Do not use heat lamps for heating.
11. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Monitor cable pull tensions.
12. Support: Do not allow cables to lie on removable ceiling tiles.
13. Secure: Fasten securely in place with hardware specifically designed and installed so as to not damage cables.
14. Provide strain relief.
15. Keep runs short. Allow extra length for connecting to terminals. Do not bend cables in a radius less than 10 times the cable OD. Use sleeves or grommets to protect cables from vibration at points where they pass around sharp corners and through penetrations.

16. Ground wire must be copper, and grounding methods must comply with IEEE C2. Demonstrate ground resistance.

C. Balanced Twisted Pair Cable Installation:

1. Comply with TIA-568-C.2.
2. Install wiring in raceways.
3. Install termination hardware as specified in Section 27 15 13 "Communications Copper Horizontal Cabling" unless otherwise indicated.
4. Do not untwist balanced twisted pair cables more than 1/2 inch at the point of termination to maintain cable geometry.

D. Installation of Control-Circuit Conductors:

1. Install wiring in raceways.
2. Use insulated spade lugs for wire and cable connection to screw terminals.

E. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA-569-D recommendations for separating unshielded copper voice and data communications cable from potential EMI sources including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment must be as follows:

    a. Electrical Equipment or Circuit Rating Less Than 2 kVA: A minimum of 5 inch.
    b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 12 inch .
    c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 24 inch .

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment must be as follows:

    a. Electrical Equipment or Circuit Rating Less Than 2 kVA: A minimum of 2-1/2 inch.
    b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 6 inch.
    c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 12 inch.

4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures must be as follows:

    a. Electrical Equipment or Circuit Rating Less Than 2 kVA: No requirement.
    b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 3 inch.

c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 6 inch.

5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or 5 HP and Larger: A minimum of 48 inch.
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inch.

3.4 REMOVAL OF CONDUCTORS AND CABLES

A. Remove abandoned conductors and cables. Abandoned conductors and cables are those installed that are not terminated at equipment and are not identified with a tag for future use.

3.5 CONTROL-CIRCUIT CONDUCTORS

A. Minimum Conductor Sizes:

1. Class 1 remote-control and signal circuits; No 14 AWG.
2. Class 2 low-energy, remote-control, and signal circuits; No. 16 AWG.
3. Class 3 low-energy, remote-control, alarm, and signal circuits; No 12 AWG.

3.6 FIRESTOPPING

A. Comply with requirements in Section 07 84 13 "Penetration Firestopping."

B. Comply with TIA-569-D, Annex A, "Firestopping."

C. Comply with BICSI TDMM, "Firestopping" Chapter.

3.7 GROUNDING

A. For data communication wiring, comply with TIA-607-B and with BICSI TDMM, "Bonding and Grounding (Earthing)" Chapter.

B. For control-voltage wiring and cabling, comply with requirements in Section 26 05 26 "Grounding and Bonding for Electrical Systems."

3.8 IDENTIFICATION

A. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

B. Identify data and communications system components, wiring, and cabling according to TIA-606-B; label printers must use label stocks, laminating adhesives, and inks complying with UL 969.

C. Identify each wire on each end and at each terminal with a number-coded identification tag. Each wire must have a unique tag.

3.9 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Visually inspect cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA-568-C.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test cabling for direct-current loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination, but not after cross-connection.

    a. Test instruments must meet or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in its "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in its "Measurement Accuracy (Infomative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

B. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.

C. End-to-end cabling will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 26 05 23

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Grounding and bonding conductors.
2. Grounding and bonding clamps.
3. Grounding and bonding bushings.
4. Grounding and bonding hubs.
5. Grounding and bonding connectors.
6. Intersystem bonding bridge grounding connector.
7. Grounding and bonding busbars.
8. Signal reference grids.
9. Grounding (earthing) electrodes.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of product indicated.

B. Shop Drawings: Plans showing dimensioned locations of grounding features described in "Field Quality Control" Article, including the following:

1. Test wells.
2. Rod electrodes.
3. Ring electrodes.
4. Grounding arrangements and connections for separately derived systems.

C. Sustainable Design Submittals:

1. Product data for sustainable design features for each type of product.

D. Field Quality-Control Submittals:

1. Field quality-control reports.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:

1. In addition to items specified in Section 26 00 10 "Supplemental Requirements for Electrical," include the following:

    a. Plans showing locations of grounding features described in "Field Quality Control" Article, including the following:

        1) Test wells.
        2) Rod electrodes.
        3) Ring electrodes.

    b. Grounding arrangements and connections for separately derived systems.
    c. Instructions for periodic testing and inspection of grounding features at grounding connections to all connected fly-away equipment based on NFPA 70B.

        1) Tests must determine if ground-resistance or impedance values remain within specified maximums, and instructions must recommend corrective action if values do not.
        2) Include recommended testing intervals.

PART 2 - PRODUCTS

2.1 GROUNDING AND BONDING CONDUCTORS

A. Equipment Grounding Conductor:

1. General Characteristics: 600 V, THHN/THWN-2orTHWN-2, copper wire or cable, green color, in accordance with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

B. Isolated Equipment Grounding Conductor:

1. General Characteristics: 600 V, THHN/THWN-2orTHWN-2, copper wire or cable, green color with one or more yellow stripes, in accordance with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

C. ASTM - Bare Copper Grounding and Bonding Conductor:

1. Referenced Standards: Complying with one or more of the following:

    a. Soft or Annealed Copper Wire: ASTM B3
    b. Concentric-Lay Stranded Copper Conductor: ASTM B8.
    c. Tin-Coated Soft or Annealed Copper Wire: ASTM B33.
    d. 19-Wire Combination Unilay-Stranded Copper Conductor: ASTM B787/B787M.

D. UL KDER - Armored Grounding Wire:

1. Description: Single corrosion-resistant copper, aluminum, or copper-clad aluminum conductor within helically formed steel armor.
2. Regulatory Requirements:

    a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

3. Listing Criteria:

    a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

E. UL KDSH - Protector Grounding Conductor:

1. Description: Conductors intended to be used for grounding primary protector or metallic members of cable sheath in accordance with Chapters 7 and 8 of NFPA 70.
2. Regulatory Requirements:

    a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

3. Listing Criteria:

    a. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.

4. Options:

    a. Color: Light olive gray or green.

2.2 GROUNDING AND BONDING CLAMPS

A. Description: Clamps suitable for attachment of grounding and bonding conductors to grounding electrodes, pipes, tubing, and rebar. Grounding and bonding clamps specified in this article are also suitable for use with communications applications.

B. Source Limitations: Obtain products from single manufacturer.

C. Performance Criteria:

1. Regulatory Requirements:

    a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2. Listing Criteria:

    a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.

D. UL KDER and KDSH - Hex-Fitting-Type Pipe and Rod Grounding and Bonding Clamp :

1. ABB, Burndy
2. General Characteristics:

a. Two pieces with stainless steel bolts.
b. Clamp Material: Tinned brass.
c. Listed for outdoor use.

E. UL KDER and KDSH - U-Bolt-Type Pipe and Rod Grounding and Bonding Clamp

1. ABB
2. General Characteristics:

a. Clamp Material: Tinned brass.
b. Listed for outdoor use.

F. UL KDER and KDSH - Strap-Type Pipe and Rod Grounding and Bonding Clamp

1. General Characteristics:

a. Clamp Material: Galvanized steel.
b. Listed for outdoor use.

G. UL KDER - Beam Grounding and Bonding Clamp :

1. ABB, Burndy
2. General Characteristics: Mechanical-type, terminal, ground wire access from four directions; with dual, tin-plated or silicon bronze bolts.

H. UL KDER - Exothermically Welded Connection :

1. ABB, Burndy/Hubbell.
2. General Characteristics: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

I. UL KDER - Raised-Floor Signal Reference Grid Clamp :

1. ABB
2. General Characteristics: Mechanical-type, stamped-steel terminal with hex head screw.

2.3 GROUNDING AND BONDING BUSHINGS

A. Description: Bonding bushings connect conduit fittings, tubing fittings, threaded metal conduit, and unthreaded metal conduit to metal boxes and equipment enclosures, and have one or more bonding screws intended to provide electrical continuity between

bushing and enclosure. Grounding bushings have provision for connection of bonding or grounding conductor and may or may not also have bonding screws.

B. Source Limitations: Obtain products from single manufacturer.

C. Performance Criteria:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2. Listing Criteria:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

D. UL KDER - Bonding Bushing :

1. ABB
2. General Characteristics: Threaded bushing with insulated throat.

E. UL KDER - Grounding Bushing

1. ABB
2. General Characteristics: Threaded bushing with insulated throat and mechanical-type wire terminal.

2.4 GROUNDING AND BONDING HUBS

A. Description: Hubs with certified grounding or bonding locknut.

B. Source Limitations: Obtain products from single manufacturer.

C. Performance Criteria:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2. Listing Criteria:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

D. UL KDER - Grounding and Bonding Hub :

1. ABB
2. General Characteristics: Insulated, gasketed, watertight hub with mechanical-type wire terminal.

2.5 GROUNDING AND BONDING CONNECTORS

A. Source Limitations: Obtain products from single manufacturer.

B. Performance Criteria:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2. Listing Criteria:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.

C. UL KDER - Pressure-Type Grounding and Bonding Busbar Cable Connector :

1. ABB
2. General Characteristics: Copper or copper alloy, for compression bonding of one or more conductor directly to copper busbar. Listed for direct burial.

D. UL KDER - Lay-In Lug Mechanical-Type Grounding and Bonding Busbar Terminal :

1. ABB, Burndy/Hubbell.
2. General Characteristics: Mechanical-type, copper rated for direct burial terminal with set screw.

E. UL KDER - Crimped Lug Pressure-Type Grounding and Bonding Busbar Terminal:

1. ABB, Burndy/Hubbell
2. General Characteristics: Cast silicon bronze, solderless compression-type wire terminals; with long barrel and two holes spaced on 5/8 or 1 inch centers for two-bolt connection to busbar.

F. UL KDER - Split-Bolt Service-Post Pressure-Type Grounding and Bonding Busbar Terminal :

1. Burndy
2. General Characteristics: Bolts that surround cable and bond to cable under compression when nut is tightened after assembly is screwed into busbar opening.

G. UL KDER - Crimped Pressure-Type Grounding and Bonding Cable Connector:

1. ABB
2. General Characteristics: Crimp-and-compress connectors that bond to conductor when connector is compressed around conductor.

a. Tinned copper, C and H shaped.

H. UL KDER - Split-Bolt Pressure-Type Grounding and Bonding Cable Connector :

1. ABB, Burndy/Hubbell
2. General Characteristics: Bolts that surround cable and bond to cable under compression when nut is tightened.

a. Tinned copper.

I. UL KDER - Signal Reference Grid Grounding and Bonding Connector :

1. ABB, Burndy/Hubbell.
2. General Characteristics: Combination of compression wire connectors, access floor grounding clamps, bronze U-bolt grounding clamps, and copper split-bolt connectors, designed for the purpose.

2.6 INTERSYSTEM BONDING BRIDGE GROUNDING CONNECTORS

A. Description: Devices that provide means for connecting communications systems grounding and bonding conductors at service equipment or at disconnecting means for buildings or structures.

B. Performance Criteria:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2. Listing Criteria:

a. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.

C. UL KDSH - One-Piece Intersystem Bonding Bridge Grounding Connector:

1. ABB, Burndy/Hubbell.
2. General Characteristics: Zinc-alloy one-piece construction; six terminating points; gangable.

D. UL KDSH - Two-Piece Intersystem Bonding Bridge Grounding Connector:

1. General Characteristics: Copper body and polycarbonate cover; four terminating points.

2.7 GROUNDING AND BONDING BUSBARS

A. Description: Miscellaneous grounding and bonding device that serves as common connection for multiple grounding and bonding conductors.

B. Source Limitations: Obtain products from single manufacturer.

C. Performance Criteria:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2. Listing Criteria:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

D. UL KDER - Equipment Room Grounding and Bonding Busbar :

1. General Characteristics:

a. Bus: Rectangular bar of annealed copper.
b. Mounting Stand-Off Insulators: Lexan or PVC.

1) Comply with UL 891 for use in 600 V switchboards, impulse tested at 5000 V.

2. Options:

a. Dimensions: 1/4 by 4 inch > in cross section; length as indicated on Drawings.
b. Predrilled Hole Pattern: 9/32 inch Suitable for installing specified grounding and bonding connectors.
c. Mounting Hardware: Stand-off brackets that provide 2 inch clearance to access rear of bus. Brackets and bolts must be stainless steel.

2.8 GROUNDING (EARTHING) ELECTRODES

A. Description: Grounding electrodes include rod electrodes, ring electrodes, metal underground water pipes, metal building frames, concrete-encased electrodes, and pipe and plate electrodes.

B. Source Limitations: Obtain products from single manufacturer.

C. Performance Criteria:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2. Listing Criteria:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

D. UL KDER - Rod Electrode :

1. AllG, Burndy/Hubbell.
2. General Characteristics: Stainless steel, sectional type; 3/4 inch by 10 ft .

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine facility's grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of electrical system.

B. Inspect test results of grounding system measured at point of electrical service equipment connection.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with connection of electrical service equipment only after unsatisfactory conditions have been corrected.

3.2 SELECTION OF GROUNDING AND BONDING CONDUCTORS

A. Conductors: Install solid conductor for 8 AWG and smaller, and stranded conductors for 6 AWG and larger unless otherwise indicated.

B. Custom-Length Insulated Equipment Bonding Jumpers: 6 AWG, 19-strand, Type THHN.

C. Bonding Cable: 28 kcmil, 14 strands of 17 AWG conductor, 1/4 inch) in diameter.

D. Bonding Conductor: 4 AWG or 6 AWG, stranded conductor.

E. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inch wide and 1/16 inch thick.

F. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inch wide and 1/16 inch thick.

G. Underground Grounding Conductors: Install bare tinned-copper conductor, 2/0 AWG minimum.

1. Bury at least 30 inch below grade.
2. Duct-Bank Grounding Conductor: Bury 12 inch above duct bank when indicated as part of duct-bank installation.

3.3 SELECTION OF CONNECTORS

A. 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.

3.4 SELECTION OF SIGNAL REFERENCE GRIDS

A. Access Floor Signal Reference Grid:

1. Install 6 AWG bonding conductors in a grid pattern under floor.

a. Install grid bonding conductors on 4 ft centers, so as to permit bonding of one structural pedestal for each access floor tile. Connect grid conductors together where they cross each other.

3.5 INSTALLATION

A. Comply with manufacturer's published instructions.

B. Reference Standards:

1. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
2. Consult the State for resolution of conflicting requirements.

C. Special Techniques:

1. Conductors:

a. 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.

2. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.

    a. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
    b. Make connections with clean, bare metal at points of contact.
    c. Make aluminum-to-steel connections with stainless steel separators and mechanical clamps.
    d. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
    e. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
    f. 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 adjacent parts.
        2) Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
        3) Use exothermic-welded connectors for outdoor locations; if disconnect-type connection is required, use bolted clamp.

    g. 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 bolted clamp connector or bolt lug-type connector to pipe flange by using one of lug bolts of flange. Where 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 bolted connector.
        3) Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

    h. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.
    i. Grounding for Steel Building Structure: Install driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 ft apart.

3. Electrodes:

a. Ground Rods: Drive rods until tops are 2 inch 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) Use exothermic welds for below-grade connections. .

b. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least same distance from other grounding electrodes, and connect to service grounding electrode conductor.

c. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 26 05 43 "Underground Ducts and Raceways for Electrical Systems," and must be at least 12 inch deep, with cover.

1) Install at least one test well for each service unless otherwise indicated. Install at ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

d. Ring Electrode: Install grounding conductor, electrically connected to each building structure ground rod and to each indicated item, extending around perimeter of area or item indicated.

1) Install tinned-copper conductor not less than 2/0 AWG for ring electrode and for taps to building steel.
2) Bury ring electrode not less than 24 inch from equipment pad’s foundation.

e. Concrete-Encased Electrode (Ufer Ground):

1) Fabricate in accordance with NFPA 70; use minimum of 20 ft of bare copper conductor not smaller than 4 AWG.

a) If concrete foundation is less than 20 ft long, coil excess conductor within base of foundation.
b) 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.

2) Fabricate in accordance with NFPA 70; using electrically conductive coated steel reinforcing bars or rods, at least 20 ft long. If reinforcing is in multiple pieces, connect together by usual steel tie wires or exothermic welding to create required length.

4. Grounding at Service:

a. Equipment grounding conductors and grounding electrode conductors must be connected to ground bus. Install main bonding jumper between neutral and ground buses.

5. Equipment Grounding:

a. Install insulated equipment grounding conductors with 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) Receptacle circuits.
3) Single-phase motor and appliance branch circuits.
4) Three-phase motor and appliance branch circuits.
5) Flexible raceway runs.
6) Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.

c. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
d. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
e. Isolated Grounding Receptacle Circuits: Install insulated equipment grounding conductor connected to receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of applicable derived system or service unless otherwise indicated.
f. Isolated Equipment Enclosure Circuits: For designated equipment supplied by branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of applicable derived system or service unless otherwise indicated.Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.
g. Metallic Fences: Comply with requirements of IEEE C2.

1) Grounding Conductor: Bare, tinned copper, not less than 8 AWG.
2) Gates: Must be bonded to grounding conductor with flexible bonding jumper.
3) Barbed Wire: Strands must be bonded to grounding conductor.

6. Fence Grounding: Install at maximum intervals of 1500 ft except as follows:

    a. Fences within 100 ft of Buildings, Structures, Walkways, and Roadways: Ground at maximum intervals of 750 ft .

        1) Gates and Other Fence Openings: Ground fence on each side of opening.

            a) Bond metal gates to gate posts.
            b) Bond across openings, with and without gates, except at openings indicated as intentional fence discontinuities. Use 2 AWG wire and bury it at least 18 inch below finished grade.

    b. Protection at Crossings of Overhead Electrical Power Lines: Ground fence at location of crossing and at maximum distance of 150 ft on each side of crossing.
    c. Grounding Method: At each grounding location, drive grounding rod vertically until top is 6 inch below finished grade. Connect rod to fence with 6 AWG conductor. Connect conductor to each fence component at grounding location.
    d. Bonding Method for Gates: Connect bonding jumper between gate post and gate frame.
    e. Bonding to Lightning-Protection System: If fence terminates at lightning-protected building or structure, ground fence and bond fence grounding conductor to lightning-protection down conductor or lightning-protection grounding conductor, complying with NFPA 780.

3.6 FIELD QUALITY CONTROL

A. Testing Preparation:

B. Field tests and inspections must be witnessed by authorities having jurisdiction.

C. 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 calibrated torque wrench in accordance with manufacturer's published instructions.
3. Test completed grounding system at each location where 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 conductors are connected.

    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method in accordance with IEEE Std 81.

c. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify the State promptly and include recommendations to reduce ground resistance.

4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to record of tests and observations. Include number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

D. Nonconforming Work:

1. Grounding system will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective components and retest.

E. Collect, assemble, and submit test and inspection reports.

1. Report measured ground resistances that exceed the following values:

a. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 Ω.
b. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 Ω.
c. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 Ω.
d. Substations and Pad-Mounted Equipment: 5 Ω.

3.7 PROTECTION

A. After installation, protect grounding and bonding cables and equipment from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by the State.

END OF SECTION 26 05 26

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Support, anchorage, and attachment components.
2. Fabricated metal equipment support assemblies.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:

a. Slotted support systems, hardware, and accessories.
b. Clamps.
c. Hangers.
d. Sockets.
e. Eye nuts.
f. Fasteners.
g. Anchors.
h. Saddles.
i. Brackets.

2. Include rated capacities and furnished specialties and accessories.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. For fabrication and installation details for electrical hangers and support systems.

1. Hangers. Include product data for components.
2. Slotted support systems.
3. Equipment supports.
4. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

C. Delegated Design Submittals: For hangers and supports for electrical systems.

1. Include design calculations and details of hangers.
2. Include design calculations for seismic restraints.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified structural professional engineer to design hanger and support system.

B. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame Rating: Class 1.
2. Self-extinguishing according to ASTM D635.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32 inch diameter holes at a maximum of 8 inch on center in at least one surface.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. B-Line.
b. Caddy.
c. Unistrut.
d. Or approved equal.

2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
3. Material for Channel, Fittings, and Accessories: Galvanized steel
4. Channel Width: 1-5/8 inch .
5. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
6. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with minimum 13/32 inch diameter holes at a maximum of 8 inch on center, in at least one surface.

1. Champion Fiberglass, Inc.
2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.

3. Channel Width: 1-5/8 inch .
4. Fittings and Accessories: Products provided by channel and angle manufacturer and designed for use with those items.
5. Fitting and Accessory Materials: Same as those for channels and angles, except metal items may be stainless steel.
6. Rated Strength: Selected to suit applicable load criteria.
7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Conduit and Cable Support Devices: Stainless steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs must have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body must be made of malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Hilti.
        2) ITW Ramset/Redhead.
        3) MKT Fastening.
        4) Or approved equal

2. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
3. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M, Grade A325.
5. Toggle Bolts:Stainless steel springhead type.
6. Hanger Rods: Threaded steel.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 SELECTION

A. Comply with the following standards for selection and installation of hangers and supports, except where requirements are stricter:

1. NECA NEIS 101
2. NECA NEIS 102.
3. NECA NEIS 105.
4. NECA NEIS 111.

B. Comply with requirements in Section 07 84 13 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

C. Comply with requirements for raceways specified in 26 05 33 FL “Raceway and Boxes for Electrical Systems”.

D. Comply with requirements for boxes specified in Section 26 05 33.16 "Boxes and Covers for Electrical Systems."

E. Provide vibration and seismic controls with hangers and supports in accordance with Section 26 05 48.16 "Seismic Controls for Electrical Systems."

F. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and ERMC as required by NFPA 70. Minimum rod size must be 1/4 inch in diameter.

G. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slottedsupport system, sized so capacity can be increased by at least 25 > percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

H. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2 inch and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

3.2 INSTALLATION OF SUPPORTS

A. Comply with NECA NEIS 101 for installation requirements except as specified in this article.

B. Raceway Support Methods: In addition to methods described in NECA NEIS 1, ERMC may be supported by openings through structure members, in accordance with NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination must be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inchthick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inch thick.
6. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that comply with seismic-restraint strength and anchorage requirements.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section 05 50 00 "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M. Submit welding certificates.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inch larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000 psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 03 30 00 "Cast-in-Place Concrete."

C. Anchor equipment to concrete base as follows:

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup:

1. 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.

    a. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils

2. Comply with requirements in Section 09 91 13 "Exterior Painting" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

END OF SECTION 26 05 29

SECTION 26 05 33

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Type EMT-S raceways and elbows.
2. Type ERMC-S raceways, elbows, couplings, and nipples.
3. Type LFMC raceways.
4. Type PVC raceways and fittings.
5. Fittings for conduit, tubing, and cable.
6. Threaded metal joint compound.
7. Solvent cements.
8. Wireways and auxiliary gutters.
9. Termination boxes.
10. Cabinets, cutout boxes, junction boxes, pull boxes, and miscellaneous enclosures.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Raceways.
2. Wireways and auxiliary gutters.
3. Cabinets, cutout boxes, and miscellaneous enclosures.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturers' Instructions:

1. For Type ERMC-S-PVC.

PART 2 - PRODUCTS

2.1 TYPE EMT-S RACEWAYS AND ELBOWS

A. Steel Electrical Metal Tubing (EMT-S) and Elbows:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allied Tube and Conduit.
b. Republic Conduit.
c. Western Tube.
d. Or approved equal

2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 797 and UL Category Control Number FJMX.
2) Material: Steel.
3) Exterior Coating: Zinc.
4) Interior Coating: Zinc with organic top coating.

c. Options:

1) Minimum Trade Size: 3/4 inch (21 mm).

2.2 TYPE ERMC-S RACEWAYS, ELBOWS, COUPLINGS, AND NIPPLES

A. Galvanized-Steel Electrical Rigid Metal Conduit (ERMC-S-G), Elbows, Couplings, and Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allied Tube and Conduit.
b. Republic Conduit.
c. Western Tube.
d. Or approved equal

2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 6 and UL Category Control Number DYIX.
2) Exterior Coating: Zinc.
3) Interior Coating: Zinc with organic top coating.

c. Options:

1) Minimum Trade Size: 3/4 inch (21 mm).

B. PVC-Coated-Steel Electrical Rigid Metal Conduit (ERMC-S-PVC), Elbows, Couplings, and Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Allied Tube and Conduit.
    b. Republic Conduit.
    c. Western Tube.
    d. Or approved equal

2. Applicable Standards:

    a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
    b. General Characteristics:

        1) Reference Standards: UL 6 and UL Category Control Number DYIX.
        2) Exterior Coating: PVC complying with NEMA RN 1.
        3) Interior Coating: Zinc with organic top coating.
        4) Fittings for PVC-Coated Conduit:

            a) Minimum coating thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.
            b) Conduit bodies must be Form 8 with an effective seal and a positive placement feature to ease and assure proper installation. Certified results confirming seal performance at 15 psig (positive) and 25 in. of mercury (vacuum) for 72 hours must be available. Conduit bodies must be supplied with plastic-encapsulated stainless steel cover screws.
            c) Form 2 inch (51 mm) long or one pipe diameter long, whichever is less, PVC sleeve at openings of female fittings, except unions. Inside sleeve diameter must be matched to outside diameter of metal conduit.
            d) PVC coating on the outside of conduit couplings must be protected from tool damage during installation.
            e) Female threads on fittings and couplings must be protected by urethane coating.
            f) Fittings must be from same manufacturer as conduit.
            g) Beam clamps and U bolts must be formed and sized to fit outside diameter of coated conduit. Plastic-encapsulated nuts must cover the exposed portions of threads.

    c. Options:

        1) Minimum Trade Size: 1 inch.
        2) Expansion and Deflection Fittings: UL 651 with flexible external bonding jumper.

2.3 TYPE LFMC RACEWAYS

A. Steel Liquidtight Flexible Metal Conduit (LFMC-S):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Allied Tube and Conduit.
    b. Republic Conduit.
    c. Western Tube.
    d. Or approved equal

2. Applicable Standards:

    a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
    b. General Characteristics:

        1) Reference Standard: UL 360 and UL Category Control Number DXHR.
        2) Material: Steel.

    c. Options:

        1) Minimum Trade Size: 3/4 inch (21 mm).

2.4 TYPE PVC RACEWAYS AND FITTINGS

A. Schedule 40 Rigid PVC Conduit (PVC-40) and Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Calconduit.
    b. NAPCO
    c. Topaz.
    d. Or approved equal

2. Applicable Standards:

    a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
    b. General Characteristics:

        1) Reference Standards: UL 651 and UL Category Control Number DZYR.
        2) Dimensional Specifications: Schedule 40.

    c. Options:

        1) Minimum Trade Size: 1 inch (21 mm).
        2) Markings: For use with maximum 90 deg C wire.

B. Schedule 80 Rigid PVC Conduit (PVC-80) and Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Calconduit.
    b. NAPCO
    c. Topaz.
    d. Or approved equal
2. Applicable Standards:

    a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
    b. General Characteristics:

        1) Reference Standards: UL 651 and UL Category Control Number DZYR.
        2) Dimensional Specifications: Schedule 80.

    c. Options:

        1) Minimum Trade Size: 1 inch.
        2) Markings: For use with maximum 90 deg C wire.

2.5 FITTINGS FOR CONDUIT, TUBING, AND CABLE

A. Fittings for Type ERMC Raceways:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Crouse-Hinds.
    b. O-Z/Gedney.
    c. Southwire.
    d. Or approved equal

2. Applicable Standards:

    a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
    b. General Characteristics:

        1) Reference Standards: UL 514B and UL Category Control Number DWTT.
        2) Material: Steel.
        3) Coupling Method: Compression coupling.

    c. Options:

        1) Expansion and Deflection Fittings: UL 651 with flexible external bonding jumper.

B. Fittings for Type EMT Raceways:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allied Tube and Conduit.
b. O-Z/Gedney.
c. Southwire.
d. Or approved equal

2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 514B and UL Category Control Number FKAV.
2) Material: Steel.
3) Coupling Method: Compression coupling.

c. Options:

1) Expansion and Deflection Fittings: UL 651 with flexible external bonding jumper.

C. Fittings for Type LFMC Raceways:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allied Tube and Conduit.
b. O-Z/Gedney.
c. Southwire.
d. Or approved equal

2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 514B and UL Category Control Number DXAS.

2.6 ELECTRICALLY CONDUCTIVE CORROSION-RESISTANT COMPOUNDS FOR THREADED CONDUIT

A. Applicable Standards:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and approved by authorities having jurisdiction for application to threaded conduit assemblies.
2. General Characteristics:

    a. Reference Standards: UL 2419 and UL Category Control Number FOIZ.

2.7 SOLVENT CEMENTS

A. Solvent Cements for Type PVC Raceways and Fittings:

1. Applicable Standards:

    a. General Characteristics:

        1) Reference Standards: As recommended by conduit manufacturer in accordance with UL 514B and UL Category Control Number DWTT.

2.8 WIREWAYS AND AUXILIARY GUTTERS

A. Metal Wireways and Auxiliary Gutters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. B-Line.
    b. Hoffman.
    c. Wiegmann.
    d. Or approved equal

2. Applicable Standards:

    a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
    b. General Characteristics:

        1) Reference Standards: UL 870 and UL Category Control Number ZOYX.
        2) Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
        3) Finish: Manufacturer's standard enamel finish.

    c. Options:

        1) Degree of Protection: Type 1 and Type 3R selected based on environment and location.
        2) Wireway Covers: Screw-cover type unless otherwise indicated.

2.9 METALLIC OUTLET BOXES, DEVICE BOXES, RINGS, AND COVERS

A. Metallic Outlet Boxes:

1. Description: Box having pryout openings, knockouts, threaded entries, or hubs in either the sides of the back, or both, for entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting outlet box cover, but without provisions for mounting wiring device directly to box.
2. Applicable Standards:

    a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
    b. General Characteristics:

        1) Reference Standards: UL 514A and UL Category Control Number QCIT.

    c. Options:

        1) Material: Sheet steel.
        2) Sheet Metal Depth: Minimum 2.5 inch (65 mm).
        3) Luminaire Outlet Boxes and Covers: Nonadjustable, listed and labeled for attachment of luminaire weighing up to 50 lb (23 kg).

B. Metallic Conduit Bodies:

1. Description: Means for providing access to interior of conduit or tubing system through one or more removable covers at junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Crouse-Hinds.
    b. Pass & Seymour.
    c. Raco Taymac Bell.
    d. Or approved equal

3. Applicable Standards:

    a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
    b. General Characteristics:

        1) Reference Standards: UL 514A and UL Category Control Number QCIT.

C. Metallic Device Boxes:

1. Description: Box with provisions for mounting wiring device directly to box.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crouse-Hinds.
b. Hubbell.
c. Arlington Industries.
d. Or approved equal

3. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 514A and UL Category Control Number QCIT.

c. Options:

1) Material: Sheet steel.
2) Sheet Metal Depth: minimum 2.5 inch (65 mm).
3) Luminaire Outlet Boxes and Covers: Nonadjustable, listed and labeled for attachment of luminaire weighing up to 50 lb (23 kg).

D. Metallic Extension Rings:

1. Description: Ring intended to extend sides of outlet box or device box to increase box depth, volume, or both.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. B-line.
b. Crouse-Hinds.
c. Pass & Seymour.
d. Or approved equal

3. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL 514A and UL Category Control Number QCIT.

2.10 TERMINATION BOXES

A. Description: Enclosure for termination base consisting of lengths of bus bars, terminal strips, or terminal blocks with provision for wire connectors to accommodate incoming or outgoing conductors or both.

B. Termination Boxes and Termination Bases for Installation on Load Side of Service Equipment:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. B-Line.
    b. Hoffman.
    c. Schneider Electric (Square D).
    d. Or approved equal

2. Applicable Standards:

    a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
    b. General Characteristics:

        1) Reference Standards: UL 1773 and UL Category Control Number XCKT.
        2) Listed and labeled for installation on load side of service equipment.

2.11 CABINETS, CUTOUT BOXES, JUNCTION BOXES, PULL BOXES, AND MISCELLANEOUS ENCLOSURES

A. Indoor Sheet Metal Cabinets:

1. Description: Enclosure provided with frame, mat, or trim in which swinging door or doors are or can be hung.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. B-Line.
    b. Hoffman.
    c. Raco.
    d. Or approved equal

3. Applicable Standards:

    a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
    b. General Characteristics:

        1) Reference Standards: UL Category Control Number CYIV.

            a) Non-Environmental Characteristics: UL 50.
            b) Environmental Characteristics: UL 50E.

    c. Options:

        1) Degree of Protection: Type 1.

B. Indoor Sheet Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. B-Line.
    b. Hoffman.
    c. Raco.
    d. Or approved equal

3. Applicable Standards:

    a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
    b. General Characteristics:

        1) Reference Standards: UL Category Control Number BGUZ.

            a) Non-Environmental Characteristics: UL 50.
            b) Environmental Characteristics: UL 50E.

    c. Options:

        1) Degree of Protection: Type 1.

C. Indoor Cast-Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. B-Line.
    b. Hoffman.
    c. Raco.
    d. Or approved equal

3. Applicable Standards:

    a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
    b. General Characteristics:

        1) Reference Standards: UL Category Control Number BGUZ.

            a) Non-Environmental Characteristics: UL 50.
            b) Environmental Characteristics: UL 50E.

    c. Options:

        1) Degree of Protection: Type 1.

D. Indoor Sheet Metal Miscellaneous Enclosures:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. B-Line.
    b. Hoffman.
    c. Raco.
    d. Or approved equal

2. Applicable Standards:

    a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
    b. General Characteristics:

        1) Reference Standards:

            a) UL 1773 and UL Category Control Number XCKT.
            b) Non-Environmental Characteristics: UL 50.
            c) Environmental Characteristics: UL 50E.

    c. Options:

        1) Degree of Protection: Type 1.

E. Outdoor Sheet Metal Cabinets:

1. Description: Enclosure provided with frame, mat, or trim in which swinging door or doors are or can be hung.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. B-Line.
    b. Hoffman.
    c. Raco.
    d. Or approved equal

3. Applicable Standards:

    a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
    b. General Characteristics:

        1) Reference Standards: UL Category Control Number CYIV.

            a) Non-Environmental Characteristics: UL 50.
            b) Environmental Characteristics: UL 50E.

    c. Options:

1) Degree of Protection: Type 3R.

F. Outdoor Sheet Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. B-Line.
b. Hoffman.
c. Raco.
d. Or approved equal

3. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL Category Control Number BGUZ.

a) Non-Environmental Characteristics: UL 50.
b) Environmental Characteristics: UL 50E.

c. Options:

1) Degree of Protection: Type 3R.

G. Outdoor Cast-Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. B-Line.
b. Hoffman.
c. Raco.
d. Or approved equal

3. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards: UL Category Control Number BGUZ.

a) Non-Environmental Characteristics: UL 50.
b) Environmental Characteristics: UL 50E.

c. Options:

1) Degree of Protection: Type 3R.

H. Outdoor Sheet Metal Miscellaneous Enclosures:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. B-Line.
b. Hoffman.
c. Raco.
d. Or approved equal

2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
b. General Characteristics:

1) Reference Standards:

a) UL 1773 and UL Category Control Number XCKT.
b) Non-Environmental Characteristics: UL 50.
c) Environmental Characteristics: UL 50E.

c. Options:

1) Degree of Protection: Type 3R.

PART 3 - EXECUTION

3.1 SELECTION OF RACEWAYS

A. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for selection of raceways. Consult the State for resolution of conflicting requirements.

B. Outdoors:

1. Exposed Conduit: ERMC.
2. Concealed Conduit, Aboveground: EMT.
3. Direct-Buried Conduit: PVC-40.
4. Concrete-Encased Conduit Not in Trench: PVC-40.
5. Concrete-Encased Conduit in Trench: PVC-40.
6. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.

C. Indoors:

1. Exposed and Subject to Physical Damage: ERMC.
2. Exposed, Not Subject to Physical Damage: EMT.
3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
4. Damp or Wet Locations: ERMC.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.

D. Stub-ups to Above Recessed Ceilings: Provide EMT or ERMC for raceways.

E. Raceway Fittings: Select fittings in accordance with NEMA FB 2.10 guidelines.

1. ERMC: Provide threaded type fittings unless otherwise indicated.

3.2 SELECTION OF BOXES AND ENCLOSURES

A. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for selection of boxes and enclosures. Consult the State for resolution of conflicting requirements.

B. Degree of Protection:

1. Outdoors:

a. Type 3R unless otherwise indicated.

2. Indoors:

a. Type 1 unless otherwise indicated.

C. Exposed Boxes Installed Less Than 6.5 ft. (2 m) Above Floor:

1. Boxes with knockouts or unprotected openings are prohibited.
2. Provide exposed cover. Flat covers with angled mounting slots or knockouts are prohibited.

3.3 INSTALLATION OF RACEWAYS

A. Installation Standards:

1. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for installation of raceways. Consult the State for resolution of conflicting requirements.
2. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
3. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for hangers and supports.
4. Comply with NECA NEIS 101 for installation of steel raceways.
5. Comply with NECA NEIS 111 for installation of nonmetallic raceways.

6. Install raceways square to the enclosure and terminate at enclosures without hubs with locknuts on both sides of enclosure wall. Install locknuts hand tight, plus one-quarter turn more.
7. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4 inch (35 mm) trade size and insulated throat metal bushings on 1-1/2 inch (41 mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
8. Raceway Terminations at Locations Subject to Moisture or Vibration:

    a. Provide insulating bushings to protect conductors, including conductors smaller than No. 4 AWG. Install insulated throat metal grounding bushings on service conduits.

B. General Requirements for Installation of Raceways:

1. Complete raceway installation before starting conductor installation.
2. Provide stub-ups through floors with coupling threaded inside for plugs, set flush with finished floor. Plug coupling until conduit is extended above floor to final destination or a minimum of 2 ft. (0.6 m) above finished floor.
3. Install no more than equivalent of three 90-degree bends in conduit run except for control wiring conduits, for which no more than equivalent of two 90-degree fewer bends are permitted. Support within 12 inch (300 mm) of changes in direction.
4. Make bends in raceway using large-radius preformed ells except for parallel bends. Field bending must be in accordance with NFPA 70 minimum radii requirements. Provide only equipment specifically designed for material and size involved.
5. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
6. Support conduit within 12 inch (300 mm) of enclosures to which attached.
7. Install raceway sealing fittings at accessible locations in accordance with NFPA 70 and fill them with listed sealing compound. For concealed raceways, install fitting in flush steel box with blank cover plate having finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings in accordance with NFPA 70.
8. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal interior of raceways at the following points:

    a. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
    b. Where an underground service raceway enters a building or structure.
    c. Conduit extending from interior to exterior of building.
    d. Conduit extending into pressurized duct and equipment.
    e. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
    f. Where otherwise required by NFPA 70.

9. Do not install raceways or electrical items on rotating equipment.

10. Do not install conduits within 2 inch (50 mm) of the bottom side of a metal deck roof.
11. Keep raceways at least 6 inch (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
12. Cut conduit perpendicular to the length. For conduits 2 inch (53 mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length. Ream inside of conduit to remove burrs.
13. Install pull wires in empty raceways. Provide polypropylene or monofilament plastic line with not less than 200 lb (90 kg) tensile strength. Leave at least 12 inch (300 mm) of slack at both ends of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

C. Requirements for Installation of Specific Raceway Types:

1. Types ERMC:

    a. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound that maintains electrical conductivity to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

2. Type ERMC-S-PVC:

    a. Follow manufacturer's installation instructions for clamping, cutting, threading, bending, and assembly.
    b. Provide PVC-coated sealing locknut for exposed male threads transitioning into female NPT threads that do not have sealing sleeves, including transitions from PVC couplings/female adapters to Type ERMC-S-PVC elbows in direct-burial applications. PVC-coated sealing locknuts must not be used in place of conduit hub. PVC-coated sealing locknut must cover exposed threads on Type ERMC-S-PVC raceway.
    c. Coat field-cut threads on PVC-coated raceway with manufacturer-approved corrosion-preventing conductive compound prior to assembly.
    d. rior to assembly.

3. Types LFMC:

    a. Comply with NEMA RV 3. Provide a maximum of 36 inch (915 mm) of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

4. Types PVC and EPEC:

    a. Do not install Type PVC or Type EPEC conduit where ambient temperature exceeds 122 deg F (50 deg C) Conductor ratings must be limited to 75 deg C except where installed in a trench outside buildings with concrete encasement, where 90 deg C conductors are permitted.
    b. Comply with manufacturer's written instructions for solvent welding and fittings.

D. Raceways Embedded in Slabs:

1. Run raceways larger than 1 inch (27 mm) trade size below concrete slab.
2. Arrange raceways to cross building expansion joints with expansion fittings at right angles to the joint.
3. Arrange raceways to ensure that each is surrounded by a minimum of 2 inch (50 mm) of concrete without voids.
4. Do not embed threadless fittings in concrete unless locations have been specifically approved by the State.

E. Stub-ups to Above Recessed Ceilings:

1. Provide EMT or ERMC for raceways.
2. Provide a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

F. Raceway Fittings: Install fittings in accordance with NEMA FB 2.10 guidelines.

1. ERMC-S-PVC: Provide only fittings listed for use with this type of conduit. Patch and seal joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Provide sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
2. EMT: Provide compression, steel fittings. Comply with NEMA FB 2.10.
3. Flexible Conduit: Provide only fittings listed for use with flexible conduit type. Comply with NEMA FB 2.20.

G. Expansion-Joint Fittings:

1. Install in runs of aboveground PVC that are located where environmental temperature change may exceed 30 deg F (17 deg C) and that have straight-run length that exceeds 25 ft. (7.6 m). Install in runs of aboveground ERMC and EMT conduit that are located where environmental temperature change may exceed 100 deg F (55 deg C) and that have straight-run length that exceeds 100 ft. (30 m).
2. Install type and quantity of fittings that accommodate temperature change listed for the following locations:

    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
    c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
    d. Attics: 135 deg F (75 deg C) temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F (0.0115 mm per meter of length of straight run per deg C) of temperature change for metal conduits.

4. Install expansion fittings at locations where conduits cross building or structure expansion joints.
5. Install expansion-joint fitting with position, mounting, and piston setting selected in accordance with manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

H. Raceways Penetrating Rooms or Walls with Acoustical Requirements:

1. Seal raceway openings on both sides of rooms or walls with acoustically rated putty or firestopping.

3.4 INSTALLATION OF SURFACE RACEWAYS

A. Install surface raceways only where indicated.

B. Install surface raceway with a minimum 2 inch (50 mm) radius control at bend points.

C. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inch (1200) mm) and with no less than two supports per straight raceway section. Support surface raceway in accordance with manufacturer's written instructions. Tape and glue are unacceptable support methods.

3.5 INSTALLATION OF BOXES AND ENCLOSURES

A. Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures.

B. Mount boxes at heights indicated. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to top of box unless otherwise indicated.

C. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box, whether installed indoors or outdoors.

D. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

E. Locate boxes so that cover or plate will not span different building finishes.

F. Support boxes in recessed ceilings independent of ceiling tiles and ceiling grid.

G. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for purpose.

H. Fasten junction and pull boxes to, or support from, building structure. Do not support boxes by conduits.

I. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to ensure a continuous ground path.

J. Boxes and Enclosures in Areas or Walls with Acoustical Requirements:

1. Seal openings and knockouts in back and sides of boxes and enclosures with acoustically rated putty.
2. Provide gaskets for wallplates and covers.

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies.

3.7 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

3.8 CLEANING

A. Boxes: Remove construction dust and debris from device boxes, outlet boxes, and floor-mounted enclosures before installing wallplates, covers, and hoods.

END OF SECTION 26 05 33

SECTION 26 05 33.16

BOXES AND COVERS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metallic outlet boxes, device boxes, rings, and covers.
2. Nonmetallic outlet boxes, device boxes, rings, and covers.
3. Junction boxes and pull boxes.
4. Cover plates for device boxes.
5. Hoods for outlet boxes.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Metallic outlet boxes, device boxes, rings, and covers.
2. Nonmetallic outlet boxes, device boxes, rings, and covers.
3. Junction boxes and pull boxes.
4. Cover plates for device boxes.
5. Hoods for outlet boxes.

B. Shop Drawings:

1. Shop drawings for floor boxes.

C. Samples:

1. Floor box samples for initial selection.
2. Raised floor box samples for initial selection.
3. Recessed access-floor box samples for initial selection.
4. Concrete box samples for initial selection.

D. Sustainable design submittals.

1. Nonmetallic outlet boxes, device boxes, rings, and covers.
2. Junction boxes and pull boxes.
3. Cover plates for device boxes.

E. Sustainable Design Submittals:

1. Product data for sustainable design features for each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturers' Published Instructions:

1. Metallic outlet boxes, device boxes, rings, and covers.
2. Nonmetallic outlet boxes, device boxes, rings, and covers.
3. Junction boxes and pull boxes.
4. Cover plates for device boxes.
5. Hoods for outlet boxes.

PART 2 - PRODUCTS

2.1 METALLIC OUTLET BOXES, DEVICE BOXES, RINGS, AND COVERS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria: UL CCN QCIT; including UL 514A.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.
3. Samples:

a. Floor Box Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors and flooring inserts for each type of floor box.
b. Raised Floor Box Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors and flooring inserts for each type of floor box.
c. Recessed Access-Floor Box Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors and flooring inserts for each type of floor box.
d. Concrete Box Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors and flooring inserts for each type of floor box.

C. UL QCIT - Metallic Outlet Boxes and Covers:

1. Description: Box having pryout openings, knockouts, threaded entries, or hubs in either the sides of the back, or both, for entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting outlet box cover, but without provisions for mounting wiring device directly to box.
2. Hubbell, Arlington Industries.

3. Options:

    a. Material: Cast metal.
    b. Cast-Metal Depth: Minimum 2.4 inch .

D. UL QCIT - Metallic Conduit Bodies:

1. Description: Means for providing access to interior of conduit or tubing system through one or more removable covers at junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.
2. ABB

E. UL QCIT - Metallic Device Boxes:

1. Description: Box with provisions for mounting wiring device directly to box.
2. ABB
3. Options:

    a. Material: Cast metal.
    b. Cast-Metal Depth: minimum 2.4 inch .

2.2 JUNCTION BOXES AND PULL BOXES

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. Listing Criteria: UL CCN BGUZ; including UL 50 and UL 50E.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for pr
3. duct.

C. UL BGUZ - Indoor Sheet Metal Junction and Pull Boxes:

1. Options:

    a. Degree of Protection: Type 12

D. UL BGUZ - Indoor Cast-Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Options:

    a. Degree of Protection: Type 12.

E. UL BGUZ - Outdoor Sheet Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Options:

a. Degree of Protection: Type 4X.

F. UL BGUZ - Outdoor Cast-Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Options:

a. Degree of Protection: Type 4X.

2.3 COVER PLATES FOR DEVICES BOXES

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. Listing Criteria: UL CCN QCIT or UL CCN QCMZ; including UL 514D.
3. Wallplate-Securing Screws: Metal with head color to match wallplate finish.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL QCIT or QCMZ - Metallic Cover Plates for Device Boxes:

1. ABB
2. Options:

a. Damp and Wet Locations: Listed, labeled, and marked for location and use. Provide gaskets and accessories necessary for compliance with listing.
b. Wallplate Material: 0.032 inch thick, Type 302/304 non-magnetic stainless steel with brushed finish

2.4 HOODS FOR OUTLET BOXES

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. Listing Criteria:

a. UL CCN QCIT or UL CCN QCMZ; including UL 514D.
b. Receptacle, Hood, Cover Plate, Gaskets, and Seals: UL 498 Supplement SA when mated with box or enclosure complying with UL 514A, UL 514C, or UL 50E.

3. Mounts to box using fasteners different from wiring device.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL QCIT or QCMZ - Retractable or Reattachable Hoods for Outlet Boxes:

1. ABB
2. Options:

a. Provides gray, weatherproof, "while-in-use" cover.

D. UL QCIT or QCMZ - Extra-Duty, While-in-Use Hoods for Outlet Boxes:

1. ABB
2. Additional Characteristics: Marked "Extra-Duty" in accordance with UL 514D.
3. Options:

a. Provides clear, weatherproof, "while-in-use" cover.
b. Manufacturer may combine nonmetallic device box with hood as extra-duty rated assembly.

PART 3 - EXECUTION

3.1 PREPARATION

A. Shop Drawings: Prepare and submit the following:

1. Shop Drawings for Floor Boxes: Show that floor boxes are located to avoid interferences and are structurally allowable. Indicate floor thickness at location where boxes are embedded in concrete floors and underfloor clearances where boxes are installed in raised floors.

3.2 SELECTION OF BOXES AND COVERS FOR ELECTRICAL SYSTEMS

A. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NFPA 70 for selection of boxes and enclosures. Consult the State for resolution of conflicting requirements.

B. Degree of Protection:

1. Outdoors:

    a. Type 3Runless otherwise indicated.
    b. Locations Exposed to Hosedown: Type 6P.
    c. Locations Subject to Potential Flooding: Type 6P.
    d. Locations Aboveground Where Mechanism Must Operate When Ice Covered: Type 3S.
    e. Locations in-Ground or Exposed to Corrosive Agents: Type 4X.
    f. Locations in-Ground or Exposed to Corrosive Agents Where Mechanism Must Operate When Ice Covered: Type 3SX.

2. Indoors:

    a. Type 1 unless otherwise indicated.
    b. Damp or Dusty Locations: Type 12
    c. Locations Exposed to Hosedown: Type 4 6P.
    d. Locations Exposed to Corrosive Agents: Type 4X.
    e. Locations Exposed to Spraying Oil or Coolants: Type 13.

C. Exposed Boxes Installed Less Than 2.5 m (8 ft) Above Floor:

1. Provide cast-metal boxes
2. Provide exposed cover. Flat covers with angled mounting slots or knockouts are prohibited.

3.3 INSTALLATION OF BOXES AND COVERS FOR ELECTRICAL SYSTEMS

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:

1. Outlet, Device, Pull, and Junction Boxes: Article 314 of NFPA 70.
2. Consult the State for resolution of conflicting requirements.

C. Special Installation Techniques:

1. Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures.
2. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
3. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box, whether installed indoors or outdoors.
4. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
5. Locate boxes so that cover or plate will not span different building finishes.

6. Support boxes in recessed ceilings independent of ceiling tiles and ceiling grid.
7. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for purpose.
8. Fasten junction and pull boxes to, or support from, building structure. Do not support boxes by conduits.
9. Set metal floor boxes level and flush with finished floor surface.
10. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.
11. Do not install aluminum boxes, enclosures, or fittings in contact with concrete or earth.
12. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to ensure a continuous ground path.
13. Boxes and Enclosures in Areas or Walls with Acoustical Requirements:

    a. Seal openings and knockouts in back and sides of boxes and enclosures with acoustically rated putty.
    b. Provide gaskets for wallplates and covers.

14. Identification: Provide labels for boxes and associated electrical equipment.

    a. Identify field-installed conductors, interconnecting wiring, and components.
    b. Provide warning signs.
    c. Label each box with engraved metal or laminated-plastic nameplate.

D. Interfaces with Other Work:

1. Coordinate installation of new products for additional equipment with existing conditions.
2. Coordinate with Section 260573.13 "Short-Circuit Studies" for determining available fault current on input feeder.
3. Coordinate with Section 260573.19 "Arc-Flash Hazard Analysis" for determining arc-flash hazard on input feeder.

3.4 CLEANING

A. Remove construction dust and debris from boxes before installing wallplates, covers, and hoods.

3.5 PROTECTION

A. After installation, protect boxes from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by the State.

END OF SECTION 26 05 33.16

SECTION 26 05 43

UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduits and fittings, including GRC and PVC-coated steel conduit.
2. Rigid nonmetallic duct.
3. Duct accessories.
4. Precast concrete handholes.
5. Utility structure accessories.

1.2 DEFINITIONS

A. Direct Buried: Duct or a duct bank that is buried in the ground, without any additional casing materials such as concrete.

B. Duct: A single duct or multiple ducts. Duct may be either installed singly or as component of a duct bank.

C. Duct Bank:

1. Two or more ducts installed in parallel, with or without additional casing materials.
2. Multiple duct banks.

D. GRC: Galvanized rigid (steel) conduit.

E. Trafficways: Locations where vehicular or pedestrian traffic is a normal course of events.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include duct-bank materials, including spacers and miscellaneous components.
2. Include duct, conduits, and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
3. Include accessories for handholes, boxes, and other utility structures.
4. Include underground-line warning tape.
5. Include warning planks.

B. Shop Drawings:

1. Precast or Factory-Fabricated Underground Utility Structures:

    a. Include plans, elevations, sections, details, attachments to other work, and accessories.
    b. Include duct entry provisions, including locations and duct sizes.
    c. Include reinforcement details.
    d. Include frame and cover design.
    e. Include grounding details.
    f. Include dimensioned locations of cable rack inserts, pulling-in and lifting irons, and sumps.
    g. Include joint details.

2. Factory-Fabricated Handholes and Boxes Other Than Precast Concrete:

    a. Include dimensioned plans, sections, and elevations, and fabrication and installation details.
    b. Include duct entry provisions, including locations and duct sizes.
    c. Include cover design.
    d. Include grounding details.
    e. Include dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: For duct and duct bank. Show duct profiles and coordination with other utilities and underground structures.

1. Include plans and sections, drawn to scale, and show bends and locations of expansion fittings.
2. Drawings shall be signed and sealed by a qualified professional engineer.

B. Qualification Data: For testing agency.

C. Product Certificates: For concrete and steel used in precast concrete boxes and handholes, as required by ASTM C858.

D. Source quality-control reports.

E. Field quality-control reports.

1.5 MAINTENANCE MATERIALS SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Furnish cable-support stanchions, arms, and associated fasteners in quantities equal to 5 percent of quantity of each item installed.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

1.7 FIELD CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by the State or others unless permitted under the following conditions, and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify the State no fewer than fourteen (14) days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without the State's written permission.

B. Ground Water: Assume ground-water level is at grade level unless a lower water table is noted on Drawings.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND FITTINGS

A. Coated Steel Conduit: PVC-coated GRC.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch (1 mm), minimum.

B. Basis-of-Design Product: Subject to compliance with requirements, provide products by one of the following or comparable:

1. Allied Tube & Conduit.
2. Republic Conduit.
3. Western Tube.
4. Or approved equal.

C. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.

2.2 RIGID NONMETALLIC DUCT

A. Underground Plastic Utilities Duct: Type EPC-80-PVC and Type EPC-40-PVC RNC, complying with NEMA TC 2 and UL 651, with matching fittings complying with NEMA TC 3 by same manufacturer as duct.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cantex.
2. IPLEX.
3. National Pipe & Plastics.
4. Or approved equal.

C. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.

D. Solvents and Adhesives: As recommended by conduit manufacturer.

2.3 DUCT ACCESSORIES

A. Duct Spacers: Factory-fabricated, rigid, PVC interlocking spacers; sized for type and size of duct with which used, and selected to provide minimum duct spacing indicated while supporting duct during concreting or backfilling.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allied Tube & Conduit.
b. Cantex.
c. IPEX.
d. Or approved equal.

B. Underground-Line Warning Tape: Comply with requirements for underground-line warning tape specified in Section 26 05 53 "Identification for Electrical Systems."

C. Concrete Warning Planks: Nominal 12 by 24 by 3 inches (300 by 600 by 75 mm) in size, manufactured from 6000-psi (41-MPa) concrete.

1. Color: Red dye added to concrete during batching.
2. Mark each plank with "ELECTRIC" in 2-inch- (50-mm-) high, 3/8-inch- (10-mm-) deep letters.

2.4 PRECAST CONCRETE HANDHOLES AND BOXES

A. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover shall form top of enclosure and shall have load rating consistent with that of handhole or box.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Christy.
2. Oldcastle.
3. Jensen Precast.
4. Or approved equal.

C. Comply with ASTM C858 for design and manufacturing processes.

D. Frame and Cover: Weatherproof steel frame, with steel cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.

E. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.

F. Cover Legend: Molded lettering, "ELECTRIC".

G. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated or otherwise required by Utility Company.

H. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.

I. Knockout Panels: Precast openings in walls, arranged to match dimensions and elevations of approaching duct, plus an additional 12 inches (300 mm) vertically and horizontally to accommodate alignment variations.

1. Splayed location.
2. Knockout panels shall be located no less than 6 inches (150 mm) from interior surfaces of walls, floors, or frames and covers of handholes, but close enough to corners to facilitate racking of cables on walls.
3. Knockout panel opening shall have cast-in-place, welded-wire fabric reinforcement for field cutting and bending to tie in to concrete envelopes of duct.
4. Knockout panels shall be framed with at least two additional No. 3 steel reinforcing bars in concrete around each opening.
5. Knockout panels shall be 1-1/2 to 2 inches (38 to 50 mm) thick.

J. Duct Entrances in Handhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.

1. Type and size shall match fittings to duct to be terminated.
2. Fittings shall align with elevations of approaching duct and be located near interior corners of handholes to facilitate racking of cable.

K. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.5 UTILITY STRUCTURE ACCESSORIES

A. Accessories for Utility Structures: Utility equipment and accessory items used for utility structure access and utility support, listed and labeled for intended use and application.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Christy.
2. Oldcastle.
3. Jensen Precast.

4. Or approved equal.

C. Pulling Eyes in Concrete Walls: Eyebolt with reinforcing-bar fastening insert, 2-inch-(50-mm-) diameter eye, and 1-by-4-inch (25-by-100-mm) bolt.

1. Working Load Embedded in 6-Inch (150-mm), 4000-psi (27.6-MPa) Concrete: 13,000-lbf (58-kN) minimum tension.

D. Pulling-in and Lifting Irons in Concrete Floors: 7/8-inch- (22-mm-) diameter, hot-dip galvanized, bent steel rod; stress relieved after forming; and fastened to reinforcing rod. Exposed triangular opening.

1. Ultimate Yield Strength: 40,000-lbf (180-kN) shear and 60,000-lbf (270-kN) tension.

E. Bolting Inserts for Concrete Utility Structure Cable Racks and Other Attachments: Flared, threaded inserts of noncorrosive, chemical-resistant, nonconductive thermoplastic material; 1/2-inch (13-mm) ID by 2-3/4 inches (69 mm) deep, flared to 1-1/4 inches (31 mm) minimum at base.

1. Tested Ultimate Pullout Strength: 12,000 lbf (53 kN) minimum.

F. Ground Rod Sleeve: 3-inch (75-mm) PVC sleeve in floors 2 inches (50 mm) from the wall adjacent to, but not underneath, the ducts routed from the facility.

G. Cable Rack Assembly: Nonmetallic. Components fabricated from nonconductive, fiberglass-reinforced polymer.

1. Stanchions: Nominal 36 inches (900 mm) high by 4 inches (100 mm) wide, with provisions to connect to other sections to form a continuous unit, with minimum of nine holes for arm attachment.
2. Arms: Arranged for secure, drop-in attachment in horizontal position at any location on cable stanchions, and capable of being locked in position. Arms shall be available in lengths ranging from 3 inches (75 mm) with 450-lb (204-kg) minimum capacity to 20 inches (500 mm) with 250-lb (114-kg) minimum capacity. Top of arm shall be nominally 4 inches (100 mm) wide, and arm shall have slots along full length for cable ties.

H. Duct-Sealing Compound: Nonhardening, safe for contact with human skin, not deleterious to cable insulation, and workable at temperatures as low as 35 deg F (2 deg C). Capable of withstanding temperature of 300 deg F (150 deg C) without slump and adhering to clean surfaces of plastic ducts, metallic conduit, conduit and duct coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals.

I. Cover Hooks: Light duty, designed for lifts less than 60 lbf (270 N). Two required.

2.6 SOURCE QUALITY CONTROL

A. Test and inspect precast concrete utility structures according to ASTM C1037.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate layout and installation of duct, duct bank, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field. Notify the State if there is a conflict between areas of excavation and existing structures or archaeological sites to remain.

B. Coordinate elevations of duct and duct-bank entrances into handholes, and boxes with final locations and profiles of duct and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct and duct bank will drain to boxes and handholes, and as approved by the State.

C. Clear and grub vegetation to be removed and protect vegetation to remain. Remove and stockpile topsoil for reapplication.

3.2 UNDERGROUND DUCT APPLICATION

A. Duct for Electrical Feeders 600 V and Less: Type EPC-80-PVC, Type EPC-40-PVC RNC, direct-buried unless otherwise indicated.

B. Duct for Electrical Branch Circuits: Type EPC-80-PVC and Type EPC-40-PVC RNC, direct-buried unless otherwise indicated.

C. Stub-ups: Concrete-encased PVC-coated GRC.

3.3 UNDERGROUND ENCLOSURE APPLICATION

A. Handholes and Boxes for 600 V and Less:

1. Units in Roadways and Other Deliberate Traffic Paths: Precast concrete. AASHTO HB 17, H-20 structural load rating.
2. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Precast concrete, AASHTO HB 17, H-20 structural load rating.
3. Units in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Precast concrete, AASHTO HB 17, H-10 structural load rating.
4. Cover design load shall not exceed the design load of the handhole or box.

3.4 EARTHWORK

A. Excavation and Backfill: Do not use heavy-duty, hydraulic-operated, compaction equipment.

3.5 DUCT AND DUCT-BANK INSTALLATION

A. Provide duct, spacers, and accessories whether or not shown. Duct installation requirements in this Section also apply to duct bank.

B. Install duct according to NEMA TCB 2.

C. Slope: Pitch duct a minimum slope of 1:300 down toward boxes and handholes and away from buildings and equipment. Slope duct from a high point between two items, to drain in both directions.

D. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches (1200 mm), both horizontally and vertically, at other locations unless otherwise indicated.

1. Duct shall have maximum of three 90 degree bends or the total of all bends shall be no more 270 degrees between pull points.

E. Joints: Use solvent-cemented joints in duct and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent duct do not lie in same plane.

F. End Bell Entrances to Concrete Boxes and Handholes: Use end bells, spaced approximately 10 inches (250 mm) o.c. for 5-inch (125-mm) duct, and vary proportionately for other duct sizes.

1. Begin change from regular spacing to end-bell spacing 10 feet (3 m) from the end bell, without reducing duct slope and without forming a trap in the line.
2. Grout end bells into structure walls from both sides to provide watertight entrances.

G. Terminator Entrances to Concrete Boxes and Handholes: Use manufactured, cast-in-place duct terminators, with entrances into structure spaced approximately 6 inches (150 mm) o.c. for 4-inch (100-mm) duct, and vary proportionately for other duct sizes.

1. Begin change from regular spacing to terminator spacing 10 feet (3 m) from the terminator, without reducing duct line slope and without forming a trap in the line.

H. Sealing: Provide temporary closure at terminations of duct with pulled cables. Seal spare duct at terminations. Use sealing compound and plugs to withstand at least 15-psig (1.03-MPa) hydrostatic pressure.

I. Pulling Cord: Install 200-lbf- (1000-N-) test nylon cord in empty ducts.

J. Direct-Buried Duct and Duct Bank:

1. Excavate trench bottom to provide firm and uniform support for duct. Prepare trench bottoms for pipes less than 6 inches (150 mm) in nominal diameter.
2. Width: Excavate trench 3 inches (75 mm) wider than duct on each side.
3. Depth: Install top of duct at least 36 inches (900 mm) below finished grade unless otherwise indicated.

4. Set elevation of bottom of duct bank below frost line.
5. Support ducts on duct spacers coordinated with duct size, duct spacing, and outdoor temperature.
6. Spacer Installation: Place spacers close enough to prevent sagging and deforming of duct, with not less than four spacers per 20 feet (6 m) of duct. Place spacers within 24 inches (600 mm) of duct ends. Stagger spacers approximately 6 inches (150 mm) between tiers. Secure spacers to earth and to ducts to prevent floating during concreting. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
7. Install duct with a minimum of 3 inches (75 mm) between ducts for like services and 6 inches (150 mm) between power and communications duct.
8. Install manufactured GRC elbows for stub-ups, at building entrances, and at changes of direction in duct.

    a. Couple RNC duct to GRC with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete.
    b. Stub-ups to Outdoor Equipment: Extend concrete-encased GRC horizontally a minimum of 60 inches (1500 mm) from edge of base. Install insulated grounding bushings on terminations at equipment.

        1) Stub-ups shall be minimum 4 inches (100 mm)above finished floor and minimum 3 inches (75 mm)from conduit side to edge of slab.

9. After installing first tier of duct, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand place backfill to 4 inches (100 mm) over duct and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction.

    a. Place minimum 3 inches (75 mm) of sand as a bed for duct. Place sand to a minimum of 6 inches (150 mm) above top level of duct.
    b. Place minimum 6 inches (150 mm) of engineered fill above concrete encasement of duct.

K. Warning Planks: Bury warning planks approximately 12 inches (300 mm) above direct-buried duct, placing them 24 inches (600 mm) o.c. Align planks along the width and along the centerline of duct or duct bank. Provide an additional plank for each 12-inch (300-mm) increment of duct-bank width over a nominal 18 inches (450 mm). Space additional planks 12 inches (300 mm) apart, horizontally.

L. Underground-Line Warning Tape: Bury conducting underground line specified in Section 260553 "Identification for Electrical Systems" no less than 12 inches (300 mm) above all concrete-encased duct and duct banks. Align tape parallel to and within 3 inches (75 mm) of centerline of duct bank. Provide an additional warning tape for each 12-inch (300-mm) increment of duct-bank width over a nominal 18 inches (450 mm). Space additional tapes 12 inches (300 mm) apart, horizontally.

3.6 INSTALLATION OF CONCRETE HANDHOLES, AND BOXES

A. Precast Concrete Box and Handhole Installation:

1. Comply with ASTM C891 unless otherwise indicated.
2. Install units level and plumb and with orientation and depth coordinated with connecting duct, to minimize bends and deflections required for proper entrances.
3. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1-inch (25-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

B. Elevations:

1. Handhole Covers: In paved areas and trafficways, set surface flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.

C. Hardware: Install removable hardware, including pulling eyes, cable stanchions, and cable arms, as required for installation and support of cables and conductors and as indicated.

D. Field-Installed Bolting Anchors in Concrete Handholes: Do not drill deeper 2 inches (50 mm) for handholes, for anchor bolts installed in the field. Use a minimum of two anchors for each cable stanchion.

3.7 GROUNDING

A. Ground underground ducts and utility structures according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."

3.8 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Demonstrate capability and compliance with requirements on completion of installation of underground duct, duct bank, and utility structures.
2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide a minimum 12-inch-(300-mm-) long mandrel equal to duct size minus 1/4 inch (6 mm). If obstructions are indicated, remove obstructions and retest.

B. Correct deficiencies and retest as specified above to demonstrate compliance.

C. Prepare and submit test and inspection reports to the State.

3.9 CLEANING

A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of duct until duct cleaner indicates that duct is clear of dirt and debris. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

B. Clean internal surfaces including sump.

1. Sweep box interior, removing dirt and debris.
2. Remove foreign material.

END OF SECTION 26 05 43

SECTION 26 05 44

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Round sleeves.
2. Rectangular sleeves.
3. Sleeve-seal systems.
4. Sleeve-seal fittings.
5. Grout.
6. Pourable sealants.
7. Foam sealants.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.

2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

PART 2 - PRODUCTS

2.1 ROUND SLEEVES

A. Steel Wall Sleeves:

1. STI Specified Technologies Inc.
2. General Characteristics: ASTM A53/A53M, Type E, Grade B, Schedule 40, zinc coated, plain ends and integral waterstop.

B. Cast-Iron Wall Sleeves:

1. General Characteristics: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop.

C. PVC Pipe Sleeves:

1. General Characteristics: ASTM D1785, Schedule 40.

D. PVC Molded Sleeves:

1. Polywater Solutions at Work, Roxtec..
2. General Characteristics: With nailing flange for attaching to wooden forms.

E. PE or PP Molded Sleeves:

1. Polywater Solutions at Work.
2. General Characteristics: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

F. Round, Galvanized-Steel, Sheet Metal Sleeves:

1. General Characteristics: Galvanized-steel sheet; thickness not less than 0.0239 inch ; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

2.2 RECTANGULAR SLEEVES

A. Rectangular, Galvanized-Steel, Sheet Metal Sleeves:

1. STI Specified Technologies Inc.,Roxtec.
2. General Characteristics:

a. Material: Galvanized sheet steel.
b. Minimum Metal Thickness:

1) For sleeve cross-section rectangle perimeter less than 50 inch and with no side larger than 16 inch), thickness must be 0.052 inch.
2) For sleeve cross-section rectangle perimeter not less than 50 inch or with one or more sides larger than 16 inch, thickness must be 0.138 inch.

2.3 SLEEVE-SEAL SYSTEMS

A. Polywater Solutions at Work, Roxtec.

B. General Characteristics: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable or between raceway and cable.

C. Options:

1. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.4 SLEEVE-SEAL FITTINGS

A. General Characteristics: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit must have plastic or rubber waterstop collar with center opening to match piping OD.

2.5 GROUT

A. STI Specified Technologies Inc.

B. General Characteristics: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

1. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
2. Design Mix: 5000 psi , 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

2.6 POURABLE SEALANTS

A. Specified Technologies Inc.

B. Performance Criteria:

1. General Characteristics: Single-component, neutral-curing elastomeric sealants of grade indicated below.

a. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

2.7 FOAM SEALANTS

A. Performance Criteria:

1. General Characteristics: Multicomponent, liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam. Foam expansion must not damage cables or crack penetrated structure.

PART 3 - EXECUTION

3.1 INSTALLATION OF SLEEVES FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Sleeves for Conduits Penetrating Above-Grade, Non-Fire-Rated, Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall or floor so no voids remain. Tool exposed surfaces smooth; protect material while curing.
b. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 07 92 00 "Joint Sealants."

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4 inch annular clear space between sleeve and raceway or cable, unless sleeve-seal system is to be installed or seismic criteria require different clearance.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inch above finished floor level. Install sleeves during erection of floors.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Wall Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for wall assemblies.

C. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

D. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve-seal systems. Size sleeves to allow for 1 inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

E. Underground, Exterior-Wall and Floor Penetrations:

1. Install steel pipe sleeves with integral waterstops. Size sleeves to allow for 1 inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system. Install sleeve during construction of floor or wall.
2. Install steel pipe sleeves. Size sleeves to allow for 1 inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system. Grout sleeve into wall or floor opening.

3.2 INSTALLATION OF RECTANGULAR SLEEVES AND SLEEVE SEALS

A. Install sleeves in existing walls without compromising structural integrity of walls. Do not cut structural elements without reinforcing the wall to maintain the designed weight bearing and wall stiffness.

B. Install conduits and cable with no crossings within the sleeve.

C. Fill opening around conduits and cables with expanding foam without leaving voids.

D. Provide metal sheet covering at both wall surfaces and finish to match surrounding surfaces. Metal sheet must be same material as sleeve.

3.3 INSTALLATION OF SLEEVE-SEAL SYSTEMS

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install 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.

END OF SECTION 26 05 44

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Labels.
2. Bands and tubes.
3. Tapes and stencils.
4. Tags.
5. Signs.
6. Cable ties.
7. Miscellaneous identification products.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Labels.
2. Bands and tubes.
3. Tapes and stencils.
4. Tags.
5. Signs.
6. Cable ties.
7. Miscellaneous identification products.

B. Samples: For each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products.

C. Identification Schedule: For each piece of electrical equipment and electrical system components to be index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with ASME A13.1 and IEEE C2.

B. Comply with 29 CFR 1910.144 for color identification of hazards; 29 CFR 1910.145 for danger, caution, warning, and safety instruction signs and tags; and the following:

1. Fire-protection and fire-alarm equipment, including raceways, must be finished, painted, or suitably marked safety red.
2. Ceiling-mounted hangers, supports, cable trays, and raceways must be finished, painted, or suitably marked safety yellow where less than 7.7 ft above finished floor.

C. Signs, labels, and tags required for personnel safety must comply with the following standards:

1. Safety Colors: NEMA Z535.1.
2. Facility Safety Signs: NEMA Z535.2.
3. Safety Symbols: NEMA Z535.3.
4. Product Safety Signs and Labels: NEMA Z535.4.
5. Safety Tags and Barricade Tapes for Temporary Hazards: NEMA Z535.5.

D. Comply with NFPA 70E requirements for arc-flash warning labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, must comply with UL 969.

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F , material surfaces.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Raceways and Cables Carrying Circuits at 1000 V or Less:

1. Black letters on orange field.
2. Legend: Indicate voltage and system or service type.

B. Color-Coding for Phase- and Voltage-Level Identification, 1000 V or Less: Use colors listed below for ungrounded branch-circuit conductors.

1. Color must be factory applied.
2. Colors for 208Y/120 V Circuits:

a. Phase A: Black.
b. Phase B: Red.
c. Phase C: Blue.

3. Colors for 240 V Circuits:

a. Phase A: Black.
b. Phase B: Red.

4. Colors for 480Y/277 V Circuits:

a. Phase A: Brown.
b. Phase B: Orange.

c. Phase C: Yellow.

5. Color for Neutral: Whiteorgray.
6. Color for Equipment Grounds: Green.
7. Colors for Isolated Grounds: Green with two or more yellow stripes.

C. Raceways and Cables Carrying Circuits at More Than 1000 V:

1. Black letters on orange field.
2. Legend: "DANGER - CONCEALED HIGH VOLTAGE WIRING."

D. Warning Label Colors:

1. Identify system voltage with black letters on orange background.

E. Warning labels and signs must include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 3 FEET MINIMUM."

F. Equipment Identification Labels:

1. Black letters on white field.

2.3 LABELS

A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

1. Brady Corporation.

B. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters and that stay in place by gripping action.

1. Brady Corporation

C. Self-Adhesive Wraparound Labels: Preprinted, 3 mil thick, polyester flexible label with acrylic pressure-sensitive adhesive.

1. Brady Corporation
2. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over legend. Labels sized such that clear shield overlaps entire printed legend.
3. Marker for Labels:

a. Permanent, waterproof, black ink marker recommended by tag manufacturer.

D. Self-Adhesive Labels: Polyester, thermal, transfer-printed, 3 mil thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

1. Brady Corporation
2. Minimum Nominal Size:

a. 1-1/2 by 6 inch for raceway and conductors.
b. 3-1/2 by 5 inch for equipment.
c. As required by authorities having jurisdiction.

2.4 BANDS AND TUBES

A. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inch long, with diameters sized to suit diameters and that stay in place by gripping action.

B. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameter and shrunk to fit firmly. Full shrink recovery occurs at maximum of 200 deg F. Comply with UL 224.

1. Brady

2.5 TAPES AND STENCILS

A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

1. Brady

B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mil thick by 1 to 2 inch wide; compounded for outdoor use.

1. Brady

C. Tape and Stencil: 4 inch wide black stripes on 10 inch centers placed diagonally over orange background and are 12 inch wide. Stop stripes at legends.

1. Seton

D. Floor Marking Tape: 2 inch wide, 5 mil pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.

1. Brady

E. Underground-Line Warning Tape:

1. Brady Corporation
2. Tape:

    a. Recommended by manufacturer for method of installation and suitable to identify and locate underground electrical and communications utility lines.
    b. Printing on tape must be permanent and may not be damaged by burial operations.
    c. Tape material and ink must be chemically inert and not be subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.

3. Color and Printing:

    a. Comply with APWA Uniform Color Code using NEMA Z535.1 safety colors.
    b. Inscriptions for Red Tapes: "CAUTION BURIED ELECTRIC LINE BELOW".
    c. Inscriptions for Orange Tapes: "CAUTION BURIED COMMUNICATION LINE BELOW".

4. Type I Tape:

    a. Pigmented polyolefin, bright colored, continuous-printed on one side with inscription of utility, compounded for direct-burial service.
    b. Width: 3 inch .
    c. Thickness: 4 mil .
    d. Weight: 18.5 lb/1000 sq. ft .
    e. Tensile in accordance with ASTM D882: 30 lbf and 2500 psi.

5. Type II Tape:

    a. Multilayer laminate, consisting of high-density polyethylene scrim coated with pigmented polyolefin; bright colored, continuous-printed on one side with inscription of utility, compounded for direct-burial service.
    b. Width: 3 inch .
    c. Thickness: 12 mil .
    d. Weight: 36.1 lb/1000 sq. ft .
    e. Tensile in accordance with ASTM D882: 400 lbf and 11,500 psi.

6. Type ID Tape:

    a. Detectable three-layer laminate, consisting of printed pigmented polyolefin film, solid aluminum-foil core, and clear protective film that allows inspection of continuity of conductive core; bright colored, continuous-printed on one side with inscription of utility, compounded for direct-burial service.
    b. Width: 3 inch .
    c. Overall Thickness: 5 mil.
    d. Foil Core Thickness: 0.35 mil .
    e. Weight: 28 lb/1000 sq. ft .
    f. Tensile in accordance with ASTM D882: 70 lbf and 4600 psi .

7. Type IID Tape:

    a. Reinforced, detectable three-layer laminate, consisting of printed pigmented woven scrim, solid aluminum-foil core, and clear protective film that allows inspection of continuity of conductive core; bright-colored, continuous-printed on one side with inscription of utility, compounded for direct-burial service.
    b. Width: 3 inch .
    c. Overall Thickness: 8 mil .
    d. Foil Core Thickness: 0.35 mil .
    e. Weight: 34 lb/1000 sq. ft .
    f. Tensile in accordance with ASTM D882: 300 lbf and 12,500 psi .

F. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height must be 1 inch .

2.6 TAGS

A. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch , with stamped legend, punched for use with self-locking cable tie fastener.

1. Brady

B. Nonmetallic Preprinted Tags: Polyethylene tags, 0.015 inch thick, color-coded for phase and voltage level, with factory printed permanent designations; punched for use with self-locking cable tie fastener.

1. Brady

C. Write-on Tags:

1. Brady, Seton
2. Polyester Tags: 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment.
3. Marker for Tags:

    a. Permanent, waterproof, black ink marker recommended by tag manufacturer.
    b. Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.7 SIGNS

A. Baked-Enamel Signs:

1. Brady Corporation
2. Preprinted aluminum signs, high-intensity reflective, punched or drilled for fasteners, with colors, legend, and size required for application.
3. 1/4 inch grommets in corners for mounting.

4. Nominal Size: 7 by 10 inch .

B. Metal-Backed Butyrate Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396 inch galvanized-steel backing, punched and drilled for fasteners, and with colors, legend, and size required for application.
2. 1/4 inch grommets in corners for mounting.
3. Nominal Size: 10 by 14 inch .

C. Laminated Acrylic or Melamine Plastic Signs:

1. Brady Corporation
2. Engraved legend.
3. Thickness:

a. For signs up to 20 sq. inch , minimum 1/16 inch thick.
b. For signs larger than 20 sq. inch , 1/8 inch thick.
c. Engraved legend with black letters on white face.
d. Punched or drilled for mechanical fasteners with 1/4 inch grommets in corners for mounting.
e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.8 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F in accordance with ASTM D638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F .
4. Color: Black, except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch .
2. Tensile Strength at 73 deg F in accordance with ASTM D638: 12,000 psi .
3. Temperature Range: Minus 40 to plus 185 deg F .
4. Color: Black.

C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.

1. Minimum Width: 3/16 inch .
2. Tensile Strength at 73 deg F in accordance with ASTM D638: 7000 psi .
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F .
5. Color: Black.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless steel screws or stainless steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of item before installing identification products.

D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.

G. System Identification for Raceways and Cables under 1000 V: Identification must completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.

1. Secure tight to surface of conductor, cable, or raceway.

H. System Identification for Raceways and Cables over 1000 V: Identification must completely encircle cable or conduit. Place adjacent identification of two-color markings in contact, side by side.

1. Secure tight to surface of conductor, cable, or raceway.

I. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

J. Emergency Operating Instruction Signs: Install instruction signs with white legend on red background with minimum 3/8 inch) high letters for emergency instructions at equipment used for power transfer.

K. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from floor.

L. Accessible Fittings for Raceways: Identify cover of junction and pull box of the following systems with wiring system legend and system voltage. System legends must be as follows:

1. "EMERGENCY POWER."
2. "POWER."
3. "UPS."

M. Vinyl Wraparound Labels:

1. Secure tight to surface of raceway or cable at location with high visibility and accessibility.
2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to location and substrate.

N. Snap-Around Labels: Secure tight to surface at location with high visibility and accessibility.

O. Self-Adhesive Wraparound Labels: Secure tight to surface at location with high visibility and accessibility.

P. Self-Adhesive Labels:

1. Install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
2. Unless otherwise indicated, provide single line of text with 1/2 inch high letters on 1-1/2 inch high label; where two lines of text are required, use labels 2 inch high.

Q. Snap-Around Color-Coding Bands: Secure tight to surface at location with high visibility and accessibility.

R. Heat-Shrink, Preprinted Tubes: Secure tight to surface at location with high visibility and accessibility.

S. Marker Tapes: Secure tight to surface at location with high visibility and accessibility.

T. Self-Adhesive Vinyl Tape: Secure tight to surface at location with high visibility and accessibility.

1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for minimum distance of 6 inch where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.

U. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.

V. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's instructions.

W. Underground Line Warning Tape:

1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inch below finished grade. Use multiple tapes where width of multiple lines installed in common trench or concrete envelope exceeds 16 inch overall.
2. Install underground-line warning tape for direct-buried cables and cables in raceways.

X. Metal Tags:

1. Place in location with high visibility and accessibility.
2. Secure using general-purpose cable ties.

Y. Nonmetallic Preprinted Tags:

1. Place in location with high visibility and accessibility.
2. Secure using general-purpose cable ties.

Z. Write-on Tags:

1. Place in location with high visibility and accessibility.
2. Secure using general-purpose cable ties.

AA. Baked-Enamel Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to location and substrate.
2. Unless otherwise indicated, provide single line of text with 1/2 inch high letters on minimum 1-1/2 inch high sign; where two lines of text are required, use signs minimum 2 inch high.

BB. Metal-Backed Butyrate Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to location and substrate.
2. Unless otherwise indicated, provide single line of text with 1/2 inch high letters on 1-1/2 inch high sign; where two lines of text are required, use labels 2 inch high.

CC. Laminated Acrylic or Melamine Plastic Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to location and substrate.
2. Unless otherwise indicated, provide single line of text with 1/2 inch high letters on 1-1/2 inch high sign; where two lines of text are required, use labels 2 inch high.

DD. Cable Ties: General purpose, for attaching tags, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

3.3 IDENTIFICATION SCHEDULE

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

C. Concealed Raceways, Duct Banks, More Than 1000 V, within Buildings: Tape and stencil. Stencil legend "DANGER - CONCEALED HIGH-VOLTAGE WIRING" with 3 inch high, black letters on 20 inch centers.

1. Locate identification at changes in direction, at penetrations of walls and floors, and at 10 ft maximum intervals.

D. Accessible Raceways, Armored and Metal-Clad Cables, More Than 1000 V: Vinyl wraparound labels .

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50 ft maximum intervals in straight runs, and at 25 ft maximum intervals in congested areas.

E. Accessible Raceways and Metal-Clad Cables, 1000 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 A and 120 V to Ground: Identify with self-adhesive raceway labels.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50 ft maximum intervals in straight runs, and at 25 ft maximum intervals in congested areas.

F. Accessible Fittings for Raceways and Cables within Buildings: Identify cover of junction and pull box of the following systems with self-adhesive labels containing wiring system legend and system voltage. System legends must be as follows:

1. "EMERGENCY POWER."
2. "POWER."
3. "UPS."

G. Power-Circuit Conductor Identification, 1000 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use vinyl wraparound labels to identify phase.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50 ft maximum intervals in straight runs, and at 25 ft maximum intervals in congested areas.

H. Power-Circuit Conductor Identification, More Than 1000 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use nonmetallic preprinted tags colored and marked to indicate phase, and separate tag with circuit designation.

I. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, useself-adhesive labels with conductor or cable designation, origin, and destination.

J. Control-Circuit Conductor Termination Identification: For identification at terminations, provide heat-shrink preprinted tubes with conductor designation.

K. Conductors to Be Extended in Future: Attach write-on tags to conductors and list source.

L. Auxiliary Electrical Systems Conductor Identification: Marker tape that is uniform and consistent with system used by manufacturer for factory-installed connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.

M. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.

N. Concealed Raceways and Duct Banks, More Than 1000 V, within Buildings: Apply floor marking tape to the following finished surfaces:

1. Floor surface directly above conduits running beneath and within 12 inch of floor that is in contact with earth or is framed above unexcavated space.
2. Wall surfaces directly external to raceways concealed within wall.
3. Accessible surfaces of concrete envelope around raceways in vertical shafts, exposed in building, or concealed above suspended ceilings.

O. Workspace Indication: Apply floor marking tapeortape and stencil to finished surfaces. Show working clearances in direction of access to live parts. Workspace must comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

P. Instructional Signs: Self-adhesive labels, including color code for grounded and ungrounded conductors.

Q. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Metal-backed, butyrate warning signs.

1. Apply to exterior of door, cover, or other access.
2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:

    a. Power-transfer switches.
    b. Controls with external control power connections.

R. Arc Flash Warning Labeling: Self-adhesive labels.

S. Operating Instruction Signs: Metal-backed, butyrate warning signs.

T. Emergency Operating Instruction Signs: Metal-backed, butyrate warning signs with white legend on red background with minimum 3/8 inch high letters for emergency instructions at equipment used for power transfer.

U. Equipment Identification Labels:

1. Indoor Equipment: Laminated acrylic or melamine plastic sign.
2. Outdoor Equipment:Stenciled legend 4 inch high.
3. Equipment to Be Labeled:

    a. Panelboards: Typewritten directory of circuits in location provided by panelboard manufacturer. Panelboard identification must be in form of self-adhesive, engraved, laminated acrylic or melamine label.
    b. Enclosures and electrical cabinets.
    c. Access doors and panels for concealed electrical items.
    d. Switchgear.
    e. Switchboards.
    f. Transformers: Label that includes tag designation indicated for transformer, feeder, and panelboards or equipment supplied by secondary.
    g. Substations.
    h. Emergency system boxes and enclosures.
    i. Motor-control centers.
    j. Enclosed switches.
    k. Enclosed circuit breakers.
    l. Enclosed controllers.
    m. Variable-speed controllers.
    n. Push-button stations.
    o. Power-transfer equipment.
    p. Contactors.
    q. Remote-controlled switches, dimmer modules, and control devices.
    r. Battery-inverter units.
    s. Battery racks.
    t. Power-generating units.
    u. Monitoring and control equipment.
    v. UPS equipment.

END OF SECTION 26 05 53

SECTION 26 05 73.13

SHORT-CIRCUIT STUDIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes a computer-based, fault-current study to determine the minimum interrupting capacity of circuit protective devices.

1.2 DEFINITIONS

A. Field Adjusting Agency: An independent electrical testing agency with full-time employees and the capability to adjust devices and conduct testing indicated and that is a member company of NETA.

B. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

C. Power System Analysis Software Developer: An entity that commercially develops, maintains, and distributes computer software used for power system studies.

D. Power Systems Analysis Specialist: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located.

E. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion of the circuit from the system.

F. SCCR: Short-circuit current rating.

G. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

H. Single-Line Diagram: See "One-Line Diagram."

1.3 ACTION SUBMITTALS

A. Product Data:

1. For computer software program to be used for studies.
2. Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.

a. Short-circuit study input data, including completed computer program input data sheets.
b. Short-circuit study and equipment evaluation report; signed, dated, and sealed by a qualified professional engineer.

1) Submit study report for action prior to receiving final approval of distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from the State for preliminary submittal of sufficient study data to ensure that selection of devices and associated characteristics is satisfactory.
2) Revised one-line diagram, reflecting field investigation results and results of short-circuit study.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For Power Systems Analysis Software Developer.
2. For Power System Analysis Specialist.

B. Product Certificates: For short-circuit study software, certifying compliance with IEEE 399.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:

1. For overcurrent protective devices to include in emergency, operation, and maintenance manuals.
2. The following are from the Short-Circuit Study Report:

a. Final one-line diagram.
b. Final Short-Circuit Study Report.
c. Short-circuit study data files.
d. Power system data.

1.6 QUALITY ASSURANCE

A. Study shall be performed using commercially developed and distributed software designed specifically for power system analysis.

B. Software algorithms shall comply with requirements of standards and guides specified in this Section.

C. Manual calculations are unacceptable.

1. Power System Analysis Software Qualifications: Computer program shall be designed to perform short-circuit studies or have a function, component, or add-on module designed to perform short-circuit studies.

2. Computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

D. Power Systems Analysis Specialist Qualifications: Professional engineer licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

E. Short-Circuit Study Certification: Short-Circuit Study Report shall be signed and sealed by Power Systems Analysis Specialist.

PART 2 - PRODUCTS

2.1 POWER SYSTEM ANALYSIS SOFTWARE DEVELOPERS

A. Subject to compliance with requirements, the following are acceptable software products:

1. SKM
2. ETAP

B. Comply with IEEE 399 and IEEE 551.

1. Analytical features of power systems analysis software program shall have capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

C. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output.

2.2 SHORT-CIRCUIT STUDY REPORT CONTENTS

A. Executive summary of study findings.

B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.

C. One-line diagram of modeled power system, showing the following:

1. Protective device designations and ampere ratings.
2. Conductor types, sizes, and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings.
4. Motor designations and kVA ratings.
5. Switchgear, switchboard and panelboard designations and ratings.
6. Derating factors and environmental conditions.
7. Any revisions to electrical equipment required by the study.

D. Comments and recommendations for system improvements or revisions in a written document, separate from one-line diagram.

E. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to available short-circuit currents. Verify that equipment withstand ratings exceed available short-circuit current at equipment installation locations.
2. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short-circuit duties.
3. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
4. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in standards to 1/2-cycle symmetrical fault current.
5. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

F. Short-Circuit Study Input Data:

1. One-line diagram of system being studied.
2. Power sources available.
3. Manufacturer, model, and interrupting rating of protective devices.
4. Conductors.
5. Transformer data.

G. Short-Circuit Study Output Reports:

1. Low-Voltage Fault Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

    a. Voltage.
    b. Calculated fault-current magnitude and angle.
    c. Fault-point X/R ratio.
    d. Equivalent impedance.

2. Momentary Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

    a. Voltage.
    b. Calculated symmetrical fault-current magnitude and angle.
    c. Fault-point X/R ratio.
    d. Calculated asymmetrical fault currents:

        1) Based on fault-point X/R ratio.
        2) Based on calculated symmetrical value multiplied by 1.6.
        3) Based on calculated symmetrical value multiplied by 2.7.

3. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

    a. Voltage.

b. Calculated symmetrical fault-current magnitude and angle.
c. Fault-point X/R ratio.
d. No AC Decrement (NACD) ratio.
e. Equivalent impedance.
f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

PART 3 - EXECUTION

3.1 POWER SYSTEM DATA

A. Obtain all data necessary for conduct of the study.

1. Verify completeness of data supplied on one-line diagram. Call any discrepancies to the State's attention.
2. For equipment included as Work of this Project, use characteristics submitted under provisions of action submittals and information submittals for this Project.
3. For owner furnished equipment, relocated equipment and that which is existing to remain, or equipment that is part of pre-manufactured modular building, obtain required electrical distribution system data by field investigation and surveys conducted by qualified technicians and engineers, or obtain data from manufacturer or equipment. Qualifications of technicians and engineers shall be as defined by NFPA 70E.

B. Gather and tabulate the required input data to support the short-circuit study. Comply with requirements for recording circuit protective device characteristics. Record data on a Record Document copy of one-line diagram. Comply with recommendations in IEEE 551 as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification. Data include, but are not limited to, the following:

1. Product Data for Project's overcurrent protective devices involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Obtain electrical power utility impedance at the service.
3. Power sources and ties.
4. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
5. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip, SCCR, current rating, and breaker settings.
6. Motor horsepower and NEMA MG 1 code letter designation.
7. Conductor sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).
8. Derating factors.

3.2 SHORT-CIRCUIT STUDY

A. Perform study following the general study procedures contained in IEEE 399.

B. Calculate short-circuit currents according to IEEE 551.

C. Base study on device characteristics supplied by device manufacturer.

D. Begin short-circuit current analysis at the service, extending down to system overcurrent protective devices as follows:

1. To normal system low-voltage load buses where fault current is 10 kA or less.
2. Sub-panels furnished as a part of pre-manufactured modular building must be included in the study. Contractor is responsible for coordinating with modular building manufacturer to obtain data as required to complete the study.

E. Include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and apply to low- -voltage, three-phase ac systems. Also account for the fault-current dc decrement to address asymmetrical requirements of interrupting equipment.

F. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and a single line-to-ground fault at each equipment indicated on one-line diagram.

1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.

G. Include in the report identification of any protective device applied outside its capacity.

END OF SECTION 26 05 73.13

SECTION 26 05 73.16

COORDINATION STUDIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes computer-based, overcurrent protective device coordination studies to determine overcurrent protective devices and to determine overcurrent protective device settings for selective tripping.

1.2 DEFINITIONS

A. Field Adjusting Agency: An independent electrical testing agency with full-time employees and the capability to adjust devices and conduct testing indicated and that is a member company of NETA.

B. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

C. Power System Analysis Software Developer: An entity that commercially develops, maintains, and distributes computer software used for power system studies.

D. Power System Analysis Specialist: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located.

E. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion of the circuit from the system.

F. SCCR: Short-circuit current rating.

G. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

H. Single-Line Diagram: See "One-Line Diagram."

1.3 ACTION SUBMITTALS

A. Product Data:

1. For computer software program to be used for studies.
2. Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.

a. Coordination-study input data, including completed computer program input data sheets.
b. Study and equipment evaluation reports.

3. Overcurrent protective device coordination study report; signed, dated, and sealed by a qualified professional engineer.

a. Submit study report for action prior to receiving final approval of distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from the State for preliminary submittal of sufficient study data to ensure that selection of devices and associated characteristics is satisfactory.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For Power System Analysis Software Developer.
2. For Power Systems Analysis Specialist.

B. Product Certificates: For overcurrent protective device coordination study software, certifying compliance with IEEE 399.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For overcurrent protective devices to include in emergency, operation, and maintenance manuals.

1. The following are from the Coordination Study Report:

a. Final one-line diagram.
b. Final protective device coordination study.
c. Coordination study data files.
d. List of all protective device settings.
e. Time-current coordination curves.
f. Power system data.

1.6 QUALITY ASSURANCE

A. Studies shall be performed using commercially developed and distributed software designed specifically for power system analysis.

B. Software algorithms shall comply with requirements of standards and guides specified in this Section.

C. Manual calculations are unacceptable.

D. Power System Analysis Software Qualifications:

1. Computer program shall be designed to perform coordination studies or have a function, component, or add-on module designed to perform coordination studies.
2. Computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

E. Power Systems Analysis Specialist Qualifications: Professional engineer licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

PART 2 - PRODUCTS

2.1 POWER SYSTEM ANALYSIS SOFTWARE DEVELOPERS

A. Subject to compliance with requirements, the following are acceptable software products:

1. SKM
2. ETAP

B. Comply with IEEE 242 and IEEE 399.

C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

D. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.

1. Optional Features:

a. Arcing faults.
b. Simultaneous faults.
c. Explicit negative sequence.
d. Mutual coupling in zero sequence.

2.2 COORDINATION STUDY REPORT CONTENTS

A. Executive summary of study findings.

B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.

C. One-line diagram of modeled power system, showing the following:

1. Protective device designations and ampere ratings.

2. Conductor types, sizes, and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings.
4. Motor designations and kVA ratings.
5. Switchboard and panelboard designations.
6. Any revisions to electrical equipment required by the study.
7. Study Input Data: As described in "Power System Data" Article.

    a. Short-Circuit Study Output: As specified in "Short-Circuit Study Output Reports" Paragraph in "Short-Circuit Study Report Contents" Article in Section 26 05 73.13 "Short-Circuit Studies."

D. Protective Device Coordination Study:

1. Report recommended settings of protective devices, ready to be applied in the field. Use manufacturer's data sheets for recording the recommended setting of overcurrent protective devices when available.

    a. Phase and Ground Relays:

        1) Device tag.
        2) Relay current transformer ratio and tap, time dial, and instantaneous pickup value.
        3) Recommendations on improved relaying systems, if applicable.

    b. Circuit Breakers:

        1) Adjustable pickups and time delays (long time, short time, and ground).
        2) Adjustable time-current characteristic.
        3) Adjustable instantaneous pickup.
        4) Recommendations on improved trip systems, if applicable.

    c. Fuses: Show current rating, voltage, and class.

E. Time-Current Coordination Curves: Determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:

1. Device tag and title, one-line diagram with legend identifying the portion of the systems covered.
2. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.
3. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
4. Plot the following listed characteristic curves, as applicable:

    a. Power utility's overcurrent protective device.

b. Low-voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
c. Low-voltage equipment circuit-breaker trip devices, including manufacturer's tolerance bands.
d. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves.
e. Cables and conductors damage curves.
f. Ground-fault protective devices.
g. Motor-starting characteristics and motor damage points.
h. The largest feeder circuit breaker in each panelboard.

5. Maintain selectivity for tripping currents caused by overloads.
6. Maintain maximum achievable selectivity for tripping currents caused by overloads on series-rated devices.
7. Provide adequate time margins between device characteristics such that selective operation is achieved.
8. Comments and recommendations for system improvements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance of the Work. Devices to be coordinated are indicated.

1. Proceed with coordination study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to coordination study may not be used in study.

3.2 POWER SYSTEM DATA

A. Obtain all data necessary for conduct of the overcurrent protective device study.

1. Verify completeness of data supplied in one-line diagram. Call any discrepancies to the State's attention.
2. For equipment included as Work of this Project, use characteristics submitted under provisions of action submittals and information submittals for this Project.
3. For owner furnished equipment, relocated equipment and that which is existing to remain, or equipment that is part of pre-manufactured modular building, obtain required electrical distribution system data by field investigation and surveys conducted by qualified technicians and engineers, or obtain data from manufacturer or equipment. Qualifications of technicians and engineers shall be as defined by NFPA 70E.

B. Gather and tabulate all required input data to support the coordination study. List below is a guide. Comply with recommendations in IEEE 551 for the amount of detail required to be acquired in the field. Field data gathering shall be under direct supervision and

control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification. Data include, but are not limited to, the following:

1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Electrical power utility impedance at the service.
3. Power sources and ties.
4. Short-circuit current at each system bus (three phase and line to ground).
5. Full-load current of all loads.
6. Voltage level at each bus.
7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
8. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
9. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
10. Maximum demands from service meters.
11. Motor horsepower and NEMA MG 1 code letter designation.
12. Low-voltage cable sizes, lengths, number, conductor material, and conduit material (magnetic or nonmagnetic).
13. Data sheets to supplement electrical distribution system one-line diagram, cross-referenced with tag numbers on diagram, showing the following:

    a. Special load considerations, including starting inrush currents and frequent starting and stopping.
    b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.
    c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
    d. Ratings, types, and settings of utility company's overcurrent protective devices.
    e. Special overcurrent protective device settings or types stipulated by utility company.
    f. Time-current-characteristic curves of devices indicated to be coordinated.
    g. Manufacturer, frame size, interrupting rating in amperes root mean square (rms) symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
    h. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
    i. Switchboards and panelboards ampacity, and SCCR in amperes rms symmetrical.

3.3 COORDINATION STUDY

A. Comply with IEEE 242 for calculating short-circuit currents and determining coordination time intervals.

B. Comply with IEEE 399 for general study procedures.

C. Base study on device characteristics supplied by device manufacturer.

D. Begin analysis at the service, extending down to system overcurrent protective devices as follows:

1. To normal system low-voltage load buses where fault current is 10 kA or less.
2. Sub-panels furnished as a part of pre-manufactured modular building must be included in the study. Contractor is responsible for coordinating with modular building manufacturer to obtain data as required to complete the study.

E. Transformer Primary Overcurrent Protective Devices:

1. Device shall not operate in response to the following:

   a. Inrush current when first energized.
   b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
   c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.

2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.

F. Motor Protection:

1. Select protection for low-voltage motors according to IEEE 242 and NFPA 70.
2. Select protection for motors served at voltages more than 600 V according to IEEE 620.

G. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and protection recommendations in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable

G. manufacturers or from listed standards indicating conductor size and short-circuit current.

H. Include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and apply to low- and medium-voltage, three-phase ac systems. Also account for fault-current dc decrement, to address asymmetrical requirements of interrupting equipment.

I. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and a single line-to-ground fault at each equipment indicated on one-line diagram.

1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.

J. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to short-circuit ratings.
2. Adequacy of switchgear, motor-control centers, and panelboard bus bars to withstand short-circuit stresses.
3. Any application of series-rated devices shall be recertified, complying with requirements in NFPA 70.
4. Include in the report identification of any protective device applied outside its capacity.

3.4 FIELD ADJUSTING

A. Adjust relay and protective device settings according to recommended settings provided by the coordination study. Field adjustments shall be completed by the engineering service division of equipment manufacturer under the "Startup and Acceptance Testing" contract portion.

B. Make minor modifications to equipment as required to accomplish compliance with short-circuit and protective device coordination studies.

3.5 DEMONSTRATION

A. Engage Power Systems Analysis Specialist to train the State's maintenance personnel in the following:

1. Acquaint personnel in fundamentals of operating the power system in normal and emergency modes.
2. Hand-out and explain the coordination study objectives, study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpreting time-current coordination curves.
3. For the State's maintenance staff certified as NETA ETT-Certified Technicians Level III or NICET Electrical Power Testing Level III Technicians, teach how to adjust, operate, and maintain overcurrent protective device settings.

END OF SECTION 26 05 73.16

SECTION 26 05 73.19

ARC-FLASH HAZARD ANALYSIS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes a computer-based, arc-flash study to determine the arc-flash hazard distance and the incident energy to which personnel could be exposed during work on or near electrical equipment.

1.2 DEFINITIONS

A. Field Adjusting Agency: An independent electrical testing agency with full-time employees and the capability to adjust devices and conduct testing indicated and that is a member company of NETA.

B. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

C. Power System Analysis Software Developer: An entity that commercially develops, maintains, and distributes computer software used for power system studies.

D. Power Systems Analysis Specialist: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located.

E. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

F. SCCR: Short-circuit current rating.

G. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

H. Single-Line Diagram: See "One-Line Diagram."

1.3 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Study Submittals: Submit the following submittals after the approval of system protective devices submittals. Submittals shall be in digital form:

1. Arc-flash study input data, including completed computer program input data sheets.
2. Arc-flash study report; signed, dated, and sealed by Power Systems Analysis Specialist.
3. Submit study report for action prior to receiving final approval of distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from the State for preliminary submittal of sufficient study data to ensure that selection of devices and associated characteristics is satisfactory.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For Power Systems Analysis Software Developer.
2. For Power System Analysis Specialist.

B. Product Certificates: For arc-flash hazard analysis software, certifying compliance with IEEE 1584 and NFPA 70E.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:

1. Provide maintenance procedures in equipment manuals according to requirements in NFPA 70E.
2. Operation and Maintenance Procedures: Provide maintenance procedures for use by the State’s personnel that comply with requirements in NFPA 70E.

1.6 QUALITY ASSURANCE

A. Study shall be performed using commercially developed and distributed software designed specifically for power system analysis.

B. Software algorithms shall comply with requirements of standards and guides specified in this Section.

C. Manual calculations are unacceptable.

D. Power System Analysis Software Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. Computer program shall be designed to perform arc-flash analysis or have a function, component, or add-on module designed to perform arc-flash analysis.
2. Computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

E. Power Systems Analysis Specialist Qualifications: Professional engineer in charge of performing the arc-flash study, analyzing the arc flash, and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

F. Arc-Flash Study Certification: Arc-Flash Study Report shall be signed and sealed by Power Systems Analysis Specialist.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Subject to compliance with requirements, the following are acceptable software products:

1. SKM
2. ETAP

B. Comply with IEEE 1584 and NFPA 70E.

C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

2.2 ARC-FLASH STUDY REPORT CONTENT

A. Executive summary of study findings.

B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.

C. One-line diagram, showing the following:

1. Protective device designations and ampere ratings.
2. Conductor types, sizes, and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings, including derating factors and environmental conditions.
4. Motor designations and kVA ratings.
5. Switchboard and panelboard designations, and ratings.

D. Study Input Data: As described in "Power System Data" Article.

E. Short-Circuit Study Output Data: As specified in "Short-Circuit Study Output Reports" Paragraph in "Short-Circuit Study Report Contents" Article in Section 26 05 73.13 "Short-Circuit Studies."

F. Protective Device Coordination Study Report Contents: As specified in "Coordination Study Report Contents" Article in Section 26 05 73.16 "Coordination Studies."

G. Arc-Flash Study Output Reports:

1. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each equipment location included in the report:

    a. Voltage.
    b. Calculated symmetrical fault-current magnitude and angle.
    c. Fault-point X/R ratio.
    d. No AC Decrement (NACD) ratio.
    e. Equivalent impedance.
    f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
    g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

H. Incident Energy and Flash Protection Boundary Calculations:

1. Arcing fault magnitude.
2. Protective device clearing time.
3. Duration of arc.
4. Arc-flash boundary.
5. Restricted approach boundary.
6. Limited approach boundary.
7. Working distance.
8. Incident energy.
9. Hazard risk category.
10. Recommendations for arc-flash energy reduction.

I. Fault study input data, case descriptions, and fault-current calculations including a definition of terms and guide for interpretation of computer printout.

2.3 ARC-FLASH WARNING LABELS

A. Comply with requirements in Section 26 05 53 "Identification for Electrical Systems" for self-adhesive equipment labels. Produce a 3.5-by-5-inch (76-by-127-mm) self-adhesive equipment label for each work location included in the analysis.

B. Label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the following information taken directly from the arc-flash hazard analysis:

1. Location designation.
2. Nominal voltage.
3. Protection boundaries.

    a. Arc-flash boundary.
    b. Restricted approach boundary.
    c. Limited approach boundary.

4. Arc flash PPE category.

5. Required minimum arc rating of PPE in Cal/cm squared.
6. Available incident energy.
7. Working distance.
8. Engineering report number, revision number, and issue date.

C. Labels shall be machine printed, with no field-applied markings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals. Proceed with arc-flash study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to arc-flash study may not be used in study.

3.2 ARC-FLASH HAZARD ANALYSIS

A. Comply with NFPA 70E and its Annex D for hazard analysis study.

B. Preparatory Studies: Perform the Short-Circuit and Protective Device Coordination studies prior to starting the Arc-Flash Hazard Analysis.

1. Short-Circuit Study Output: As specified in "Short-Circuit Study Output Reports" Paragraph in "Short-Circuit Study Report Contents" Article in Section 26 05 73.13 "Short-Circuit Studies."
2. Coordination Study Report Contents: As specified in "Coordination Study Report Contents" Article in Section 26 05 73.16 "Coordination Studies."

C. Calculate maximum and minimum contributions of fault-current size.

1. Maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.
2. Calculate arc-flash energy at 85 percent of maximum short-circuit current according to IEEE 1584 recommendations.
3. Calculate arc-flash energy at 38 percent of maximum short-circuit current according to NFPA 70E recommendations.

D. Calculate the arc-flash protection boundary and incident energy at locations in electrical distribution system where personnel could perform work on energized parts.

E. Include all low-voltage equipment locations.

F. Calculate the limited, restricted, and prohibited approach boundaries for each location.

G. Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the sources are

interrupted or decremented with time. Fault contribution from motors shall be decremented as follows:

1. Fault contribution from induction motors shall not be considered beyond three to five cycles.
2. Fault contribution from synchronous motors shall be decayed to match the actual decrement of each as closely as possible (for example, contributions from permanent magnet generators will typically decay from 10 per unit to three per unit after 10 cycles).

H. Arc-flash energy shall generally be reported for the maximum of line or load side of a circuit breaker. However, arc-flash computation shall be performed and reported for both line and load side of a circuit breaker as follows:

1. When the circuit breaker is in a separate enclosure.
2. When the line terminals of the circuit breaker are separate from the work location.

I. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

3.3 POWER SYSTEM DATA

A. Obtain all data necessary for conduct of the arc-flash hazard analysis.

1. Verify completeness of data supplied on one-line diagram and under "Preparatory Studies" Paragraph in "Arc-Flash Hazard Analysis" Article. Call discrepancies to the State's attention.
2. For new equipment, use characteristics from approved submittals under provisions of action submittals and information submittals for this Project.
3. For owner furnished equipment, existing equipment, whether or not relocated, and equipment furnished as part of pre-manufactured modular building, obtain required electrical distribution system data by field investigation and surveys conducted by qualified technicians and engineers, or obtain data from the manufacturer of equipment.

B. Electrical Survey Data: Gather and tabulate the following input data to support study. Comply with recommendations in IEEE 1584 and NFPA 70E as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification. Data include, but are not limited to, the following:

1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.

2. Obtain electrical power utility impedance or available short circuit current at the service.
3. Power sources and ties.
4. Short-circuit current at each system bus (three phase and line to ground).
5. Full-load current of all loads.
6. Voltage level at each bus.
7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
8. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
9. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
10. Motor horsepower and NEMA MG 1 code letter designation.
11. Low-voltage conductor sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).

3.4 LABELING

A. Apply arc-flash label on the front cover of each section of the equipment and on side or rear covers with accessible live parts and hinged doors or removable plates for each equipment included in the study. Base arc-flash label data on highest values calculated at each location.

B. Each piece of equipment listed below shall have an arc-flash label applied to it:

1. Low-voltage switchboard.
2. Switchgear.
3. Low voltage transformers.
4. Panelboard and safety switch over 250 V.
5. Applicable panelboard and safety switch under 250 V.

3.5 APPLICATION OF WARNING LABELS

A. Install arc-flash warning labels under the direct supervision and control of Power System Analysis Specialist.

3.6 DEMONSTRATION

A. Engage Power Systems Analysis Specialist to train the State's maintenance personnel in potential arc-flash hazards associated with working on energized equipment and the significance of arc-flash warning labels.

END OF SECTION 26 05 73.19

SECTION 260800

COMMISSIONING OF ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. System specific commissioning for Lighting Control Systems
2. System specific commissioning for Electrical Service & Distribution

B. Related Sections:

1. 019113 – General Commissioning Requirements
2. Division 26

1.2 DESCRIPTION OF WORK – REFER TO 019113

1.3 SUBMITTALS – REFER TO 019113

PART 2 - PRODUCTS – REFER TO 019113

PART 3 - EXECUTION

3.1 COMMISSIONING PROCESS AND PROCEDURES – REFER TO 019113

3.2 SYSTEM READINESS DOCUMENTATION

A. The Contractor shall review and complete all System Readiness documentation in accordance with Section 019113 and this Section 260800.

B. The Contractor shall submit the System Readiness Manual prior to Functional Performance Testing. When it is necessary to begin functional testing on a system (or systems) before the readiness of other systems can be documented, it may be acceptable to provide preliminary submittals of the System Readiness Manual for which checklists and forms have been completed only for the system(s) that are ready for testing. The System Readiness Manual shall include the following:

1. System Readiness Checklists – provided by the Commissioning Provider (CxP) to be compiled and completed by the Contractor.
2. Start-up and testing procedures and data forms for all equipment and systems within the commissioning scope of work, in accordance with the Contract Documents.

C. A sample System Readiness Checklist is provided at the end of this section. The final checklists will be drafted by the CxP after equipment submittals have been accepted.

D. A separate checklist shall be submitted and subsequently completed for each system and item of equipment within the commissioning scope of work as specified in Section 019113.

E. The System Readiness Checklists do not represent all of the Contract Document requirements for the associated equipment. Completion of the items on the checklists does not release the contractor from requirements specified elsewhere.

F. The Contractor's Commissioning Coordinator (CxC) shall verify completion of all documentation, sign the System Readiness Checklists and return the System Readiness Manual to the CxP as an indication of final completion of all installation criteria as specified in the Contract Documents.

3.3 FUNCTIONAL PERFORMANCE TESTING

A. The Functional Performance Test (FPT) procedures shall be developed, performed and demonstrated in accordance with Section 019113 and this Section 260800.

B. At a minimum, the contractors and equipment suppliers listed in the FPT Minimum Participants Table in this Section 260800 shall be required to participate in developing, performing and demonstrating the indicated FPTs.

C. A sample FPT is provided at the end of this section. The final FPTs will be drafted by the CxP after equipment submittals have been accepted.

D. The CxC shall, with the CxP's input, coordinate the subcontractors in developing, performing and demonstrating the FPTs.

E. Functional testing shall consist of the following four phases:

1. Component testing:
   a. Component testing applies to all control input and output (I/O) devices, including those provided by the equipment suppliers and/or those provided with the Building Management System (BMS), as applicable. Examples include: sensor assemblies, detectors, relays and switches, valves, dampers, actuators, thermometers and gauges.
   b. Component testing consists of demonstrating field I/O calibration and operation, which may include sampled verification that:
      i. Sensor readings are reasonable and accurate within the design range as specified.
      ii. Actuators operate smoothly with their control signal over the full range of operation.
      iii. All components, values and alarms are correctly mapped to and reported at the operator interface.
2. System Testing – Operational Verification:
   a. After functional testing of the system components has been successfully completed, each aspect of the sequence of operation and control system function shall be functionally tested, including those provided by the equipment suppliers and those provided with the BMS, as applicable.
3. System Testing – Integrated System Verification:
   a. After operational testing has successfully demonstrated that each system functions in accordance with the Contract Documents, functional testing shall occur to verify that the interaction between the systems is as required. Each interactive function shall be functionally tested, including those provided by the equipment suppliers and those provided with the BMS, as applicable.
4. System Testing – Real Time Performance Analysis (Trend Logging):
   a. After operational testing has been successfully completed, real time performance testing shall be performed as applicable. The trend data collection shall be set up prior to demonstration of the FPTs and may be used during testing for troubleshooting and to identify corrective actions. Trend data shall be logged for the intervals and periods specified in the FPT procedures. Unless otherwise specified in the FPTs, test periods shall include occupied, unoccupied and weekend schedules.
   b. Analysis of real-time performance data shall demonstrate that that the systems operate in accordance with the acceptance criteria specified in the

FPT procedures. The Contractor shall verify that such data demonstrates acceptable results before submitting for CxP review. If acceptable results are not demonstrated, re-testing, trouble-shooting and corrective actions shall be performed to provide resolution. Provisions for retesting, including BACK-CHARGING as specified in Section 019113, shall apply to trend analysis.

3.4 SEASONAL FUNCTIONAL PERFORMANCE TESTING

A. Seasonal functional testing does not apply to the commissioned systems within this Division.

3.5 FPT DEMONSTRATION SAMPLING

A. When a functional test applies to many similar components or systems that are not a part of a life-safety system, the contractor may demonstrate a sampling of the FPTs to the CxP in accordance with Section 019113.

B. Demonstration Sampling will apply only for the components and systems as listed in the FPT Demonstration Sampling Table below.

SYSTEM	SAMPLE SIZE
Lighting Controls	20%

3.6 FPT MINIMUM PARTICIPANTS TABLE

A. At a minimum, the parties listed in the table below will participate in the functional testing process and in demonstrating successful FPTs to the CxP.

PARTICIPANTS
Commissioning Coordinator
Electrical Contractor's Representative

3.7 SAMPLE SYSTEM READINESS CHECKLIST

A. The following sample checklist is included to provide the contractor with a representation of the level of rigor required.

Sample – Sample Project
Sample Building
SYSTEM READINESS CHECKLIST
E01 – Lighting System

System Readiness

This completed form and the associated installation, start-up, and testing documentation comprise the System Readiness Manual section for the Lighting System. Signing below and submitting this section formally certifies that pre-commissioning work has been successfully completed for this system and that all applicable components, equipment, sub-systems and controls are ready for functional performance testing.

Signed: _____ **Date:** _____

Sample – General Contractor's Commissioning Coordinator

Requested Documentation

- ☐ Title 24 Acceptance Tests
- ☐ Successful FPT as completed by contractor

Functional Performance Test Readiness

- ☐ Completed copies of all required documentation noted above are included as part of the System Readiness Manual, either directly hereafter or as part of a larger report elsewhere (e.g. TAB report).
- ☐ Installation is complete and all requirements are satisfied per Contract Documents & manufacturer requirements
- ☐ All equipment is connected under permanent power.
- ☐ All equipment controls are completely installed and configured, including programming, setpoints, schedules, graphics, loop tuning, etc (as applicable).
- ☐ All outstanding issues have been corrected and/or recorded for future tracking and do not affect the safety or reliability of functional testing.
- ☐ EQUIPMENT IS READY FOR FUNCTIONAL PERFORMANCE TESTING (FPTs) – Preliminary testing has been performed by contractor(s) with acceptable results achieved and verified through successful completion of the FPT procedures. Any deviations from the specified Sequence of Operation have been documented for record.

Applicable Equipment

Lighting Fixtures

- ☐ Lighting Fixtures

Installation Checks

Electrical

- ☐ All light fixtures are installed and verified to be operational. Any burned out lamps have been replaced.
- ☐ All controls panels, sensors, wiring termination and equipment are tagged with permanent labels per the Construction Documents.
- ☐ All controls sensors, controllers and gateways have been verified to be properly communicating with the system controller.

Sample – Sample Project
Sample Building
SYSTEM READINESS CHECKLIST
E01 – Lighting System

- ☐ Occupancy sensor programming and control has been reviewed and verified to be correct per the Construction Documents.
- ☐ Any failed sensors have been replaced and retested.
- ☐ Lighting levels have been measured, tuned and verified to be appropriate for all zones as per the Construction Documents.
- ☐ All spaces have been reviewed and physically verified to be operating per the correct profile type from the sequence of operations.
- ☐ The lighting controls sequences of operation, including all schedules, time-outs, light levels, and sensitivities, has been programmed per the Construction Documents. Any deviations have been recorded and also noted hereafter.

3.8 SAMPLE FUNCTIONAL PERFORMANCE TEST

A. The following functional test is included to provide the contractor with a representation of the level of rigor required.

Sample Client – Sample Project – Sample Building
Functional Performance Test – Lighting System

FPT E01 – LIGHTING SYSTEM

A) SYSTEM DESCRIPTION

1) Equipment Tested:
   a) Lighting Fixtures & Controls
2) xx% Sampling Rate for Cx Demonstration *(100% of equipment is to be tested by the contractor prior to Cx Demonstration)*
3) System Operating Summary
   a) Modes: Manual, Automatic – Occupied, Automatic – Unoccupied
   b) Control Points: Occupancy
   c) Alarms: N/A

B) OBJECTIVES

1) Perform comprehensive testing of all control related components and their driven devices (e.g. sensors, dampers, actuators).
2) Demonstrate that the system operates per the sequence of operations established by the contract documents.

C) SYSTEM SCHEMATIC & SEQUENCE OF OPERATION

[INSERT SOO HERE]

D) TESTING PREREQUISITES

1) Final installation of the system and all components is complete. System Readiness documentation is complete and submitted for Cx Review.
2) All controls related components and their driven devices (e.g. sensors, dampers, actuators, etc.) are installed, checked/calibrated, labeled, and operational.
3) The systems and equipment under test, along with any supporting systems (e.g. those providing power, temperature controlled air/water, etc.), are operational and under automatic control.

E) REQUIRED TOOLS

1) The following test equipment is required for this testing procedure and shall be supplied by the contractor.
   a) Calibrated equipment must be capable of readings within the tolerance and accuracy specified per the contract documents, with calibration performed within the past year. Complete the following for each calibrated instrument below.

Test Instrument	Make	Model	Serial Number	Calibration Date
Light Meter				

F) TESTING PARTICIPANTS

1) Record the following information from each individual present for the Cx Demonstration of the testing procedures.

Role	Name / Initials	Company	Email	Phone	Dates Present
Owner's Rep.					
Cx Coordinator					
Trade Contractor's Rep.					
Manufacturer's Rep.					
Controls Contractor's Rep.					
Cx Provider					

G) FIELD TESTING PROCEDURES

1) Interior Fixtures – Occupancy Sensor Test Dates(s): _____ / Initials: _____
This test will validate that the operation of the lighting controls matches the sequence of operations for a sampling of spaces.

a) Use the steps of the below procedures to complete functional testing for a sampling of spaces. A table is provided following the procedures for recording of results. Where an individual fixture/sensor within a space does not function as per the sequence of operations, note its designation on the test and/or its location on the plans for reference.
   (1) Record the room number or name for each space in the table below along with the profile type per the SOO.
   (2) Record the observed operation during testing by filling in the remaining columns.
   (3) Make any notes on deviations or other observations at the end of this test document.
   (4) Confirm the programmed SOO matches the profile by indicating pass/fail.

b) For testing, confirmation of each item means the following:
   (1) ON Operation:
      (a) A (Auto On) – the lights automatically turn on (or brighten) when occupancy is detected
         (i) Check that lights in enclosed spaces do not automatically turn on until the space is entered
      (b) M (Manual On) – the lights must be manually turned on via the local switch and do not turn on with occupancy
   (2) Switch – a local switch is present with all functions (on/off/dim) operable
      (a) Check that lights dim to minimum and full brightness without any flickering or other operational issues
   (3) Motion Group – all lights within the space are grouped such that occupancy detection by any sensors turns on (or brightens) all lights
   (4) Scenes – scenes are programmed and enabled via the local switch
   (5) Timeout Duration – the time delay after occupancy ends before which the lights will dim or turn off
      (a) Indicate "Manual" if lights do not automatically timeout and must be manually turned off
   (6) Timeout State:
      (a) D (Dim) – the lights dim to a minimum level when the space is no longer occupied
      (b) O (Off) – the lights turn off fully when the space is no longer occupied

Sample Client – Sample Project – Sample Building
Functional Performance Test – Lighting System

Space ID/Type	SOO Profile Type	ON Operation	Switch Works?	Motion Group?	Scenes?	Timeout Time	Timeout Duration	Timeout State	Timeout Matches SOO?
		☐ A/☐ M	☐ Y/☐ N	☐ Y/☐ N	☐ Y/☐ N			☐ D/☐ O	☐ P/☐ F/____
		☐ A/☐ M	☐ Y/☐ N	☐ Y/☐ N	☐ Y/☐ N			☐ D/☐ O	☐ P/☐ F/____
		☐ A/☐ M	☐ Y/☐ N	☐ Y/☐ N	☐ Y/☐ N			☐ D/☐ O	☐ P/☐ F/____
		☐ A/☐ M	☐ Y/☐ N	☐ Y/☐ N	☐ Y/☐ N			☐ D/☐ O	☐ P/☐ F/____
		☐ A/☐ M	☐ Y/☐ N	☐ Y/☐ N	☐ Y/☐ N			☐ D/☐ O	☐ P/☐ F/____
		☐ A/☐ M	☐ Y/☐ N	☐ Y/☐ N	☐ Y/☐ N			☐ D/☐ O	☐ P/☐ F/____
		☐ A/☐ M	☐ Y/☐ N	☐ Y/☐ N	☐ Y/☐ N			☐ D/☐ O	☐ P/☐ F/____
		☐ A/☐ M	☐ Y/☐ N	☐ Y/☐ N	☐ Y/☐ N			☐ D/☐ O	☐ P/☐ F/____
		☐ A/☐ M	☐ Y/☐ N	☐ Y/☐ N	☐ Y/☐ N			☐ D/☐ O	☐ P/☐ F/____
		☐ A/☐ M	☐ Y/☐ N	☐ Y/☐ N	☐ Y/☐ N			☐ D/☐ O	☐ P/☐ F/____
		☐ A/☐ M	☐ Y/☐ N	☐ Y/☐ N	☐ Y/☐ N			☐ D/☐ O	☐ P/☐ F/____
		☐ A/☐ M	☐ Y/☐ N	☐ Y/☐ N	☐ Y/☐ N			☐ D/☐ O	☐ P/☐ F/____
		☐ A/☐ M	☐ Y/☐ N	☐ Y/☐ N	☐ Y/☐ N			☐ D/☐ O	☐ P/☐ F/____
		☐ A/☐ M	☐ Y/☐ N	☐ Y/☐ N	☐ Y/☐ N			☐ D/☐ O	☐ P/☐ F/____
		☐ A/☐ M	☐ Y/☐ N	☐ Y/☐ N	☐ Y/☐ N			☐ D/☐ O	☐ P/☐ F/____
		☐ A/☐ M	☐ Y/☐ N	☐ Y/☐ N	☐ Y/☐ N			☐ D/☐ O	☐ P/☐ F/____
		☐ A/☐ M	☐ Y/☐ N	☐ Y/☐ N	☐ Y/☐ N			☐ D/☐ O	☐ P/☐ F/____
		☐ A/☐ M	☐ Y/☐ N	☐ Y/☐ N	☐ Y/☐ N			☐ D/☐ O	☐ P/☐ F/____
		☐ A/☐ M	☐ Y/☐ N	☐ Y/☐ N	☐ Y/☐ N			☐ D/☐ O	☐ P/☐ F/____
		☐ A/☐ M	☐ Y/☐ N	☐ Y/☐ N	☐ Y/☐ N			☐ D/☐ O	☐ P/☐ F/____
		☐ A/☐ M	☐ Y/☐ N	☐ Y/☐ N	☐ Y/☐ N			☐ D/☐ O	☐ P/☐ F/____

Date
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VEREGY
FORMERLY EMPOWERED SOLUTIONS

Sample Client – Sample Project – Sample Building
Functional Performance Test – Lighting System

2) Interior Fixtures – Daylighting Test Dates(s): _____ / Initials: _____
This test will validate that the lights dim and brighten automatically in response to daylighting for a sampling of spaces.

a) Use the steps of the below procedures to complete functional testing for a sampling of spaces. A table is provided following the procedures for recording of results. Where an individual fixture/sensor within a space does not function as per the sequence of operations, note its designation on the test and/or its location on the plans for reference.

(1) Record the room number or name for each space in the table below along with the profile type per the SOO.

(2) For each tested space, record the light output during daytime hours at the desk level using a light meter and the percent output reported for the fixture.

(3) For each tested space, record the light output during evening hours at the desk level using a light meter and the percent output reported for the fixture.

(4) Verify that fixtures in daylit spaces adjust their output in response to ambient light levels: Pass / Fail

(5) Verify that light levels in daylit spaces achieve the target levels per their SOO profile: Pass / Fail

b) Verify that lights in open office areas with daylighting are not substantially dimmed differently between adjacent fixtures such that the result is aesthetically unpleasant (e.g. checkerboard pattern, etc): ☐ P/ ☐ F/ _____

Space ID/Type	SOO Profile Type	Daytime Luminance (foot-candles)	Daytime Fixture Output (%)	Nighttime Luminance (foot-candles)	Nighttime Fixture Output (%)	Fixtures Dim in Response to Ambient Light	Light Levels Meet Targets Per SOO Profile
						☐ P/ ☐ F/ _____	☐ P/ ☐ F/ _____
						☐ P/ ☐ F/ _____	☐ P/ ☐ F/ _____
						☐ P/ ☐ F/ _____	☐ P/ ☐ F/ _____
						☐ P/ ☐ F/ _____	☐ P/ ☐ F/ _____
						☐ P/ ☐ F/ _____	☐ P/ ☐ F/ _____
						☐ P/ ☐ F/ _____	☐ P/ ☐ F/ _____
						☐ P/ ☐ F/ _____	☐ P/ ☐ F/ _____
						☐ P/ ☐ F/ _____	☐ P/ ☐ F/ _____

Sample Client – Sample Project – Sample Building
Functional Performance Test – Lighting System

3) Controlled Receptacles Test Dates(s): _____ / Initials: _____

This test will validate that the controlled receptacles are enabled/disabled based on occupancy as detected by the lighting controls occupancy sensors for a sampling of spaces.

NOTE: This test can be performed in conjunction with the Interior Fixtures – Occupancy Sensor Test above.

a) Use the steps of the below procedures to complete functional testing for a sampling of spaces. A table is provided following the procedures for recording of results. Where an individual fixture/sensor within a space does not function as per the sequence of operations, note its designation on the test and/or its location on the plans for reference.

(1) Record the room number or name for each space in the table below along with the profile type per the SOO.

(2) Plug in a small light or other device with clear on/off states into the controlled receptacle

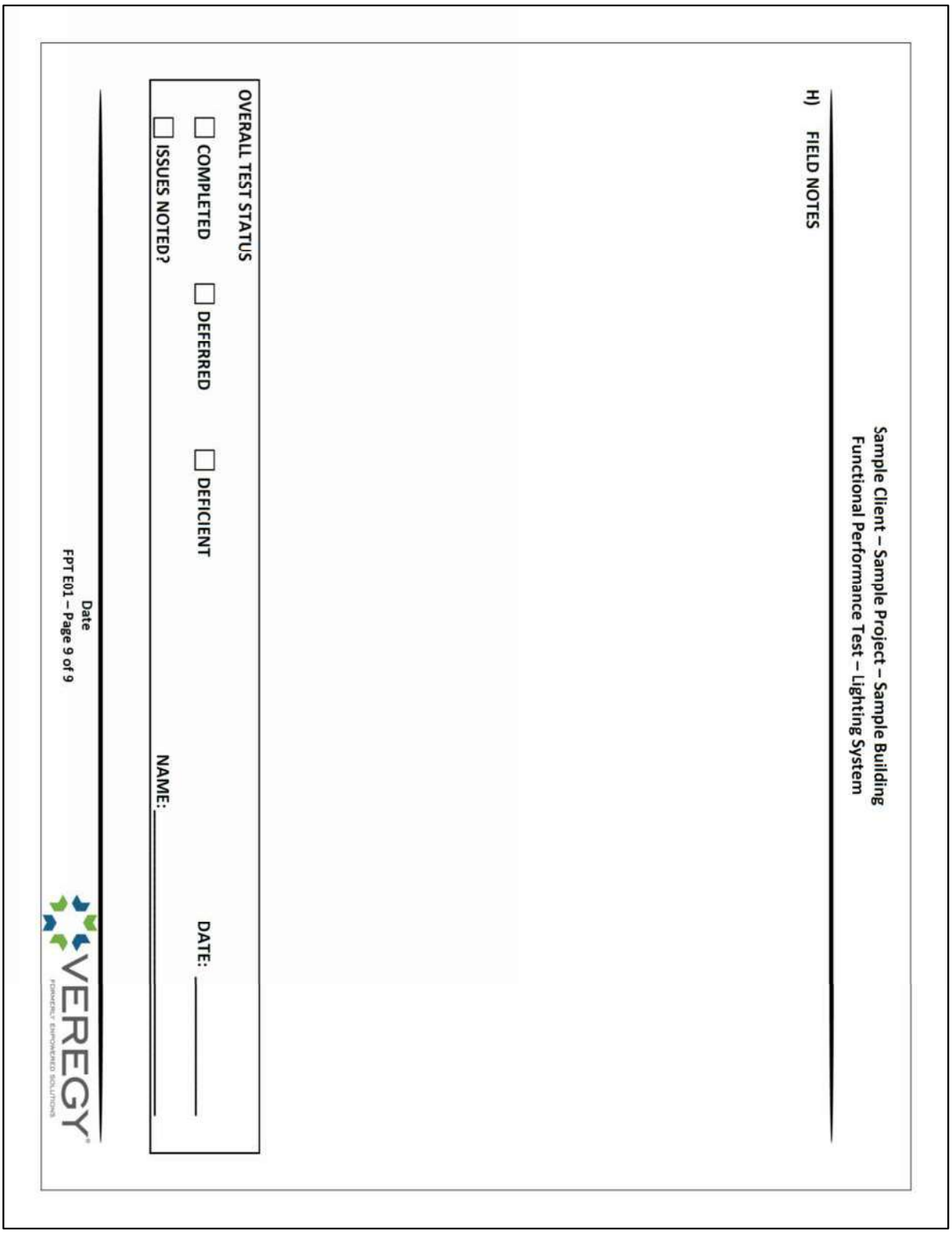
(a) Verify that the device is ON when the space is occupied (or via the wall switch as applicable): Pass / Fail

(b) Place the lighting controls into 'Auto', note the time of activation and leave the area.

(c) Verify that the device turns OFF after the timeout period expires: Pass / Fail

Space ID/Type	SOO Profile Type	Device is ON	Time	Timeout Duration	Device is OFF after Timeout
		☐ P/ ☐ F/ _____			☐ P/ ☐ F/ _____
		☐ P/ ☐ F/ _____			☐ P/ ☐ F/ _____
		☐ P/ ☐ F/ _____			☐ P/ ☐ F/ _____
		☐ P/ ☐ F/ _____			☐ P/ ☐ F/ _____
		☐ P/ ☐ F/ _____			☐ P/ ☐ F/ _____
		☐ P/ ☐ F/ _____			☐ P/ ☐ F/ _____
		☐ P/ ☐ F/ _____			☐ P/ ☐ F/ _____
		☐ P/ ☐ F/ _____			☐ P/ ☐ F/ _____
		☐ P/ ☐ F/ _____			☐ P/ ☐ F/ _____
		☐ P/ ☐ F/ _____			☐ P/ ☐ F/ _____

VEREGY
FORMERLY ENPOWERED SOLUTIONS



END OF SECTION

SECTION 26 09 23

LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Indoor occupancy and vacancy sensors.
2. Switchbox-mounted occupancy sensors.
3. Outdoor motion sensors.
4. Emergency shunt relay.
5. Conductors and cables.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Daylight-harvesting switching controls.
2. Indoor occupancy and vacancy sensors.
3. Switchbox-mounted occupancy sensors.
4. Outdoor motion sensors.
5. Lighting contactors.
6. Emergency shunt relay.
7. Conductors and cables.

B. Shop Drawings:

1. Show installation details for the following:

a. Occupancy sensors.
b. Vacancy sensors.

2. Interconnection diagrams showing field-installed wiring.
3. Include diagrams for power, signal, and control wiring.

C. Sustainable Design Submittals:

1. ASHRAE/IES 90.1 LPD Compliance Documentation: Prepare plans and calculations demonstrating that as-constructed lighting power density complies with mandatory provisions of ASHRAE/IES 90.1 and that as-constructed lighting, including daylighting and controls, improves on baseline energy performance. If included with Project, indicate locations of energy meters for lighting loads.
2. Lighting Control Documentation: Floor plans indicating the following information:

a. As-installed locations of switches and dimmers.

b. Lighting zones and control strategy for each switch or dimmer, including unoccupied time-delay setting for shut-off and override time-delay setting for shut-off.
c. Multilevel or dimming range capability for each switch or dimmer.
d. Which switches or dimmers are operated by occupancy sensors, vacancy sensors, daylighting sensors, or time clocks.

D. Field quality-control reports.

1.3 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's warranties.

1.4 WARRANTY

A. Special Extended Warranty: Manufacturer and Installer warrant that installed lighting control devices perform in accordance with specified requirements and agree to repair or replace, including labor, materials, and equipment, devices that fail to perform as specified within extended warranty period.

1. Failures include, but are not limited to, the following:

a. Faulty operation of lighting control software.
b. Faulty operation of lighting control devices.

2. Extended Warranty Period: Two year(s) from date of Beneficial Occupancy.

PART 2 - PRODUCTS

2.1 DAYLIGHT-HARVESTING DIMMING CONTROLS, DIGITAL

A. nLight

B. Description: Sensing daylight and electrical lighting levels, the system adjusts the indoor electrical lighting levels. As daylight increases, lights are dimmed.

1. Lighting control set point is based on the following two lighting conditions:

a. When no daylight is present (target level).
b. When significant daylight is present.

2. System programming is done with two hand-held, remote-control tools.

a. Initial setup tool.
b. Tool for occupants to adjust the target levels by increasing the set point up to 25 percent, or by minimizing the electric lighting level.

C. Ceiling-Mounted Dimming Controls: Solid-state, light-level sensor unit, with integrated power pack, to detect changes in indoor lighting levels that are perceived by the eye.

D. Electrical Components, Devices, and Accessories:

1. Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Sensor Output: zero to 10 V(dc) to operate luminaires. Sensor is powered by controller unit.
3. Light-Level Sensor Set-Point Adjustment Range: 20 to 60 fc (120 to 640 lx).

E. Power Pack: Digital controller capable of accepting three8PSJ inputs with two output(s) rated for 20 A LED load at 120 and 277 V(ac), for 13 A LED at 120 and 277 V(ac).Sensor has 24 V(dc) Class 2 power source.

1. With integral current monitoring.
2. Compatible with digital addressable lighting interface.

2.2 INDOOR OCCUPANCY AND VACANCY SENSORS

A. Lutron, nLight

B. General Requirements for Sensors:

1. Ceiling-mounted, solid-state indoor occupancy and vacancy sensors.
2. Dual technology.
3. Separate power pack.
4. Hardwired connection to switch and BAS and lighting control system.
5. Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
6. Operation:

a. Occupancy Sensor: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
b. Vacancy Sensor: Unless otherwise indicated, lights are manually turned on and sensor turns lights off when the room is unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
c. Combination Sensor: Unless otherwise indicated, sensor must be programmed to turn lights on when coverage area is occupied and turn them off when unoccupied, or to turn off lights that have been manually turned on; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.

7. Sensor Output: Sensor is powered from the power pack.
8. Power: Line voltage.

9. Power Pack: Dry contacts rated for 20 A ballast or LED load at 120 and 277 V(ac), for 13 A tungsten at 120 V(ac), and for 1 hp at 120 V(ac). Sensor has 24 V(dc), 150 mA, Class 2 power source.
10. Mounting:

    a. Sensor: Suitable for mounting in any position in a standard device box or 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.

11. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
12. Bypass Switch: Override the "on" function in case of sensor failure.
13. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; turn lights off when selected lighting level is present.

C. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is 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. inch and detect a person of average size and weight moving not less than 12 inch in either a horizontal or a vertical manner at an approximate speed of 12 inch/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.
4. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1000 sq. ft. 2000 sq. ft. when mounted 48 inch above finished floor.

2.3 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

A. Lutron, nLight

B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor with manual on-off switch, suitable for mounting in a single gang switchbox, with provisions for connection to BAS using hardwired connection.

1. Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application, and must comply with California Title 24.
2. Occupancy Sensor Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn lights off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
3. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.

4. Switch Rating: Not less than 800 VA ballast or LED load at 120 V, 1200 VA ballast or LED load at 277 V, and 800 W incandescent.

C. Wall-Switch Sensor :

1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 900 sq. ft..
2. Sensing Technology: Dual technology - PIR and ultrasonic.
3. Switch Type: SP, field-selectable automatic "on," or manual "on," automatic "off."
4. Capable of controlling load in three-way application.
5. Voltage: Dual voltage - 120 and 277 V.
6. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc . The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
7. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
8. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.
9. Color: White>.
10. Faceplate: Color matched to switch.

2.4 EMERGENCY SHUNT RELAY

A. Lutron, Nlight.

B. Description: NC, electrically held relay, arranged for wiring in parallel with manual or automatic switching contacts; complying with UL 924.

1. Coil Rating: 277 V.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.

B. Examine walls and ceilings for suitable conditions where lighting control devices will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF SENSORS

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 systems, and partition assemblies.

B. 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 instructions.

3.3 INSTALLATION OF WIRING

A. Wiring Method: Comply with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch.

B. Wiring within Enclosures: Separate power-limited and nonpower-limited conductors in accordance with conductor manufacturer's instructions.

C. Size conductors in accordance with lighting control device manufacturer's instructions unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, device, and outlet boxes; terminal cabinets; and equipment enclosures.

3.4 IDENTIFICATION

A. Identify components and power and control wiring in accordance with Section 26 05 53 "Identification for Electrical Systems.

1. Identify controlled circuits in lighting contactors.
2. Identify circuits or luminaires 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. Field tests must be witnessed by the State.

B. Tests and Inspections:

1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Nonconforming Work:

1. Lighting control devices will be considered defective if they do not pass tests and inspections.
2. Remove and replace defective units and retest.

D. Prepare test and inspection reports.

E. Manufacturer Services:

1. Engage factory-authorized service representative to supervise field tests and inspections.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Beneficial Occupancy, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit the State's operations.
2. For daylighting controls, adjust set points and deadband controls to suit the State's operations.
3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.

3.7 MAINTENANCE

A. Software and Firmware Service Agreement:

1. Technical Support: Beginning at Beneficial Occupancy, verify that software and firmware service agreement includes software support for two years.
2. Upgrade Service: At Beneficial Occupancy, update software and firmware to latest version. Install and program software upgrades that become available within two years from date of Beneficial Occupancy. Verify upgrading software includes operating system and new or revised licenses for using software.

    a. Upgrade Notice: No fewer than 30 days to allow the State to schedule and access the system and to upgrade computer equipment if necessary.

3. Upgrade Reports: Prepare written report after each update, documenting upgrades installed.

END OF SECTION 26 09 23

SECTION 26 24 13

SWITCHBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Service and distribution switchboards rated 600 V and less.
2. Surge protection devices.
3. Disconnecting and overcurrent protective devices.
4. Accessory components and features.

B. Related Requirements

1. Section 26 05 73.19 "Arc-Flash Hazard Analysis" for arc-flash analysis and arc-flash label requirements.

1.2 ACTION SUBMITTALS

A. Product Data: For each switchboard, overcurrent protective device, surge protection device, ground-fault protector, accessory, and component.

1. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

B. Shop Drawings: For each switchboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Detail short-circuit current rating of switchboards and overcurrent protective devices.
5. Include descriptive documentation of optional barriers specified for electrical insulation and isolation.
6. Detail utility company's metering provisions with indication of approval by utility company.
7. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
8. Include time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.
9. Include schematic and wiring diagrams for power, signal, and control wiring.

C. Delegated Design Submittal:

1. For arc-flash hazard analysis.
2. For arc-flash labels.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and testing agency.

B. Seismic Qualification Data: Certificates, for switchboards, overcurrent protective devices, accessories, and components, from manufacturer.

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.

C. 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.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For switchboards and components to include in emergency, operation, and maintenance manuals.

1. Shall include the following but not limited to:

a. Routine maintenance requirements for switchboards and all installed components.
b. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
c. Time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

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.

B. Testing Agency Qualifications: Accredited by NETA.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver switchboards in sections or lengths that can be moved past obstructions in delivery path.

B. Remove loose packing and flammable materials from inside switchboards. Protect and store to prevent condensation and damage from weather.

C. Handle and prepare switchboards for installation according to NEMA PB 2.1.

1.7 FIELD CONDITIONS

A. Installation Pathway: Remove and replace access fencing, doors, lift-out panels, and structures to provide pathway for moving switchboards into place.

B. Environmental Limitations:

1. Do not deliver or install switchboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above switchboards is complete, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

    a. Ambient Temperature: Not exceeding 104 deg F (40 deg C).
    b. Altitude: Not exceeding 6600 feet (2000 m).

C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by the State or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify the State no fewer than ten working days in advance of proposed interruption of electric service.
2. Indicate method of providing temporary electric service.
3. Do not proceed with interruption of electric service without the State's written permission.
4. Comply with NFPA 70E.

1.8 COORDINATION

A. Coordinate layout and installation of switchboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance

requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.9 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace switchboard enclosures, buswork, overcurrent protective devices, accessories, and factory installed interconnection wiring that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Three years from date of Beneficial Occupancy.

B. Manufacturer's Warranty: Manufacturer's agrees to repair or replace surge protection devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Beneficial Occupancy.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Switchboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation. Shake-table testing shall comply with ICC-ES AC156.
2. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the applicable seismic forces. Contractor is responsible for retaining a qualified professional engineer to determine applicable seismic criteria.

2.2 SWITCHBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Schneider Electric (Square D).
2. Eaton.
3. GE.

B. Source Limitations: Obtain switchboards, 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 2.

E. Comply with NFPA 70.

F. Comply with UL 891.

G. Front-Connected, Front-Accessible Switchboards:

1. Main Devices: Panel mounted.
2. Branch Devices: Panel mounted.
3. Sections front and rear aligned.

H. Nominal System Voltage: 480Y/277 V.

I. Main-Bus Continuous: 800A.

J. Seismic Requirements: Fabricate and test switchboards according to IEEE 344 to withstand applicable seismic criteria. Contractor is responsible for retaining a qualified professional engineer to determine applicable seismic criteria.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation. Shake-table testing shall comply with ICC-ES AC156.

a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

K. Indoor Enclosures: Steel, NEMA 250, Type 1.

L. Outdoor Enclosures: Type 3R.

1. Finish: Factory-applied finish in manufacturer's standard color; undersurfaces treated with corrosion-resistant undercoating.
2. Enclosure: Flat roof; bolt-on rear covers for each section, with provisions for padlocking.

M. Barriers: Between adjacent switchboard sections.

N. Insulation and isolation for main bus of main section and main and vertical buses of feeder sections.

O. Service Entrance Rating: Switchboards intended for use as service entrance equipment shall contain from one to six service disconnecting means with overcurrent protection, a neutral bus with disconnecting link, a grounding electrode conductor terminal, and a main bonding jumper.

P. Utility Metering Compartment: Barrier compartment and section complying with utility company's requirements; hinged sealable door; buses provisioned for mounting utility company's current transformers and potential transformers or potential taps as required by utility company. If separate vertical section is required for utility metering, match and align with basic switchboard. Provide service entrance label and necessary applicable service entrance features.

Q. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.

R. Removable, Hinged Rear Doors and Compartment Covers: Secured by standard bolts, for access to rear interior of switchboard.

S. Hinged Front Panels: Allow access to circuit breaker, metering, accessory, and blank compartments.

T. Pull Box on Top of Switchboard:

1. Adequate ventilation to maintain temperature in pull box within same limits as switchboard.
2. Set back from front to clear circuit-breaker removal mechanism.
3. Removable covers shall form top, front, and sides. Top covers at rear shall be easily removable for drilling and cutting.
4. Bottom shall be insulating, fire-resistive material with separate holes for cable drops into switchboard.
5. Cable supports shall be arranged to facilitate cabling and adequate to support cables indicated, including those for future installation.

U. Buses and Connections: Three phase, four wire unless otherwise indicated.

1. Provide phase bus arrangement A, B, C from front to back, top to bottom, and left to right when viewed from the front of the switchboard.
2. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent conductivity, silver-plated.
3. Copper feeder circuit-breaker line connections.
4. Load Terminals: Insulated, rigidly braced, runback bus extensions, of same material as through buses, equipped with compression connectors for outgoing circuit conductors. Provide load terminals for future circuit-breaker positions at full-ampere rating of circuit-breaker position.
5. Ground Bus: 1/4-by-2-inch- (6-by-50-mm-) hard-drawn copper of 98 percent conductivity, equipped with compression connectors for feeder and branch-circuit ground conductors.
6. 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.
7. Disconnect Links:

    a. Isolate neutral bus from incoming neutral conductors.
    b. Bond neutral bus to equipment-ground bus for switchboards utilized as service equipment or separately derived systems.

8. Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with compression connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.
9. Isolation Barrier Access Provisions: Permit checking of bus-bolt tightness.

V. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.

W. 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.

X. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components including instruments and instrument transformers.

2.3 SURGE PROTECTION DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Schneider Electric (Square D).
2. Eaton.
3. GE.

B. SPDs: Comply with UL 1449, Type 1.

C. Features and Accessories:

1. Integral disconnect switch.
2. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
3. Indicator light display for protection status.
4. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status.
5. Surge counter.

D. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 200 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

E. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V, three-phase, four-wire circuits shall not exceed the following:

1. Line to Neutral: 1200 V for 480Y/277 V.
2. Line to Ground: 1200 V for 480Y/277 V.
3. Line to Line: 2000 V for 480Y/277 V.

F. SCCR: Equal or exceed 100 kA.

G. Nominal Rating: 20 kA.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with fully rated 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 all circuit-breaker frame sizes 100 A and larger.
2. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:

    a. Instantaneous trip.
    b. Long- and short-time pickup levels.
    c. Long and short time adjustments.
    d. Ground-fault pickup level, time delay, and I squared t response.

3. MCCB Features and Accessories:

    a. Standard frame sizes, trip ratings, and number of poles.
    b. Lugs: Compression style, suitable for number, size, trip ratings, and conductor material.
    c. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
    d. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.

2.5 INSTRUMENTATION

A. Instrument Transformers: NEMA EI 21.1, and the following:

1. Potential Transformers: NEMA EI 21.1; 120 V, 60 Hz, tapped secondary; disconnecting type with integral fuse mountings. Burden and accuracy shall be consistent with connected metering and relay devices.
2. Current Transformers: NEMA EI 21.1; 5 A, 60 Hz, secondary; wound bar or window type; single secondary winding and secondary shorting device. Burden and accuracy shall be consistent with connected metering and relay devices.
3. Current Transformers for Neutral and Ground-Fault Current Sensing: Connect secondary wiring to ground overcurrent relays, via shorting terminals, to provide selective tripping of main and tie circuit breaker. Coordinate with feeder circuit-breaker, ground-fault protection.

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. Mounting Accessories: For anchors, mounting channels, bolts, washers, and other mounting accessories, comply with manufacturer's instructions.

2.7 IDENTIFICATION

A. Service Equipment Label: NRTL labeled for use as service equipment for switchboards with one or more service disconnecting and overcurrent protective devices.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store switchboards according to NEMA PB 2.1.

1. Lift or move panelboards with spreader bars and manufacturer-supplied lifting straps following manufacturer's instructions.
2. Use rollers, slings, or other manufacturer-approved methods if lifting straps are not furnished.
3. Protect from moisture, dust, dirt, and debris during storage and installation.
4. Install temporary heating during storage per manufacturer's instructions.

B. Examine switchboards before installation. Reject switchboards that are moisture damaged or physically damaged.

C. Examine elements and surfaces to receive switchboards for compliance with installation tolerances and other conditions affecting performance of the Work or that affect the performance of the equipment.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install switchboards and accessories according to NEMA PB 2.1.

B. Equipment Mounting: Install switchboards on concrete base, 4-inch (100-mm) nominal thickness. Comply with requirements for concrete base shown on Drawings.

1. Install conduits entering underneath the switchboard, entering under the vertical section where the conductors will terminate. Install with couplings flush with the concrete base. Extend 2 inches (50-mm) above concrete base after switchboard is anchored in place.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to switchboards.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, straps and brackets, and temporary blocking of moving parts from switchboard units and components.

D. Install filler plates in unused spaces of panel-mounted sections.

E. Install overcurrent protective devices, surge protection devices, and instrumentation.

1. Set field-adjustable switches and circuit-breaker trip ranges.

F. Comply with NECA 1.

3.3 CONNECTIONS

A. Bond conduits entering underneath the switchboard to the equipment ground bus with a bonding conductor sized per NFPA 70.

B. Support and secure conductors within the switchboard according to NFPA 70.

C. Extend insulated equipment grounding cable to busway ground connection and support cable at intervals in vertical run.

3.4 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

B. Switchboard Nameplates: Label each switchboard compartment with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

C. Device Nameplates: Label each disconnecting and overcurrent protective device and each meter and control device mounted in compartment doors with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Acceptance Testing:

a. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit. Open control and metering circuits within the switchboard, and remove neutral connection to surge

protection and other electronic devices prior to insulation test. Reconnect after test.

b. Test continuity of each circuit.

2. Test ground-fault protection of equipment for service equipment per NFPA 70.
3. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
4. Correct malfunctioning units on-site where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
5. Perform the following infrared scan tests and inspections, and prepare reports:

    a. Initial Infrared Scanning: After Beneficial Occupancy, but not more than 60 days after Final Acceptance, perform an infrared scan of each switchboard. Remove front panels so joints and connections are accessible to portable scanner.
    b. Instruments and Equipment:

        1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

6. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

C. Switchboard will be considered defective if it does not pass tests and inspections.

D. 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 specified in Section 26 05 73.16 "Coordination Studies."

3.7 PROTECTION

A. Temporary Heating: Apply temporary heat, to maintain temperature according to manufacturer's written instructions, until switchboard is ready to be energized and placed into service.

3.8 DEMONSTRATION

A. Train the State's maintenance personnel to adjust, operate, and maintain switchboards, overcurrent protective devices, instrumentation, and accessories.

END OF SECTION 26 24 13

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Panelboards.
2. Disconnecting and overcurrent protective devices.

1.2 DEFINITIONS

A. MCCB: Molded-case circuit breaker.

B. VPR: Voltage protection rating.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.
2. Include manufacturer's sample extended warranty language.

B. Shop Drawings: For each panelboard and related equipment:

1. Include dimensioned plans, elevations, sections, and details.
2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.
3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
4. Detail bus configuration, current, and voltage ratings.
5. Short-circuit current rating of panelboards and overcurrent protective devices.
6. Include evidence of listing, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for SPD as installed in panelboard.
7. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
8. Include wiring diagrams for power, signal, and control wiring.
9. Key interlock scheme drawing and sequence of operations.
10. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

Include Internet link for electronic access to downloadable PDF of coordination curves.

11. vice. Include Internet link for electronic access to downloadable PDF of coordination curves.

C. Field quality-control reports.

1.4 INFORMATIONAL SUBMITTALS

A. Panelboard Schedules: For installation in panelboards.

B. Manufacturer's published instructions.

C. Field Reports:

1. Manufacturer's field reports for field quality-control support.
2. Field reports for voltage monitoring and adjusting.
3. Field reports for infrared scanning.

1.5 CLOSEOUT SUBMITTALS

A. Warranty documentation.

1.6 QUALIFICATIONS

A. Low-Voltage Electrical Testing and Inspecting Agency: Entities possessing active credentials from a qualified electrical testing laboratory recognized by authorities having jurisdiction.

1. On-site electrical testing supervisors must have documented certification and experience with testing electrical equipment in accordance with NETA testing standards.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation in accordance with NEMA PB 1.

1.8 WARRANTY

A. Special Installer Extended Warranty: Installer warrants that fabricated and installed panelboards perform in accordance with specified requirements and agrees to repair or replace components or products that fail to perform as specified within extended-warranty period.

1. Extended-Warranty Period: Two years from date of Beneficial Occupancy; full coverage for labor, materials, and equipment.

B. Special Manufacturer Extended Warranty: Manufacturer warrants that panelboards perform in accordance with specified requirements and agrees to provide repair or replacement of components or products that fail to perform as specified within extended-warranty period.

1. Initial Extended-Warranty Period: five years from date of Beneficial Occupancy; full coverage for labor, materials, and equipment.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

B. Fabricate and test panelboards in accordance with IEEE 344 to withstand seismic forces.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

D. Comply with NEMA PB 1.

E. Enclosures: Flush and Surface-mounted, dead-front cabinets.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: UL 50E, Type 1.
b. Outdoor Locations: UL 50E, Type 3R.

2. Height: 7 ft (2.13 m) maximum.
3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims must cover live parts and may have no exposed hardware.
4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims must cover live parts and may have no exposed hardware.
5. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
6. Finishes:

a. Panels and Trim: 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.
c. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components.

F. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.

a. Plating must run entire length of bus.
b. Bus must be fully rated for entire length.

2. Interiors must be factory assembled into unit. Replacing switching and protective devices may not disturb adjacent units or require removing main bus connectors.
3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

G. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Terminations must allow use of 75 deg C rated conductors without derating.
3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
4. Main and Neutral Lugs: Compression type, with lug on neutral bar for each pole in panelboard.
5. Ground Lugs and Bus-Configured Terminators: Compression type, with lug on bar for each pole in panelboard.

H. Quality-Control Label: Panelboards or load centers must be labeled, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards or load centers must have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.

I. Future Devices: Panelboards or load centers must have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

1. Percentage of Future Space Capacity: 20 percent.

J. Panelboard Short-Circuit Current Rating:

1. Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for 100 percent interrupting capacity.

a. Panelboards and overcurrent protective devices rated 240 V or less must have short-circuit ratings as shown on Drawings, but not less than 10 000 A(rms) symmetrical.

b. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V must have short-circuit ratings, but not less than 14 000 A(rms) symmetrical.

2.2 PANELBOARDS

A. UL QEUY - Distribution Panelboard

1. Products

   a. Schneider Electric (Square D).
   b. Eaton.
   c. GE.
   d. Or approved equal.

2. Source Limitations: Obtain products from single manufacturer.
3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

   a. Distribution Type Panelboards: UL CCN QEUY; including UL 67 and NEMA PB 1.

4. Standard Features:

   a. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

      1) For doors more than 36 inch high, provide two latches, keyed alike.

   b. Mains: Circuit breaker.

      1) Location: Top.t
      2) Main Breaker: Main lug interiors up to 400 A must be field convertible to main breaker.

   c. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
   d. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.
   e. Branch Overcurrent Protective Devices: Fused switches.

5. Other Available Features Required by Project:

   a. Surge Suppression: Factory installed as integral part of indicated panelboards, complying with UL 1449 SPD Type 1.
   b. Isolated Ground Bus: Adequate for branch-circuit isolated ground
   b. conductors; insulated from box.
   c. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure.

d. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and listed and labeled, by qualified electrical testing laboratory recognized by authorities having jurisdiction, as suitable for nonlinear loads in electronic-grade panelboards and others designated. Connectors must be sized for double-sized or parallel conductors.
e. Do not mount neutral bus in gutter.
f. Feed-Through Lugs: Compression type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
g. Subfeed (Double) Lugs: Compressiontype suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
h. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

1. Products

a. Schneider Electric (Square D).
b. Eaton.
c. GE.
d. Or approved equal.

B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers:

a. Inverse time-current element for low-level overloads.
b. Instantaneous magnetic trip element for short circuits.
c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic Trip Circuit Breakers:

a. RMS sensing.
b. Field-replaceable rating plug or electronic trip.
c. Digital display of settings, trip targets, and indicated metering displays.
d. Multi-button keypad to access programmable functions and monitored data.
e. Ten-event, trip-history log. Each trip event must be recorded with type, phase, and magnitude of fault that caused trip.
f. Integral test jack for connection to portable test set or laptop computer.
g. Field-Adjustable Settings:

1) Instantaneous trip.
2) Long- and short-time pickup levels.
3) Long- and short-time adjustments.
4) Ground-fault pickup level, time delay, and I squared T response.

4. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6 mA trip).
5. GFPE Circuit Breakers: Class B ground-fault protection (30 mA trip).
6. Arc-Fault Circuit Interrupter Circuit Breakers: Comply with UL 1699; 120/240 V, single-pole configuration.
7. Subfeed Circuit Breakers: Vertically mounted.
8. MCCB Features and Accessories:

    a. Standard frame sizes, trip ratings, and number of poles.
    b. Breaker handle indicates tripped status.
    c. UL listed for reverse connection without restrictive line or load ratings.
    d. Lugs: Compressionstyle, suitable for number, size, trip ratings, and conductor materials.
    e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
    f. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
    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.
    i. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.
    j. Rating Plugs: Three-pole breakers with ampere ratings greater than 100 A must have interchangeable rating plugs or electronic adjustable trip units.
    k. Auxiliary Contacts: One, SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.
    l. Alarm Switch: Single-pole, normally open contact that actuates only when circuit breaker trips.

C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

1. Provide fuses and spare fuse cabinet.
2. Fused Switch Features and Accessories:

    a. Standard ampere ratings and number of poles.
    b. Mechanical cover interlock with manual interlock override, to prevent opening of cover when switch is in on position. Interlock must prevent switch from being turned on with cover open. Operating handle must have lock-off means with provisions for three padlocks.
    c. Auxiliary Contacts: Two normally open and normally closed contact(s) that operate with switch handle operation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.

B. Receive, inspect, handle, and store panelboards in accordance with NEMA PB 1.1.

C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.

D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's published instructions.

B. Reference Standards:

1. Panelboards: Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NEMA PB 1.1.
2. Consult the State for resolution of conflicting requirements.

C. Special Techniques:

1. Equipment Mounting:

    a. Install floor-mounted panelboards on cast-in-place concrete equipment base(s).
    b. Attach panelboard to vertical finished or structural surface behind panelboard.
    c. Mount surface-mounted panelboards to steel slotted supports 1-1/4 inch in depth. Orient steel slotted supports vertically.
    d. Provide seismic control devices.

2. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.
3. Provide mounting and anchoring devices.
4. Mount top of trim 7.5 ft above finished floor unless otherwise indicated.
5. Mount panelboard cabinet plumb and rigid without distortion of box.
6. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
7. Install overcurrent protective devices and controllers not already factory installed.

    a. Set field-adjustable, circuit-breaker trip ranges.

b. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver in accordance with manufacturer's published instructions.

8. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
9. Install filler plates in unused spaces.
10. Stub four 1 inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in future. Stub four 1 inch empty conduits into raised floor space or below slab not on grade.
11. Arrange conductors in gutters into groups and bundle and wrap with wire ties.
12. Mount spare fuse cabinet in accessible location.

D. Interfaces with Other Work:

1. 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.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components.

B. Install warning signs.

C. Panelboard Nameplates: Label each panelboard with nameplate.

D. Device Nameplates: Label each branch circuit device in power panelboards with nameplate.

E. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles must be located on interior of panelboard door.

F. Breaker Labels: Faceplate must list current rating, UL and IEC certification standards, and AIC rating.

G. Circuit Directory:

1. Provide directory card inside panelboard door, mounted in metal frame with transparent protective cover.

a. Circuit directory must identify specific purpose with detail sufficient to distinguish it from other circuits.

2. Provide computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.

a. Circuit directory must identify specific purpose with detail sufficient to distinguish it from other circuits.

3. Create directory to indicate installed circuit loads; incorporate the State's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

3.4 FIELD QUALITY CONTROL

A. Administrant for Low-Voltage Electrical Tests and Inspections:

1. The State will engage qualified low-voltage electrical testing and inspecting agency to administer and perform tests and inspections.
2. Engage qualified low-voltage electrical testing and inspecting agency to administer and perform tests and inspections.
3. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.
4. Administer and perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Field tests and inspections must be witnessed by the State.

D. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers and low-voltage surge arrestors stated in NETA ATS, Paragraph 7.6 Circuit Breakers Perform optional tests. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Beneficial Occupancy, but not more than 60 days after Final Acceptance, perform infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
b. Follow-up Infrared Scanning: Perform additional follow-up infrared scan of each panelboard 11 months after date of Beneficial Occupancy.
c. Instruments and Equipment:

1) Use infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

E. Nonconforming Work:

1. Panelboards will be considered defective if they do not pass tests and inspections.
2. Remove and replace defective units and retest.

F. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.

1. Include certified report that identifies panelboards included and that describes scanning results, with comparisons of two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

G. Manufacturer Services: Engage factory-authorized service representative to support field 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.

C. Load Balancing: After Beneficial Occupancy, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes. Prior to making circuit changes to achieve load balancing, inform the State of effect on phase color coding.

1. Measure loads during period of normal facility operations.
2. Perform circuit changes to achieve load balancing outside normal facility operation schedule or at times directed by the State. Avoid disrupting services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After changing circuits to achieve load balancing, recheck loads during normal facility operations. Record load readings before and after changing circuits to achieve load balancing.
4. Tolerance: Maximum difference between phase loads, within panelboard, may not exceed 20 percent.

3.6 PROTECTION

A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature in accordance with manufacturer's published instructions.

END OF SECTION 26 24 16

SECTION 26 27 16

ELECTRICAL CABINETS AND ENCLOSURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cabinets and cutout boxes.
2. Termination boxes.
3. Miscellaneous enclosures.
4. Rack or frame systems.
5. Enclosure-mounted relocatable power taps.

1.2 DEFINITIONS

A. RBB: Rack bonding busbar, located in equipment cabinets and racks.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Cabinets and cutout boxes.
2. Termination boxes.
3. Miscellaneous enclosures.
4. Rack or frame systems.
5. Enclosure-mounted relocatable power taps.

B. Shop Drawings:

1. Shop drawings for custom enclosures and cabinets.
2. Shop drawings for racks or frames.

C. Sustainable Design Submittals:

1. Product data for sustainable design features for each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturers' Published Instructions:

1. Cabinets and cutout boxes.
2. Termination boxes.
3. Miscellaneous enclosures.

4. Rack or frame systems.
5. Enclosure-mounted relocatable power taps.

PART 2 - PRODUCTS

2.1 CABINETS AND CUTOUT BOXES

A. Performance Criteria:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2. Listing Criteria:

a. UL CCN CYIV.
b. Non-Environmental Characteristics: UL 50.
c. Environmental Characteristics: UL 50E.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL CYIV - Indoor Sheet Metal Cabinets:

1. General Characteristics: Enclosure provided with frame, mat, or trim in which swinging door or doors are or can be hung.
2. Options:

a. Degree of Protection: Type 12

D. UL CYIV - Indoor Sheet Metal Cutout Boxes :

1. General Characteristics: Enclosure that has swinging doors or covers secured directly to and telescoping with walls of enclosure.
2. Options:

a. Degree of Protection: Type 12.

E. UL CYIV - Outdoor Sheet Metal Cabinets :

1. General Characteristics: Enclosure provided with frame, mat, or trim in which swinging door or doors are or can be hung.
2. Options:

a. Degree of Protection: Type 4X.

F. UL CYIV - Outdoor Sheet Metal Cutout Boxes :

1. General Characteristics: Enclosure that has swinging doors or covers secured directly to and telescoping with walls of enclosure.
2. Options:

a. Degree of Protection: Type 4X.

2.2 TERMINATION BOXES

A. Description: Enclosure for termination base consisting of lengths of bus bars, terminal strips, or terminal blocks with provision for wire connectors to accommodate incoming or outgoing conductors or both.

B. Performance Criteria:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2. Listing Criteria:

a. UL CCN XCKT; including UL 1773.
b. Non-Environmental Characteristics: UL 50.
c. Environmental Characteristics: UL 50E.

C. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

D. UL XCKT - Termination Boxes and Termination Bases for Installation on Line Side of Service Equipment :

1. Additional Characteristics: Listed and labeled for installation on line side of service equipment.
2. Options:

a. Indoor Degree of Protection: Type 1
b. Outdoor Degree of Protection: Type 4X.

E. UL XCKT - Termination Boxes and Termination Bases for Installation on Load Side of Service Equipment:

1. Additional Characteristics: Listed and labeled for installation on load side of service equipment.
2. Options:

    a. Indoor Degree of Protection: Type 1.
    b. Outdoor Degree of Protection: Type 4X.

2.3 MISCELLANEOUS ENCLOSURES

A. Performance Criteria:

1. Regulatory Requirements:

    a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2. Listing Criteria:

    a. UL CCN XCKT; including UL 1773.
    b. Non-Environmental Characteristics: UL 50.
    c. Environmental Characteristics: UL 50E.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL XCKT - Indoor Sheet Metal Miscellaneous Enclosures :

1. Options:

    a. Degree of Protection: Type 1.

D. UL XCKT - Outdoor Sheet Metal Miscellaneous Enclosures:

1. Options:

    a. Degree of Protection: Type 4X.

2.4 RACK OR FRAME SYSTEMS

A. Description: This category covers rack or frame systems that are not complete but include components and assemblies that are intended to power, protect, heat, cool, or otherwise support electrical or electronic equipment that will be installed at a later time.

B. Performance Criteria:

1. Regulatory Requirements:

    a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2. Listing Criteria:

    a. UL CCN NWIN; including UL 2416.
    b. Non-Environmental Characteristics: UL 50.
    c. Environmental Characteristics: UL 50E or UL 2416.

C. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

D. UL NWIN - 19 Inch Open Equipment Rack:

1. Nvent Hoffman
2. General Characteristics:

    a. Threaded rails designed for mounting telecommunications equipment.
    b. Width: Compatible with EIA/ECIA 310-E, 19 inch equipment mounting with an opening of 17.72 inch between rails.
    c. Frames: Modular units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.
    d. Finish: Manufacturer's standard, baked-polyester powder coat.
    e. Cable Management:

        1) Metal, with integral wire retaining fingers.
        2) Baked-polyester powder coat finish.
        3) Vertical cable management panels have front and rear channels with covers.
        4) Horizontal crossover cable manager at top of each relay rack, with minimum height of two rack units each.

3. Options:

    a. Configuration: Two-post and four-post.
    b. Material: Extruded steel.
    c. Color: Black.
    d. Floor-Mounted Racks:

        1) Overall Height: 72 inch .
        2) Overall Depth: 23 inch.
        3) Rail Depth: 3 inch.
        4) Two-Post Load Rating: 400 lb.
        5) Four-Post Load Rating: 1000 lb.

6) Number of Rack Units per Rack: 38

a) Numbering: Every rack unit(s), on interior of rack.

7) Threads: 10-32.
8) Vertical and horizontal cable management channels, top and bottom cable troughs, grounding lug, and a power strip.
9) Base must have minimum four mounting holes for permanent attachment to floor.
10) Top must have provisions for attaching to cable tray or ceiling.
11) Self-leveling.

e. Wall-Mounted Racks:

1) Height: 18 inch
2) Depth: 23 inch
3) Load Rating: 200 lb.
4) Number of Rack Units per Rack: 8
5) Threads: 10-32.
6) Wall Attachment: Four pre-punched mounting holes.
7) Equipment Access: Integral swing.

E. UL NWIN - 19 Inch Enclosed Equipment Rack

1. Nvent Hoffman
2. General Characteristics:

a. Manufacturer-assembled four-post frame enclosed by side and top panels and front and rear doors, designed for mounting telecommunications equipment.
b. Threaded rails designed for mounting telecommunications equipment.
c. Width: Compatible with EIA/ECIA 310-E, 19 inch equipment mounting with an opening of 17.72 inch between rails.
d. Frames: Modular units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.
e. Finish: Manufacturer's standard, baked-polyester powder coat.
f. Cable Management:

1) Metal, with integral wire retaining fingers.
2) Baked-polyester powder coat finish.
3) Vertical cable management panels have front and rear channels with covers.
4) Horizontal crossover cable manager at top of each relay rack, with minimum height of two rack units each.

3. Options:

a. Material: Extruded steel.
b. Color: Black.
c. Modular Freestanding Cabinets:

1) Overall Height: 72 inch.
2) Overall Depth: 23 inch.
3) Load Rating: 3000 lb (1362 kg).
4) Number of Rack Units: 38.

a) Numbering: Every rack unit(s), on interior of rack.

5) Threads: 10-32.
6) Removable and lockable side and top panels.
7) Hinged and lockable front and rear doors.
8) Adjustable feet for leveling.
9) Screened ventilation openings in roof and rear door.
10) Cable access provisions in roof and base.
11) RBB.
12) Rack-mounted, 550 cfm fan with filter.
13) Power strip.
14) All cabinets keyed alike.

d. Modular Wall Cabinets:

1) Height: 18 inch
2) Depth: 23 inch.
3) Load Rating: 150 lb.
4) Number of Rack Units: 8.
5) Threads: 10-32.
6) Lockable front and rear doors.
7) Louvered side panels.
8) Cable access provisions top and bottom.
9) Grounding lug.
10) Rack-mounted, 250 cfm fan.
11) Power strip.
12) All cabinets keyed alike.

F. UL NWIN - 23 Inch Open Equipment Rack:

1. Nvent Hoffman
2. General Characteristics:

a. Threaded rails designed for mounting telecommunications equipment.
b. Width: Compatible with 23 inch equipment mounting.
c. Frames: Modular units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.
d. Finish: Manufacturer's standard, baked-polyester powder coat.
e. Cable Management:

1) Metal, with integral wire retaining fingers.
2) Baked-polyester powder coat finish.
3) Vertical cable management panels have front and rear channels with covers.
4) Horizontal crossover cable manager at top of each relay rack, with minimum height of two rack units each.

3. Options:

    a. Configuration: Two post and four post.
    b. Material: Extruded steel
    c. Color: Black.
    d. Floor-Mounted Racks:

        1) Overall Height: 72 inch.
        2) Overall Depth: 23 inch.
        3) Rail Depth: 3 inch.
        4) Two-Post Load Rating: 200 lb .
        5) Four-Post Load Rating: 1000 lb.
        6) Number of Rack Units per Rack: 38.

            a) Numbering: Every rack unit(s), on interior of rack.

        7) Threads: 10-32.
        8) Vertical and horizontal cable management channels, top and bottom cable troughs, grounding lug, and a power strip.
        9) Base must have minimum four mounting holes for permanent attachment to floor.
        10) Top must have provisions for attaching to cable tray or ceiling.
        11) Self-leveling.

    e. Wall-Mounted Racks:

        1) Height: 18 inch.
        2) Depth: 23 inch.
        3) Load Rating: 150 lb.
        4) Number of Rack Units per Rack: 8.
        5) Threads: 10-32.
        6) Wall Attachment: Four pre-punched mounting holes.
        7) Equipment Access: Integral swing.

G. UL NWIN - 23 Inch Enclosed Equipment Rack:

1. Nvent Hoffman
2. General Characteristics:

    a. Manufacturer-assembled four-post frame enclosed by side and top panels and front and rear doors, designed for mounting telecommunications equipment.
    b. Threaded rails designed for mounting telecommunications equipment.
    c. Width: Compatible with 23 inch equipment mounting.
    d. Frames: Modular units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.
    e. Finish: Manufacturer's standard, baked-polyester powder coat.
    f. Cable Management:

        1) Metal, with integral wire retaining fingers.
        2) Baked-polyester powder coat finish.

3) Vertical cable management panels have front and rear channels with covers.
4) Horizontal crossover cable manager at top of each relay rack, with minimum height of two rack units each.

3. Options:

a. Material: Extruded steel.
b. Color: Black.
c. Modular Freestanding Cabinets:

1) Overall Height: 72 inch.
2) Overall Depth: 23 inch.
3) Load Rating: 3000 lb.
4) Number of Rack Units: 38.

a) Numbering: Every rack unit(s), on interior of rack.

5) Threads: 10-32.
6) Removable and lockable side and top panels.
7) Hinged and lockable front and rear doors.
8) Adjustable feet for leveling.
9) Screened ventilation openings in roof and rear door.
10) Cable access provisions in roof and base.
11) RBB.
12) Rack-mounted, 550 cfm fan with filter.
13) Power strip.
14) All cabinets keyed alike.

d. Modular Wall Cabinets:

1) Height: 18 inch.
2) Depth: 23 inch.
3) Load Rating: 150 lb.
4) Number of Rack Units: 8.
5) Threads: 10-32.
6) Lockable front and rear doors.
7) Louvered side panels.
8) Cable access provisions top and bottom.
9) Grounding lug.
10) Rack-mounted, 250 cfm fan.
11) Power strip.
12) All cabinets keyed alike.

2.5 ENCLOSURE-MOUNTED RELOCATABLE POWER TAPS

A. Description: This category covers relocatable power taps rated 250 V(ac) or less, 20 A or less, and intended to supply power to cord-and-plug-connected electrical utilization equipment located inside cabinets, enclosures, and racks.

B. Performance Criteria:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2. Listing Criteria: UL CCN XBYS; including UL 1363.

C. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

D. UL XBYS - Enclosure-Mounted Relocatable Power Tap :

1. Starc System
2. General Characteristics:

a. Rocker-type on-off switch, illuminated when in on position.
b. LED indicator lights for power and protection status.
c. LED indicator lights for reverse polarity and open outlet ground.

3. Options:

a. Wiring Devices: Six 5-20R receptacles.
b. Circuit Breaker and Thermal Fusing: Unit continues to supply power if protection is lost.
c. Cord Length: Close-coupled, direct plug-in 15 ft.
d. Surge Protection: Type 3 SPDs.

1) Peak Single-Impulse Surge Current Rating: 33 kA per phase.
2) Protection modes must be line to neutral, line to ground, and neutral to ground. UL 1449 clamping voltage for all three modes may not be more than 330 V.

PART 3 - EXECUTION

3.1 PREPARATION

A. Shop Drawings: Prepare and submit the following:

1. Shop Drawings for Custom Enclosures and Cabinets: Include plans, elevations, sections, and attachment details.
2. Shop Drawings for Racks or Frames:

a. Include plans, elevations, sections, details, and attachments to other work.

b. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
c. Include workspace requirements and access for cable connections.
d. Grounding: Indicate location of RBB and its mounting detail showing standoff insulators and wall-mounting brackets.

3.2 SELECTION OF ELECTRICAL CABINETS AND ENCLOSURES

A. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for selection of electrical cabinets and enclosures. Consult the State for resolution of conflicting requirements.

B. Degree of Protection:

1. Outdoors:

a. Locations Exposed to Hosedown: Type 4.
b. Locations Subject to Potential Flooding: Type 6P.
c. Locations Aboveground Where Mechanism Must Operate When Ice Covered: Type 3S.
d. Locations in-Ground or Exposed to Corrosive Agents: Type 4X.
e. Locations in-Ground or Exposed to Corrosive Agents Where Mechanism Must Operate When Ice Covered: Type 3SX.

2. Indoors:

a. Type 1 unless otherwise indicated.
b. Damp or Dusty Locations: Type 12.
c. Surface Mounted in Kitchens and Other Locations Exposed to Oil or Coolants: Type 12.

3.3 INSTALLATION ELECTRICAL CABINETS AND ENCLOSURES

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:

1. Cabinets and Cutout Boxes: Article 312 of NFPA 70.
2. Consult the State for resolution of conflicting requirements.

C. Special Installation Techniques:

1. Mount cabinets and enclosures at heights indicated. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
2. Do not install cabinets, enclosures, or fittings in contact with concrete or earth.

3. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to ensure a continuous ground path.
4. Identification: Provide labels for cabinets, enclosures, racks and associated electrical equipment.

    a. Identify field-installed conductors, interconnecting wiring, and components.
    b. Provide warning signs.
    c. Label each cabinet, enclosure, and rack with engraved metal or laminated-plastic nameplate.

D. Interfaces with Other Work:

1. Coordinate installation of new products for flyaway gate with existing conditions.
2. Coordinate with Section 07 84 13 "Penetration Firestopping" for installation of sealants.
3. Grounding and Bonding:

    a. Cabinets, Enclosures, and Racks for Electrical Systems: Coordinate with Section 26 05 26 "Grounding and Bonding for Electrical Systems" for grounding of RBBs.
    b. Cabinets, Enclosures, and Racks for Communications Systems and Electronic Safety and Security Systems: Coordinate with Section 27 05 26 "Grounding and Bonding for Communications Systems" for grounding of RBBs.

4. Coordinate with Section 26 05 73.13 "Short-Circuit Studies" for determining available fault current on input feeder.
5. Coordinate with Section 26 05 73.19 "Arc-Flash Hazard Analysis" for determining arc-flash hazard on input feeder.

3.4 CLEANING

A. Remove construction dust and debris from cabinets, enclosures, and racks.

3.5 PROTECTION

A. Protect coatings and finishes of cabinets, enclosures, and racks from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 26 27 16

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. General-use switches, dimmer switches, and fan-speed controller switches.
2. General-grade single straight-blade receptacles.
3. General-grade duplex straight-blade receptacles.
4. Locking receptacles.
5. Pin-and-sleeve receptacles.
6. Special-purpose power outlet assemblies.
7. Connectors, cords, and plugs.

1.2 DEFINITIONS

A. UL 1472 Type I Dimmer: Dimmer in which air-gap switch is used to energize preset lighting levels.

1.3 ACTION SUBMITTALS

A. Product Data:

1. General-use switches, dimmer switches, and fan-speed controller switches.
2. General-grade duplex straight-blade receptacles.
3. Locking receptacles.
4. Pin-and-sleeve receptacles.
5. Special-purpose power outlet assemblies.
6. Connectors, cords, and plugs.

B. Shop Drawings:

1. Wiring diagrams for duplex straight-blade receptacles with integral switching means.

A. Sustainable Design Submittals:

1. Product data for sustainable design features for each type of product.
2. Lighting Control Documentation: Floor plans indicating the following information:

a. As-installed locations of switches and dimmers.
b. Lighting zones and control strategy for each switch or dimmer, including

unoccupied time-delay setting for shut-off and override time-delay setting for shut-off.

c. Multilevel or dimming range capability for each switch or dimmer.

d. Which switches or dimmers are operated by occupancy sensors, vacancy sensors, daylighting sensors, or time clocks.

3. Record floor plan Drawings indicating as-installed locations of switches and dimmers, indicating lighting zone's each device control, to verify extent of ability of the installed Work to provide occupant control for customizing environment.

4. Record floor plan Drawings indicating as-installed locations of uncontrolled and marked controlled receptacles superimposed on office furniture layout, to verify extent of ability of the installed Work to provide each occupant ability to select at least one uncontrolled receptacle and at least one controlled receptacle for powering workspace equipment. Indicate locations of UL-approved relocatable power taps and power strips, indicating means of securing protection from damage and accessibility for inspection. Indicate locations of temporary extension cords, indicating plan for replacing them with permanent wiring within 90 days.

B. Samples:

1. One for each kind of toggle switch and cover plate accessory specified, in each finish and color specified.

2. One for each kind of dimmer switch and cover plate accessory specified, in each finish and color specified.

3. One for each kind of duplex straight-blade receptacle and cover plate accessory specified, in each finish and color specified.

C. Field quality-control reports.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturers' Instructions: Record copy of official installation and testing instructions issued to Installer by manufacturer for the following:

1. Dimmers.

2. Duplex straight-blade receptacles.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Items: Furnish extra materials to the State that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Extra Keys for Key Lock Switches: One of each kind.

2. SPD Receptacles: Equal to 10 percent of quantity installed for each kind specified, but no fewer than one unit.

B. Special Tools:

1. Proprietary equipment and software required to maintain, repair, adjust, or implement future changes to controlled receptacles.
2. Proprietary equipment required to maintain, repair, adjust, or implement future changes to cord connectors.

1.6 WARRANTY FOR DEVICES

A. Special Manufacturer Extended Warranty: Manufacturer warrants that devices perform in accordance with specified requirements and agrees to provide repair or replacement of devices that fail to perform as specified within extended warranty period.

1. Initial Extended Warranty Period: Three years from date of Beneficial Occupancy; full coverage for labor, materials, and equipment.
2. Follow-On Extended Warranty Period: Eight years from date of Beneficial Occupancy; full coverage for materials that failed because of transient voltage surges only, free on board origin, freight prepaid.

PART 2 - PRODUCTS

2.1 GENERAL-USE SWITCHES, DIMMER SWITCHES, AND FAN-SPEED CONTROLLER SWITCHES

A. Toggle Switch

1. Manufacturers:

a. Lutron
b. Nlight
c. Or approved equal

2. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

3. General Characteristics:

a. Reference Standards: UL CCN WMUZ and UL 20.

4. Options:

a. Device Color: White in accordance with NEMA WD 1

1) General-duty, 120-277 V, 20 A, single pole.
2) Extra-heavy-duty, 120-277 V, 20 A, single pole.

5. Accessories:

a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

B. Dimmer Switch :

1. Manufacturers:

a. Lutron
b. Nlight
c. Or approved equal

2. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

3. General Characteristics:

a. Reference Standards: UL CCN EOYX and UL 1472 Type I dimmer.

4. Options:

a. Device Color: White in accordance with NEMA WD 1
b. Switch Style: Toggle.
c. Dimming Control Style: Slide.

5. Accessories:

a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

2.2 GENERAL-GRADE DUPLEX STRAIGHT-BLADE RECEPTACLES

A. Duplex Straight-Blade Receptacle:

1. Manufacturers:

a. Hubbell
b. Cooper
c. Leviton
d. Or approved equal

2. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

3. General Characteristics:

a. Reference Standards: UL CCN RTRT and UL 498.

4. Options:

a. Device Color: Ivory in accordance with NEMA WD 1.
b. Configuration:

1) Extra-heavy-duty, smooth face, NEMA 5-20R.
2) Extra-heavy-duty, smooth face, NEMA 6-20R.

5. Accessories:

a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

B. Isolated Ground Duplex Straight-Blade Receptacle :

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2. General Characteristics:

a. Reference Standards: UL CCN RTRT and UL 498.

3. Options:

a. Device Color: Ivory in accordance with NEMA WD 1.
b. Configuration:

1) Heavy-duty, smooth face, NEMA 5-20R.

4. Accessories:

a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

C. Isolated Ground Duplex Straight-Blade Receptacle with Type 3 Surge Protective Device :

1. Manufacturers:

a. Hubbell
b. Cooper
c. Leviton
d. Or approved equal

2. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

3. General Characteristics:

a. Reference Standards:

1) UL CCN RTRT and UL 498.
2) Surge Protective Devices: UL 1449, Type 3.

4. Options:

a. Device Color: Ivory in accordance with NEMA WD 1.
b. Configuration: Heavy-duty, smooth face, NEMA 5-20R.

5. Accessories:

a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receptacles:

1. Verify that receptacles to be procured and installed for the owner-furnished equipment are compatible with mating attachment plugs on equipment.

3.2 INSTALLATION OF SWITCHES

A. Comply with manufacturer's instructions.

B. Reference Standards:

1. Unless more stringent requirements are specified in Contract Documents or manufacturers' instructions, comply with installation instructions in NECA NEIS 130.
2. Mounting Heights: Unless otherwise indicated in Contract Documents, comply with mounting heights recommended in NECA NEIS 1.
3. Consult the State for resolution of conflicting requirements.

C. Identification:

1. Identify cover or cover plate for device with panelboard identification and circuit number in accordance with Section 26 05 53 "Identification for Electrical Systems."

3.3 INSTALLATION OF STRAIGHT-BLADE RECEPTACLES

A. Comply with manufacturer's instructions.

B. Reference Standards:

1. Unless more stringent requirements are specified in Contract Documents or manufacturers' instructions, comply with installation instructions in NECA NEIS 130.
2. Mounting Heights: Unless otherwise indicated in Contract Documents, comply with mounting heights recommended in NECA NEIS 1.
3. Receptacle Orientation: Unless otherwise indicated in Contract Documents, orient receptacle to match configuration diagram in NEMA WD 6.
4. Consult the State for resolution of conflicting requirements.

C. Identification:

1. Identify cover or cover plate for device with panelboard identification and circuit number in accordance with Section 26 05 53 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL OF SWITCHES

A. Field tests and inspections must be witnessed by the State's representatives.

B. Tests and Inspections:

1. Perform tests and inspections in accordance with manufacturers' instructions.

C. Nonconforming Work:

1. Unit will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

D. Assemble and submit test and inspection reports.

E. Manufacturer Services:

1. Engage factory-authorized service representative to supervise field tests and inspections.

3.5 FIELD QUALITY CONTROL OF STRAIGHT-BLADE RECEPTACLES

A. Field tests and inspections must be witnessed by the State's representatives and authorities having jurisdiction.

B. Tests and Inspections:

1. Insert and remove test plug to verify that device is securely mounted.
2. Verify polarity of hot and neutral pins.
3. Measure line voltage.
4. Measure percent voltage drop.
5. Measure grounding circuit continuity; impedance must be not greater than 2 ohms.

C. Nonconforming Work:

1. Device will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

D. Assemble and submit test and inspection reports.

E. Manufacturer Services:

1. Engage factory-authorized service representative to supervise field tests and inspections.

3.6 FIELD QUALITY CONTROL OF LOCKING RECEPTACLES

A. Field tests and inspections must be witnessed by the State's representatives and authorities having jurisdiction.

B. Tests and Inspections:

1. Insert and remove test plug to verify that device is securely mounted.
2. Verify polarity of hot and neutral pins.
3. Measure line voltage.
4. Measure percent voltage drop.
5. Measure grounding circuit continuity; impedance must be not greater than 2 ohms.
6. Perform additional installation and maintenance inspections and diagnostic tests in accordance with NECA NEIS 130 and manufacturers' instructions.

C. Nonconforming Work:

1. Device will be considered defective if it does not pass tests and inspections.

2. Remove and replace defective units and retest.

D. Assemble and submit test and inspection reports.

E. Manufacturer Services:

1. Engage factory-authorized service representative to supervise field tests and inspections.

3.7 FIELD QUALITY CONTROL OF PIN-AND-SLEEVE RECEPTACLES

A. Field tests and inspections must be witnessed by the State's representatives and authorities having jurisdiction.

B. Tests and Inspections:

1. Insert and remove test plug to verify that device is securely mounted.
2. Measure line voltage.
3. Measure percent voltage drop.
4. Measure ground impedance, which must be not greater than 2 ohms.
5. Perform additional installation and maintenance inspections and diagnostic tests in accordance with NECA NEIS 130 and manufacturers' instructions.

C. Nonconforming Work:

1. Device will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

D. Assemble and submit test and inspection reports.

E. Manufacturer Services:

1. Engage factory-authorized service representative to supervise field tests and inspections.

3.8 FIELD QUALITY CONTROL OF CONNECTORS, CORDS, AND PLUGS

A. Field tests and inspections must be witnessed by the State's representatives and authorities having jurisdiction.

B. Tests and Inspections:

1. Perform tests and inspections indicated in manufacturer's instructions.

C. Nonconforming Work:

1. Unit will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

D. Assemble and submit test and inspection reports.

E. Manufacturer Services:

1. Engage factory-authorized service representative to supervise field tests and inspections.

3.9 SYSTEM STARTUP FOR SWITCHES

A. Perform startup service.

1. Complete installation and startup checks for momentary switches, dimmer switches, and fan-speed controller switches in accordance with manufacturer's instructions.

3.10 ADJUSTING

A. Occupancy Adjustments for Controlled Receptacles: When requested within 12 months from date of Beneficial Occupancy, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

B. Cord Reels and Fittings: Adjust spring mechanisms and moving parts of cord reels and fittings to function smoothly, and lubricate as recommended in writing by manufacturer.

3.11 PROTECTION

A. Devices:

1. Schedule and sequence installation to minimize risk of contamination of wires and cables, devices, device boxes, outlet boxes, covers, and cover plates by plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other materials.
2. After installation, protect wires and cables, devices, device boxes, outlet boxes, covers, and cover plates from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by the State.

B. Cord Reels and Fittings:

1. After installation, protect cord reels and fittings from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by the State.

C. Connectors, Cords, and Plugs:

1. After installation, protect connectors, cords, and plugs from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by the State.

END OF SECTION 26 27 26

SECTION 26 28 13

FUSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cartridge fuses rated 600 V ac and less for use in the following:

a. Control circuits.
b. Panelboards.
c. Switchboards.
d. Enclosed controllers.
e. Enclosed switches.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, 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. Submit in PDF format.
5. Coordination charts and tables and related data.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals.

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 used on the Project. Submit in PDF format.
4. Coordination charts and tables and related data.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

1.5 FIELD 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Mersen

B. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, current-limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

1. Type RK-1: 600-V, zero- to 600-A rating, 200 kAIC, time delay.
2. Type RK-5: 600-V, zero- to 600-A rating, 200 kAIC, time delay.
3. Type J: 600-V, zero- to 600-A rating, 200 kAIC, time delay.
4. Type L: 600-V, 601- to 6000-A rating, 200 kAIC, time delay.
5. Type T: 600-V, zero- to 800-A rating, 200 kAIC, very fast acting , time delay.

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. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

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:

1. Feeders: Class L, fast acting
2. Motor Branch Circuits: Class RK5, time delay.
3. Power Electronics Circuits: Class J, high speed.
4. Other Branch Circuits: Class RK1, time delay

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) in location shown or as indicated in the field by the State.

3.4 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems" and indicating fuse replacement information inside of door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION 26 28 13

SECTION 26 28 16

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Molded-case circuit breakers (MCCBs).
4. Molded-case switches.
5. Enclosures.

1.2 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
5. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF and manufacturer model files for all devices required for performing Electrical Short-Circuit, Coordination and Arc-Flash Hazard Stuides, in electronic format.

B. Shop Drawings: For enclosed switches and circuit breakers.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include wiring diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Seismic Qualification Data: Certificates, for enclosed switches and circuit breakers, accessories, and components, from manufacturer.

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.

C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals.

1. Including the following:

a. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF manufacturer model files for all devices required for performing Electrical Short-Circuit, Coordination and Arc-Flash Hazard Stuides, in electronic format.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Fuse Pullers: Two for each size and type.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: Accredited by NETA.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 120 deg F.
2. Altitude: Not exceeding 6600 feet.

1.9 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: One year from date of Beneficial Occupancy.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the applicable seismic forces and the unit will be fully operational after the seismic event." The Contractor is responsible for retaining services of a qualified professional as required to determine applicable seismic forces.

2.2 GENERAL REQUIREMENTS

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.

B. Product Selection for Restricted Space: Indicated maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

D. Comply with NFPA 70.

2.3 FUSIBLE SWITCHES

A. Manufacturers:

1. Schneider Electric (Square D).
2. Eaton.
3. Siemens.
4. Or approved equal.

B. Type HD, Heavy Duty:

1. Single throw.
2. Three pole.
3. 240 or 600-V ac, as required to match system voltage.
4. 600 A and smaller.
5. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate fuses.
6. Lockable handle with capability to accept three padlocks and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open. Contact rating - 24-V ac. Coordinate contact ratings with Division 22 and 23 submittals and adjust if other control voltages are required or proposed.
5. Hookstick Handle: Allows use of a hookstick to operate the handle.
6. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.4 NONFUSIBLE SWITCHES

A. Manufacturers:

1. Schneider Electric (Square D).
2. Eaton.
3. Siemens.
4. Or approved equal.

B. Type HD, Heavy Duty, Three Pole, Single Throw, 240 or 600-V ac (as required by system voltage), 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and

bonded; labeled for copper and aluminum neutral conductors.

3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open. Contact rating - 24-V ac. Coordinate contact ratings with Division 22 and 23 submittals and adjust if other control voltages are required or proposed.
5. Hookstick Handle: Allows use of a hookstick to operate the handle.
6. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.5 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers:

1. Schneider Electric (Square D).
2. Eaton.
3. Siemens.
4. Or approved equal.

B. Circuit breakers shall be constructed using glass-reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.

C. Circuit breakers shall have a toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. The circuit-breaker handle shall be over center, be trip free, and reside in a tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon shall be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with a push-to-trip button, located on the face of the circuit breaker to mechanically operate the circuit-breaker tripping mechanism for maintenance and testing purposes.

D. The maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings shall be clearly marked on face of circuit breaker. Circuit breakers shall be 100 percent rated.

E. MCCBs shall be equipped with a device for locking in the isolated position.

F. Lugs shall be suitable for 194 deg F rated wire, sized according to the 167 deg F temperature rating in NFPA 70.

G. Standard: Comply with UL 489 with interrupting capacity to comply with available fault currents.

H. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:

1. Instantaneous trip.
2. Long- and short-time pickup levels.
3. Long- and short-time time adjustments.

I. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

J. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: mechanical type, suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application.
4. Communication Capability: Circuit-breaker-mounted communication module.
5. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
6. Auxiliary Contacts: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
7. Alarm Switch: One NC contact that operates only when circuit breaker has tripped.
8. Accessory Control Power Voltage: Integrally mounted, self-powered, 24-V ac.

2.6 MOLDED-CASE SWITCHES

A. Manufacturers:

1. Schneider Electric (Square D).
2. Eaton.
3. Siemens.
4. Or approved equal.

B. Description: MCCB with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.

C. Standard: Comply with UL 489 with interrupting capacity to comply with available fault currents.

D. Features and Accessories:

1. Standard frame sizes and number of poles.
2. Lugs:

a. Mechanical type, suitable for number, size, trip ratings, and conductor material.
b. Lugs shall be suitable for 194 deg F rated wire, sized according to the 167 deg F temperature rating in NFPA 70.

3. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
4. Auxiliary Contacts: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic switch contacts, "b" contacts operate in reverse of switch contacts.
5. Alarm Switch: One NC contact that operates only when switch has tripped.
6. Accessory Control Power Voltage: Integrally mounted, self-powered; 24-V ac.

2.7 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

B. Enclosure Finish: The enclosure shall be finished with:

1. Gray baked enamel paint, electrodeposited on cleaned, phosphatized steel (NEMA 250 Type 1).
2. Gray baked enamel paint, electrodeposited on cleaned, phosphatized galvannealed steel (NEMA 250 Types 3R).

C. Operating Mechanism: The circuit-breaker operating handle shall be externally operable with the operating mechanism being an integral part of the box, not the cover. The cover interlock mechanism shall have an externally operated override. The override shall not permanently disable the interlock mechanism, which shall return to the locked position once the override is released. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Commencement of work shall indicate Installer's acceptance of the areas and conditions as satisfactory.

3.2 PREPARATION

A. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by the State or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Construction Manager no fewer than ten days in advance of proposed interruption of electric service.
2. Indicate method of providing temporary electric service.
3. Do not proceed with interruption of electric service without the State's written permission.
4. Comply with NFPA 70E.

3.3 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS

A. Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Other Wet or Damp, Indoor Locations: NEMA 250, Type 3R.

3.4 INSTALLATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

C. Install fuses in fusible devices.

D. Comply with NFPA 70 and NECA 1.

3.5 IDENTIFICATION

A. Comply with requirements in Section 26 05 53 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections with the assistance of a factory-authorized service representative.

B. Tests and Inspections for Switches:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.
b. Inspect anchorage, alignment, grounding, and clearances.
c. Verify that the unit is clean.
d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
e. Verify that fuse sizes and types match the panel schedules and single line diagrams shown in Drawings.
f. Verify that each fuse has adequate mechanical support and contact integrity.
g. Inspect bolted electrical connections for high resistance using one of the

two following methods:

1) Use a low-resistance ohmmeter.

a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.

a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.

h. Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on the Drawings.
i. Verify correct phase barrier installation.
j. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.

2. Electrical Tests:

a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
b. Measure contact resistance across each switchblade fuse holder. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
c. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
d. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
e. Perform ground fault test according to NETA ATS 7.14 "Ground Fault Protection Systems, Low-Voltage."

C. Tests and Inspections for Molded Case Circuit Breakers:

1. Visual and Mechanical Inspection:

a. Verify that equipment nameplate data are as described in the

Specifications.

b. Inspect physical and mechanical condition.
c. Inspect anchorage, alignment, grounding, and clearances.
d. Verify that the unit is clean.
e. Operate the circuit breaker to ensure smooth operation.
f. Inspect bolted electrical connections for high resistance using one of the two following methods:

1) Use a low-resistance ohmmeter.

a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.

a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.

g. Inspect operating mechanism, contacts, and chutes in unsealed units.
h. Perform adjustments for final protective device settings in accordance with the coordination study.

2. Electrical Tests:

a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
b. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with circuit breaker closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
c. Perform a contact/pole resistance test. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
d. Perform insulation resistance tests on all control wiring with respect to ground. Applied potential shall be 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable. Test duration shall be one minute. For
d. units with solid state components, follow manufacturer's recommendation. Insulation resistance values shall be no less than two megohms.
e. Determine the following by primary current injection:

1) Long-time pickup and delay. Pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
2) Short-time pickup and delay. Short-time pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
3) Ground-fault pickup and time delay. Ground-fault pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
4) Instantaneous pickup. Instantaneous pickup values shall be as specified and within manufacturer's published tolerances.

f. Test functionality of the trip unit by means of primary current injection. Pickup values and trip characteristics shall be as specified and within manufacturer's published tolerances.
g. Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of the shunt trip and close coils shall be as indicated by manufacturer.
h. Verify correct operation of auxiliary features such as trip and pickup indicators; zone interlocking; electrical close and trip operation; trip-free, anti-pump function; and trip unit battery condition. Reset all trip logs and indicators. Investigate units that do not function as designed.
i. Verify operation of charging mechanism. Investigate units that do not function as designed.

3. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

1. Test procedures used.
2. Include identification of each enclosed switch and circuit breaker tested and describe test results.
3. List deficiencies detected, remedial action taken, and observations after remedial action.

3.7 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 specified in Section 26 05 73.16 "Coordination Studies."

END OF SECTION 26 28 16

SECTION 26 51 19

LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cylinder.
2. Downlight.
3. Recessed, linear.
4. Materials.
5. Luminaire support.

B. Related Requirements:

1. Section 26 09 23 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.2 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. LED: Light-emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaires.
4. Include emergency lighting units, including batteries and chargers.
5. Include life, output (lumens, CCT, and CRI), and energy-efficiency data.

6. Photometric data and adjustment factors based on laboratory tests, complying with IES "Lighting Measurements Testing and Calculation Guides" for each luminaire type. The adjustment factors shall be for lamps and accessories identical to those indicated for the luminaire as applied in this Project and IES LM-80.

    a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
    b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Samples: For each luminaire and for each color and texture with standard factory-applied finish.

D. Samples for Initial Selection: For each type of luminaire with custom factory-applied finishes.

1. Include Samples of luminaires and accessories involving color and finish selection.

E. Samples for Verification: For each type of luminaire.

1. Include Samples of luminaires and accessories to verify finish selection.

F. Product Schedule: For luminaires and lamps.

G. Sustainable Design Submittals:

1. Product data for sustainable design features for each type of product.
2. ASHRAE/IES 90.1 LPD Compliance Documentation: Prepare plans and calculations demonstrating that as-constructed lighting power density complies with mandatory provisions of ASHRAE/IES 90.1 and that as-constructed lighting, including daylighting and controls, improves on baseline energy performance. If included with Project, indicate locations of energy meters for lighting loads.
3. Field quality-control reports.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Luminaires.
2. Suspended ceiling components.
3. Partitions and millwork that penetrate the ceiling or extend to within 12 inches of the plane of the luminaires.
4. Structural members to which luminaires will be attached.
5. Initial access modules for acoustical tile, including size and locations.
6. Items penetrating finished ceiling, including the following:

    a. Other luminaires.
    b. Air outlets and inlets.
    c. Speakers.
    d. Sprinklers.
    e. Access panels.

7. Moldings.

B. Qualification Data: For testing laboratory providing photometric data for luminaires.

C. Seismic Qualification Data: For luminaires, accessories, and components, from manufacturer.

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.

D. Product Certificates: For each type of luminaire.

E. Product Test Reports: For each type of luminaire, for tests performed by a qualified testing agency.

F. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps: Ten for every 100 of each type and rating installed. Furnish at least one of each type.
2. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.

1.7 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications:

1. Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.
2. 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 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.

B. Provide luminaires from a single manufacturer for each luminaire type.

C. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

D. Mockups: For interior luminaires in room or module mockups, complete with power and control connections.

1. Obtain the State's approval of luminaires in mockups before starting installations.
2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless the State specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Beneficial Occupancy.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.9 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

B. Warranty Period: Five year(s) from date of Beneficial Occupancy.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance:

1. Luminaires shall withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.
2. Luminaires and lamps shall be labeled vibration and shock resistant.
3. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."

B. Ambient Temperature: 5 to 104 deg F .

C. Altitude: Sea level to 1000 feet.

2.2 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels 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 characteristics:

a. "USE ONLY" and include specific lamp type.
b. Lamp diameter, shape, size, wattage, and coating.
c. CCT and CRI.

C. Recessed luminaires shall comply with NEMA LE 4.

D. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.

E. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

F. California Title 24 compliant.

G. Sustainable Features:

1. Energy Efficiency of LED Luminaires: Luminaire is certified by ENERGY STAR.
2. Corporate Sustainability Report: Provide corporate sustainability report that is publicly available from manufacturer and that includes environmental impacts of extraction operations and activities associated with product and its supply chain.

3. Regional Materials (LEED): Provide documentation if product is sourced (extracted, manufactured, or purchased) within 100 miles of Project site.

2.3 DOWNLIGHT

A. Rab Voltage: 120 V ac.

B. Lamp:

1. Minimum 575 lm.
2. Minimum allowable efficacy of 80 lm/W.
3. CRI of minimum80. CCT of 4100 K.
4. Rated lamp life of 35,000 hours to L70.
5. Dimmable from 100 percent to zero percent of maximum light output.
6. Internal driver.
7. User-Replaceable Lamps:

    a. Bulb shape complying with ANSI C78.79.
    b. Lamp base complying with ANSI C81.61 or IEC 60061-1.

8. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

C. Housings:

1. Extruded-aluminum housing and heat sink.
2. Clear anodized finish.
3. Universal mounting bracket.
4. Integral junction box with conduit fittings.

D. 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.

E. Diffusers and Globes:

1. Fixed lens.
2. Wide light distribution.
3. Prismatic acrylic, UV-stabilized acrylic.
4. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
5. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

F. Standards:

1. ENERGY STAR certified.
2. RoHS compliant.
3. UL Listing: Listed for damp location.
4. Recessed luminaires shall comply with NEMA LE 4.

2.4 RECESSED, LINEAR.

A. Rab

B. Nominal Operating Voltage: 120 V ac.

C. Lamp:

1. Minimum 2,000 lm.
2. Minimum allowable efficacy of 85 lm/W.
3. CRI of minimum 80. CCT of 4100 K.
4. Rated lamp life of 35,000 hours to L70.
5. Dimmable from 100 percent to zero percent of maximum light output.
6. Internal driver.
7. User-Replaceable Lamps:

    a. Bulb shape complying with ANSI C78.79.
    b. Lamp base complying with ANSI C81.61 or IEC 60061-1.

8. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

D. Housings:

1. Extruded-aluminum housing and heat sink.
2. Clear anodized finish.
3. With integral mounting provisions.

E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

F. Diffusers and Globes:

1. Prismatic acrylic, UV-stabilized.
2. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

G. Standards:

1. ENERGY STAR certified.
2. RoHS compliant.
3. UL Listing: Listed for damp location.
4. NEMA LE 4.

2.5 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.

2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Steel:

1. ASTM A36/A36M for carbon structural steel.
2. ASTM A568/A568M for sheet steel.

C. Stainless Steel:

1. Manufacturer's standard grade.
2. Manufacturer's standard type, ASTM A240/240M.

D. Galvanized Steel: ASTM A653/A653M.

E. Aluminum: ASTM B209.

2.6 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.7 LUMINAIRE SUPPORT

A. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: ASTM A641/A641M, Class 3, soft temper, zinc-coated steel, 12 gage.

D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

A. If approved by the State, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

3.3 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Provide support for luminaire without causing deflection of ceiling or wall.
4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

E. Flush-Mounted Luminaires:

F. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

G. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

3.6 STARTUP SERVICE

A. Comply with requirements for startup specified in Section 26 09 43.16 "Addressable-Luminaire Lighting Controls."

B. Comply with requirements for startup specified in Section 26 09 43.23 "Relay-Based Lighting Controls."

3.7 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Beneficial Occupancy, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the State.

END OF SECTION 26 51 19

SECTION 26 56 13

LIGHTING POLES AND STANDARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Poles and accessories for support of luminaires.

1.2 DEFINITIONS

A. EPA: Equivalent projected area.

B. Luminaire: Complete luminaire.

C. Pole: Luminaire-supporting structure, including tower used for large-area illumination.

D. Standard: See "Pole."

1.3 ACTION SUBMITTALS

A. Product Data: For each pole, accessory, and luminaire-supporting and -lowering device, arranged as indicated.

1. Include data on construction details, profiles, EPA, cable entrances, materials, dimensions, weight, rated design load, and ultimate strength of individual components.
2. Include finishes for lighting poles and luminaire-supporting devices.
3. Anchor bolts.

B. Shop Drawings:

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Detail fabrication and assembly of poles and pole accessories.
4. Anchor bolt templates keyed to specific poles and certified by manufacturer.
5. Method and procedure of pole installation. Include manufacturer's written installations.

1.4 INFORMATIONAL SUBMITTALS

A. Pole and Support Component Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements according to AASHTO LTS-6-M and that load imposed by luminaire and attachments has been included in design. The certification shall be based on design calculations signed and sealed by a professional engineer.

B. Qualification Data: For Installer and testing agency.

C. Seismic Qualification Data: For poles, accessories, and components, from manufacturer.

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.

D. Source quality-control reports.

E. Field quality-control reports.

F. Sample Warranty: Manufacturer's standard warranty.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Pole repair materials.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C1093 for foundation testing.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Package aluminum poles for shipping according to ASTM B660.

B. Store poles on decay-resistant skids at least 12 inches (300 mm) above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.

C. Retain factory-applied pole wrappings on metal poles until right before pole installation. Handle poles with web fabric straps.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of pole(s) 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 a specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs from special warranty period.

1. Warranty Period: Five years from date of Beneficial Occupancy.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Foundation and pole shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified.
2. Component Importance Factor: 1.0.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Valmont Structures.
2. Lyte Poles
3. Or approved equal.

C. Source Limitations: Obtain poles from single manufacturer or producer.

D. Poles: Comply with ASTM A500/A500M, Grade B carbon steel with a minimum yield of 46,000 psig (317 MPa); one-piece construction up to 40 feet (12 m) in height with access handhole in pole wall.

1. Shape: Round, 5 inch diameter, straight.
2. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.

E. Brackets for Luminaires: Detachable, cantilever, without underbrace.

1. Adaptor fitting welded to pole, allowing the bracket to be bolted to the pole-mounted adapter, then bolted together with stainless-teel bolts.
2. Cross Section: Tapered oval, with straight tubular end section to accommodate luminaire. Match pole material and finish.

F. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.

G. Fasteners: Stainless steel, size and type as determined by manufacturer. Corrosion-resistant items compatible with support components.

1. Materials: Compatible with poles and standards as well as the substrates to which poles and standards are fastened and shall not cause galvanic action at contact points.
2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.

H. Grounding and Bonding Lugs: Welded 1/2-inch (13-mm) threaded lug, complying with requirements in Section 26 05 26 "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size indicated, and accessible through handhole.

I. Handhole: Oval shaped, with minimum clear opening of 2-1/2 by 5 inches (65 by 130 mm), with cover secured by stainless-steel captive screws.

J. Cable Support Grip: Wire-mesh type with rotating attachment eye, sized for diameter of cable and rated for a minimum load equal to weight of supported load multiplied by a 5.0 safety factor.

K. Galvanized Finish: After fabrication, hot-dip galvanize according to ASTM A123/A123M.

2.2 POLE ACCESSORIES

A. Base Covers: Manufacturers' standard metal units, finished same as pole, and arranged to cover pole's mounting bolts and nuts.

2.3 MOUNTING HARDWARE

A. Anchor Bolts: Manufactured to ASTM F1554, Grade 55, with a minimum yield strength of 55,000 psi (380 000 kPa).

1. Galvanizing: Hot dip galvanized according to ASTM A153, Class C.
2. Threading: Uniform National Coarse, Class 2A.

B. Nuts: ASTM A563, Grade A, Heavy-Hex.

1. Galvanizing: Hot dip galvanized according to ASTM A153, Class C.
2. Four nuts provided per anchor bolt, shipped with nuts pre-assembled to the anchor bolts.

C. Washers: ASTM F436, Type 1.

1. Galvanizing: Hot dip galvanized according to ASTM A153, Class C.
2. Two washer(s) provided per anchor bolt.

2.4 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. 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 areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine poles, luminaire-mounting devices, lowering devices, and pole accessories before installation. Components that are scratched, dented, marred, wet, moisture damaged, or visibly damaged are considered defective.

C. Examine roughing-in for foundation and conduit to verify actual locations of installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 POLE FOUNDATION

A. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Structural steel complying with ASTM A36/A36M and hot-dip galvanized according to ASTM A123/A123M; and with top-plate and mounting bolts to match pole-base flange and strength required to support pole, luminaire, and accessories.

B. Anchor Bolts: Install plumb using manufacturer-supplied steel template, uniformly spaced.

3.3 POLE INSTALLATION

A. Alignment: Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on pole.

B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features.

1. Fire Hydrants and Water Piping: 60 inches (1520 mm).
2. Water, Gas, Electric, Communications, and Sewer Lines: 10 feet (3 m).
3. Trees: 15 feet (5 m) from tree trunk.

C. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer.

1. Use anchor bolts and nuts selected to resist seismic forces defined for the application and approved by manufacturer.
2. Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.

3. Install base covers unless otherwise indicated.
4. Use a short piece of 1/2 -inch (13-mm) diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.

D. Poles and Pole Foundations Set in Concrete-Paved Areas: Install poles with a minimum 6-inch- (150-mm-) wide, unpaved gap between the pole or pole foundation and the edge of the adjacent concrete slab. Fill unpaved ring with pea gravel. Insert material to a level 1 inch (25 mm) below top of concrete slab.

E. Raise and set pole using web fabric slings (not chain or cable) at locations indicated by manufacturer.

3.4 CORROSION PREVENTION

A. Steel Conduits: Comply with requirements in Section 26 05 33 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- (0.254-mm-) thick, pipe-wrapping plastic tape applied with a 50-percent overlap.

3.5 GROUNDING

A. Ground Metal Poles and Support Structures: Comply with requirements in Section 26 05 26 "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.

3.6 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.7 FIELD QUALITY CONTROL

A. Perform the following special inspections:

1. Inspect poles for nicks, mars, dents, scratches, and other damage.
2. System function tests.

END OF SECTION 26 56 13

SECTION 26 56 19

LED EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Luminaire-mounted photoelectric relays.
2. Luminaire types.
3. Materials.
4. Finishes.
5. Luminaire support components.

1.2 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color rendering index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. Lumen: Measured output of lamp and luminaire, or both.

F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of luminaire.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaire.
4. Lamps, include life, output (lumens, CCT, and CRI), and energy-efficiency data.
5. Photometric data and adjustment factors based on laboratory tests, complying with IES Lighting Measurements Testing and Calculation Guides, of each luminaire type. The adjustment factors shall be for lamps and accessories identical to those indicated for the luminaire as applied in this Project.

a. Manufacturer's Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the NVLAP for Energy Efficient Lighting Products.

b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

6. Wiring diagrams for power, control, and signal wiring.
7. Photoelectric relays.
8. Means of attaching luminaires to supports and indication that the attachment is suitable for components involved.

B. Product Schedule: For luminaires and lamps. Use same designations indicated.

C. Sustainable Features:

1. Energy Efficiency of LED Luminaires: Luminaire is certified by ENERGY STAR.
2. Backlight, Uplight, and Glare (BUG) Ratings: Exterior luminaire complies with IES LP-11-recommended BUG ratings at luminaire's intended location.
3. IDA/IES Five Principles Ready:

a. Exterior luminaire is adjustable to illuminate only to extent necessary for its intended purpose.
b. Exterior luminaire is aimable.
c. Exterior luminaire is dimmable.
d. Exterior luminaire is controllable to turn on only when needed.
e. Exterior luminaire has warm color temperature.

4. Corporate Sustainability Report: Provide corporate sustainability report that is publicly available from manufacturer and that includes environmental impacts of extraction operations and activities associated with product and its supply chain.
5. Regional Materials (LEED): Provide documentation if product is sourced (extracted, manufactured, or purchased) within 100 miles of Project site.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing laboratory providing photometric data for luminaires.

B. Seismic Qualification Data: For luminaires, accessories, and components, from manufacturer.

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.

C. Product Certificates: For each type of the following:

1. Luminaire.
2. Photoelectric relay.

D. Product Test Reports: For each luminaire, for tests performed by manufacturer and witnessed by a qualified testing agency.

E. Source quality-control reports.

F. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and photoelectric relays to include in operation and maintenance manuals.

1. Provide a list of all fixture types and ratings used on Project. Use ANSI and manufacturers' codes.
2. Provide a list of all photoelectric relay types used on Project; use manufacturers' codes.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lighting Fixtures: Furnish at least one of each type.

1.7 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications:

1. Luminaire manufacturers' laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.
2. 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 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products and complying with applicable IES testing standards.

B. Provide luminaires from a single manufacturer for each luminaire type.

C. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

D. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering prior to shipping.

1.9 FIELD CONDITIONS

A. Verify existing and proposed utility structures prior to the start of work associated with luminaire installation.

B. Mark locations of exterior luminaires for prior to the start of luminaire installation. Examine marked locations with involvement from various trades to ensure coordination. In particular coordinate location of poles with landscaping scope, including placement of trees.

1.10 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures, including luminaire support components.
b. Faulty operation of luminaires and accessories.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Period: 3 year(s) from date of Beneficial Occupancy.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance:

1. Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
2. Luminaires and lamps shall be labeled vibration and shock resistant.
3. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified.

2.2 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. UL Compliance: Comply with UL 1598 and listed for wet location.

C. Lamp base complying with ANSI C81.61.

D. Bulb shape complying with ANSI C79.1.

E. CRI of 70. CCT of 5000K.

F. L70 lamp life of 50,000 hours.

G. Lamps dimmable from 100 percent to 0 percent of maximum light output.

H. Internal driver.

I. Nominal Operating Voltage: -277V ac.

J. Lamp Rating: Lamp marked for outdoor use.

K. Source Limitations:

1. Obtain luminaires from single source from a single manufacturer.
2. For luminaires, obtain each color, grade, finish, type, and variety of luminaire from single source with resources to provide products of consistent quality in appearance and physical properties.

2.3 LUMINAIRE TYPES

A. Type A (Site, Wall/Building Mounted):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Cooper, Failsafe per Lighting Schedule.
    b. Or approved equal.

2. Luminaire Shape: Rectangular.
3. Mounting: Building using fixture yoke and additional support hardware per manufacturer recommendation using stainless-steel fasteners. Contractor is responsible for providing adapters, slipfitters, and all other material and labor for complete installation.
4. Housings:

    a. Die-cast aluminum clamshell design.
    b. Epoxy powder coat paint, industrial gray finish.

B. Type B and C (Area, Parking Lot Lighting):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Cooper, McGraw-Edison per Lighting Schedule.
    b. Or approved equal.

2. Luminaire Shape: Rectangular.
3. Mounting: Pole mounted with extruded-aluminum rectangular round arm, 10 inches in length.

4. Luminaire-Mounting Height: 25 foot pole plus height of pole base (approximately 6 inches).
5. Distribution: T3.
6. Housings:

    a. Extruded-aluminum housing and heat sink.
    b. Powder-coat finish.

2.4 MATERIALS

A. Metal Parts: Free of burrs and sharp corners and edges.

B. Sheet Metal Components: Corrosion-resistant aluminum with stainless steel fasteners and hardware. Form and support to prevent warping and sagging.

C. 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.

D. Diffusers and Globes:

1. Acrylic Diffusers: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
2. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.

E. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

F. 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.

G. Housings:

1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.
2. Provide filter/breather for enclosed luminaires.

2.5 FINISHES

A. Contractor is responsible for selection and coordination of all finishes with the State prior to ordering. Complete selection process and coordinate submittals to ensure submittals include approved finishes.

B. Variations in Finishes: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. 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.

D. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20 requirements; and seal aluminum surfaces with clear, hard-coat wax.
3. Class I, Clear-Anodic Finish: AA-M32C22A41 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

2.6 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire electrical conduit to verify actual locations of conduit connections before luminaire installation.

C. Examine site, walls and canopy ceilings for suitable conditions where luminaires will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Comply with NECA 1.

B. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

C. Install lamps in each luminaire.

D. Fasten luminaire to structural support.

E. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Support luminaires without causing deflection of finished surface.
4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

F. Wall-Mounted Luminaire Support:

1. Attached to a minimum 1/8 inch (3 mm) backing plate attached to wall structural members.

G. Wiring Method: Install cables in raceways. Conceal raceways and cables.

H. Coordinate layout and installation of luminaires with other construction.

I. Adjust luminaires that require field adjustment or aiming.

J. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" and Section 26 05 33 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

3.3 INSTALLATION OF INDIVIDUAL GROUND-MOUNTED LUMINAIRES

A. Aim as indicated.

B. Install on concrete base with top 4 inches (100 mm) above finished grade or surface at luminaire location. Cast conduit into base, and finish by troweling and rubbing smooth.

3.4 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 26 05 33 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- (0.254-mm-) thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.5 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.6 FIELD QUALITY CONTROL

A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.

B. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Verify operation of photoelectric controls.

C. Illumination Tests:

1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IES testing guide(s):

   a. IES LM-5.
   b. IES LM-64.
   c. IES LM-72.

2. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

D. Luminaire will be considered defective if it does not pass tests and inspections.

E. 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.

3.7 DEMONSTRATION

A. Train the State’s maintenance personnel to adjust, operate, and maintain luminaires.

3.8 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Beneficial Occupancy, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3. Adjust the aim of luminaires in the presence of the State.

END OF SECTION 26 56 19

SECTION 27 05 28

PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Type OFR and Type CR communications raceways and fittings.
2. Cable supports and positioning devices.

B. Related Requirements:

1. Section 26 00 11 "Facility Performance Requirements for Electrical" for seismic-load, wind-load, acoustical, and other field conditions applicable to Work specified in this Section.
2. Section 27 00 10 "Supplemental Requirements for Communications" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
3. Section 07 84 13 "Penetration Firestopping" specifies firestopping for communications pathways installed by this Section.
4. Section 26 05 26 "Grounding and Bonding for Electrical Systems" specifies grounding and bonding conductors and connectors for communications pathways installed by this Section.
5. Section 26 05 29 "Hangers and Supports for Electrical Systems" specifies hangers and supports for communications pathways installed by this Section.
6. Section 26 05 33.13 "Conduits for Electrical Systems" specifies the following installed by this Section:

a. Type EMT-A and Type EMT-SS duct raceways and elbows.
b. Type EMT-S duct raceways and elbows.
c. Type ENT duct raceways and fittings.
d. Type HDPE and Type EPEC duct raceways and fittings.
e. Type ERMC-A and Type ERMC-SS duct raceways, elbows, couplings, and nipples.
f. Type ERMC-S duct raceways, elbows, couplings, and nipples.
g. Type FMC-S and Type FMC-A duct raceways.
h. Type FMT duct raceways.
i. Type IMC duct raceways.
j. Type LFMC duct raceways.
k. Type LFNC duct raceways.
l. Type PVC duct raceways and fittings.
m. Type RTRC-AG duct raceways and fittings.
n. Type RTRC-BG duct raceways and fittings.
o. Fittings for conduit, tubing, and cable.
p. Electrically conductive corrosion-resistant compounds for threaded conduit.

q. Solvent cements.

7. Section 26 05 33.16 "Boxes and Covers for Electrical Systems" specifies the following installed by this Section:

    a. Metallic outlet boxes, device boxes, rings, and covers.
    b. Nonmetallic outlet boxes, device boxes, rings, and covers.
    c. Junction boxes and pull boxes.
    d. Cover plates for device boxes.
    e. Hoods for outlet boxes.

8. Section 26 05 33.23 "Surface Raceways for Electrical Systems" specifies the following installed by this Section:

    a. Surface metal raceways and fittings.
    b. Surface nonmetallic raceways.
    c. Strut-type channel raceways and fittings.
    d. Wireways and auxiliary gutters.

9. Section 26 05 36 "Cable Trays for Electrical Systems" specifies cable trays for communications pathways installed by this Section.
10. Section 26 05 39 "Underfloor Raceways for Electrical Systems" specifies underfloor raceways for communications pathways installed by this Section.
11. Section 26 05 43 "Underground Ducts and Raceways for Electrical Systems" specifies the following installed by this Section:

    a. Duct accessories.
    b. Handholes and boxes for exterior underground wiring.
    c. Manholes for exterior underground wiring.
    d. Utility structure accessories.
    e. Duct sealing.

12. Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling" specifies sleeves and sleeve seals for communications pathways installed by this Section.
13. Section 26 05 53 "Identification for Electrical Systems" specifies labels and warning signs for communications pathways installed by this Section.
14. Section 26 27 16 "Electrical Cabinets and Enclosures" for communications enclosures installed by this Section.
15. Section 26 27 19 "Multi-Outlet Assemblies" specifies the following installed by this Section:

    a. Wall-mounted, surface metal raceway multi-outlet assemblies.
    b. Wall-mounted, surface nonmetallic raceway multi-outlet assemblies.
    c. Floor-mounted, recessed metal raceway multi-outlet assemblies.
    d. Indoor service poles.
    e. Floor-mounted, enclosure multi-outlet assemblies.
    f. Fire-rated, poke-through assemblies.
    g. Above-floor service fittings.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.

a. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.

1) If listed manufacturer differs from selling manufacture, indicate relationship between entities on submittal. Clearly indicate which entity warrants product performance and fitness for purpose.
2) Listing criteria identified in approval letter must match specified listing criteria. Approval of only equipment's enclosure is not considered approval of equipment for intended application.
3) Product identification in approval letter must match product branding and model numbers in submittal. Approval letters for similar products are not acceptable.

B. Samples:

1. Type OFR and Type CR Raceways: For each color and texture specified, 12 inches long.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturers' published instructions submittals.

PART 2 - PRODUCTS

2.1 TYPE OFR AND TYPE CR COMMUNICATIONS RACEWAYS AND FITTINGS

A. Description: This product group covers raceways and fittings for installation of conductive and nonconductive optical-fiber cable, communications cable, power-limited fire-alarm cable, signaling cable, and coaxial cable in accordance with NFPA 70.

B. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria:

a. Optical-Fiber Cable Raceway: UL CCN QAZM; including UL 2024.
b. Communications Cable Raceway: UL CCN QBAA; including UL 2024.

C. UL QAZM - Type OFR-GP General-Purpose Optical-Fiber Raceway.

1. Source Limitations: Obtain products from single manufacturer.
2. Product Characteristics:

    a. Texture: Smooth
    b. Splicing: Fusion.

3. Required Product Options:

    a. Couplings and Fittings:

        1) Ensure that all couplings and fittings meet project specifications and are compatible with system components.
        2) Verify that the materials used are free from defects and suitable for the intended application.
        3) Install couplings and fittings according to the manufacturer's recommendations and industry standards.

D. UL QAZM - Type OFR-P Plenum Optical-Fiber Raceway:

1. Source Limitations: Obtain products from single manufacturer.
2. Product Characteristics:

    a. Meets UL 2024 test requirements for "PLENUM" marking.
    b. Texture: Smooth.
    c. Splicing: Fusion.

3. Required Product Options:

    a. Couplings and Fittings:

        1) Ensure that all couplings and fittings meet project specifications and are compatible with system components.
        2) Verify that the materials used are free from defects and suitable for the intended application.
        3) Install couplings and fittings according to the manufacturer's recommendations and industry standards.

E. UL QAZM - Type OFR-R Riser Optical-Fiber Raceway:

1. Source Limitations: Obtain products from single manufacturer.
2. Product Characteristics:

    a. Meets UL 2024 test requirements for "RISER" marking.
    b. Texture: Smooth.
    c. Splicing: Fusion.

3. Required Product Options:

    a. Couplings and Fittings:

        1) Ensure that all couplings and fittings meet project specifications and are compatible with system components.

2) Verify that the materials used are free from defects and suitable for the intended application.
3) Install couplings and fittings according to the manufacturer's recommendations and industry standards.

F. UL QBAA - Type CR-GP General-Purpose Communications Cable:

1. Source Limitations: Obtain products from single manufacturer.
2. Product Characteristics:

a. Texture: Smooth
b. Splicing: Fusion.

3. Required Product Options:

a. Couplings and Fittings:

1) Ensure that all couplings and fittings meet project specifications and are compatible with system components.
2) Verify that the materials used are free from defects and suitable for the intended application.
3) Install couplings and fittings according to the manufacturer's recommendations and industry standards.

2.2 CABLE SUPPORTS AND POSITIONING DEVICES

A. Description: This category covers straps, hooks, and similar types of hardware for installation and use in communications cabling systems in accordance with NFPA 70 and manufacturer's installation instructions

B. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

C. UL DWMU - J-Hook or G-Hook Cable Support:

1. Source Limitations: Obtain products from single manufacturer.
2. Product Listing Criteria: UL CCN DWMU; including UL 2239 or UL 1565.
3. Product Characteristics:

a. Material: Galvanized steel.

D. UL DWMU - Conduit or Cable Support Strap:

1. Source Limitations: Obtain products from single manufacturer.
2. Product Listing Criteria: UL CCN DWMU; including UL 2239 or UL 1565.
3. Product Characteristics:

a. Mounting Orientation: Vertical or Horizontal.

b. Conduit, Cable, or Tubing Bundle Capacity: Per NEC.

E. UL ZODZ - Cable Clamp, Clip, or Mount Positioning:

1. Source Limitations: Obtain products from single manufacturer.
2. Product Listing Criteria: UL CCN ZODZ; including UL 1565.
3. Product Characteristics:

a. Materials: Metallic.
b. Bundle Capacity: Per NEC

PART 3 - EXECUTION

3.1 SELECTION OF PATHWAYS FOR COMMUNICATIONS SYSTEMS

A. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NFPA 70 for selection of duct raceways. Consult the State for resolution of conflicting requirements.

B. Type OFR and Type CR Communications Raceways: Comply with Table 800.154(b) of NFPA 70.

C. Minimum Pathway Size:

1. For Copper and Aluminum Cables: Metric designator 21 (trade size 3/4).
2. For Optical-Fiber Cables: Metric designator 25 (trade size 1).

D. Maximum Pathway Length Between Cable Access Points: 75 ft (23 m).

E. Temperature Limitations:

1. Type PVC, Type HDPE, Type EPEC, Type OFR, and Type CR: Do not install where ambient temperature exceeds 122 deg F (50 deg C). Conductor ratings must be limited to 75 deg C except where installed in a trench outside buildings with concrete encasement, where 90 deg C conductors are permitted.
2. Type RTRC: Do not install where ambient temperature exceeds 230 deg F (110 deg C)

F. Outdoor Pathways:

1. Exposed and Subject to Severe Physical Damage: IMC.
2. Exposed and Subject to Physical Damage: Corrosion-resistant EMT.

a. Locations less than 2.5 m (8 ft) above finished floor.

3. Exposed and Not Subject to Physical Damage: Corrosion-resistant EMT
4. Concealed Aboveground: PVC-80.
5. Direct Buried: PVC-80 or PVC-40.
6. Concrete Encased Not in Trench: PVC-80 or PVC-40.
7. Concrete Encased in Trench: PVC-80 or PVC-40.

G. Indoor Pathways:

1. Exposed and Subject to Severe Physical Damage: ERMC or IMC. Locations include the following:

    a. Loading docks.
    b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    c. Mechanical rooms.
    d. Gymnasiums.

2. Exposed and Subject to Physical Damage: EMT. Locations include the following:

    a. Locations less than 2.5 m (8 ft) above finished floor.
    b. Stub-ups to above suspended ceilings.

3. Exposed and Not Subject to Physical Damage: EMT
4. Concealed above Suspended Ceilings: Cable tray and/or Hooks.
5. Concealed in Ceilings and Interior Walls and Partitions: PVC-80, PVC-40
6. Damp or Wet Locations: Corrosion-resistant EMT.

H. Duct Fittings: Select fittings in accordance with NEMA FB 2.10 guidelines.

1. ERMC and IMC: Provide threaded-type fittings unless otherwise indicated.

I. Surface Raceways: Where indicated.

J. Cable Supports and Positioning Devices:

1. Size hooks to allow minimum of 25 percent future capacity without exceeding design capacity limits.
2. Support hooks directly from building structure. Do not use ceiling grid support rods or wires.
3. Hook spacing must allow no more than 6 inch (150 mm) of slack. Lowest point of cables must be no closer than 6 inch (150 mm) to ceiling tiles, mechanical ductwork and fittings, luminaires, power conduits, power and telecommunications outlets, and other electrical and communications equipment.
4. Space hooks no more than 5 ft (1.5 m) on center.
5. Provide hook at each change in direction.

K. Boxes and Enclosures:

1. Outdoors, Aboveground: UL 50E Type 3R.
2. Indoors: UL 50E Type 1, except use Type 4 stainless steel units in institutional and commercial kitchens and damp or wet locations.

L. Identification of Underground Pathways, Handholes, and Structures:

1. Use "COMMUNICATIONS" for legend on warning planks, underground warning tape, and covers.

3.2 SELECTION OF GROUNDING AND BONDING PRODUCTS

A. Grounding and Bonding Conductors:

1. Communications Busbar Connections:

a. TBC: Not smaller than 1/0 AWG and no smaller than largest TBB.
b. TBB: Not smaller than 2 kcmil per linear ft of conductor length, but not larger than 750 kcmil, unless otherwise indicated.
c. BBC: Not smaller than largest TBB to which it is connected unless otherwise indicated.
d. TEBC: Not smaller than 2 AWG unless otherwise indicated on Drawings. Provide bolted connectors.
e. UBC: Not smaller than 6 AWG unless otherwise indicated on Drawings. Provide bolted connectors.
f. Bonding Conductors to Structural Steel: Not smaller than 6 AWG unless otherwise indicated. Provide bolted clamp connectors.

2. Cable Tray Connections:

a. Cable Tray Equipment Grounding Conductor: 8 AWG.
b. Cable Tray Bonding Jumper: If not supplied by cable manufacturer, provide bonding jumper not smaller than 10 AWG and not longer than 12 inch (300 mm). If jumper is wire, it must be terminated with lug having two holes and long barrel for two crimps. If jumper is flexible braid, it must be terminated with one- or two-hole ferrule. Attach with bonding screw or connector provided by cable tray manufacturer.

3. Underground Connections: Not smaller than 2 AWG. Provide welded connectors, except bolted connectors may be used in handholes or manholes and as otherwise indicated.

3.3 SELECTION OF COLORS AND IDENTIFICATION MARKINGS

A. Comply with 29 CFR 1910.144 for color identification of hazards, and the following:

1. Fire-protection and fire-alarm equipment, including raceways, must be finished, painted, or suitably marked safety red.
2. Ceiling-mounted hangers, supports, cable trays, and raceways must be finished, painted, or suitably marked safety yellow where less than 7.7 ft (2.3 m) above finished floor.

B. Pipe and Conduit Labeling: Comply with ASME A13.1 and IEEE C2.

C. Color Coding Scheme for Communications Cable and Terminations: Comply with BICSI N1 and TIA-598.

D. Accessible Fittings for Raceways: Identify cover of junction and pull box of the following systems with wiring system legend and system voltage. System legends must be as follows:

1. "COMMUNICATIONS."
2. "FIRE ALARM."
3. "SECURITY."

E. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

F. Locations of Underground Lines: Underground-line warning tape for communication, control wiring, and optical-fiber cable.

G. Communications Vaults, Manholes, Handholes, and Pull and Junction Boxes: For conductors in vaults, pull and junction boxes, manholes, and handholes, use self-adhesive wraparound labels to identify phase.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50 ft (15 m) maximum intervals in straight runs, and at 25 ft (7.6 m) maximum intervals in congested areas.

H. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive labels with conductor or cable designation, origin, and destination.

I. Control-Circuit Conductor Termination Identification: For identification at terminations, provide self-adhesive labels with conductor designation.

J. Conductors To Be Extended in Future: Attach write-on tags to conductors and list source.

K. Auxiliary Electrical Systems Conductor Identification: Self-adhesive vinyl tape that is uniform and consistent with system used by manufacturer for factory-installed connections.

L. Equipment and Cabling Identification for Administrative Records and Labeling: Comply with TIA-606 requirements for Class 1 network administration.

M. Equipment Identification Labels:

1. Black letters on white field.
2. Indoor Equipment: Self-adhesive label.
3. Outdoor Equipment: Laminated acrylic or melamine sign.
4. Equipment To Be Labeled:

a. Racks, Frames, and Enclosures: Identify front and rear of each enclosure with self-adhesive labels containing equipment designation.
b. Patch Panels: Label individual rows in each rack, starting at top and working down, with self-adhesive labels.
c. Communications cabinets.
d. Access doors and panels for concealed communications items.
e. Emergency system boxes and enclosures.
f. Contactors.
g. Remote-controlled switches, dimmer modules, and control devices.

h. Monitoring and control equipment.
i. Fire-alarm equipment.
j. Security equipment.
k. Life-safety communications equipment.

N. Backbone Cables: Label each cable with a vinyl-wraparound label indicating the location of the far or other end of the backbone cable. Patch panel or punch down block where cable is terminated should be labeled identically.

O. Horizontal Cables: Label each cable with a vinyl-wraparound label.

P. Cover Plates: Label individual cover plates with self-adhesive labels. Place label at top of cover plate. Identify cover plate in accordance with TIA-606.

Q. Cable Ties: General purpose, for attaching tags, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

3.4 SELECTION OF SIGNS AND HAZARD MARKINGS

A. Comply with 29 CFR 1910.145 for danger, caution, warning, and safety instruction signs.

B. Signs, labels, and tags required for personnel safety must comply with the following standards:

1. Safety Colors: NEMA Z535.1.
2. Facility Safety Signs: NEMA Z535.2.
3. Safety Symbols: NEMA Z535.3.
4. Product Safety Signs and Labels: NEMA Z535.4.
5. Safety Tags and Barricade Tapes for Temporary Hazards: NEMA Z535.5.

C. Electrical Hazard Warnings:

1. Multiple Power Sources Warning Legend: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT/RACK HAS MULTIPLE POWER SOURCES."

D. Operating Instruction Signs: Self-adhesive labels.

3.5 INSTALLATION OF PATHWAYS FOR COMMUNICATIONS SYSTEMS

A. Comply with manufacturers' published instructions, including limitations on distance, bends, and bend radius.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:

1. Type OFR Optical-Fiber Raceways: Article 800 of NFPA 70 and BICSI N1.

2. Type CR Communications Raceways: Article 800 of NFPA 70 and BICSI N1.
3. Cable Supports and Positioning Devices: Article 800 of NFPA 70 and BICSI N1.
4. Consult the State for resolution of conflicting requirements.

C. Interfaces with Other Work:

1. Coordinate installation of new communications pathways with existing conditions.
2. Grounding and Bonding: Bond metallic communications boxes and enclosures to metallic pathways. Coordinate with Section 27 11 00 "Communications Equipment Room Fittings" for grounding and bonding of communications pathways to communications equipment room fittings.

3.6 PROTECTION

A. Protect coatings and finishes of pathways, boxes, and enclosures from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 27 05 28

SECTION 27 13 13

COMMUNICATIONS COPPER BACKBONE CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Backbone communications cables.
2. Communications-, audio/video-, data-, and other signaling-circuit accessories.

B. Products Installed, but Not Furnished, under This Section:

1. See Section 27 05 53 "Identification for Communications Systems" for communications equipment labels.
2. See Section 27 15 13 "Communications Copper Horizontal Cabling" for Type CM, CMG, and CMX cabling.

C. Related Requirements:

1. Section 260011 "Facility Performance Requirements for Electrical" for seismic-load, wind-load, acoustical, and other field conditions applicable to Work specified in this Section.
2. Section 270010 "Supplemental Requirements for Communications" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 DEFINITIONS

A. Cable Types:

1. FTP: Foil shielded twisted pair.
2. F/FTP: Bundle of FTP cables with overall foil shield.
3. F/UTP: Bundle of UTP cables with overall foil shield.
4. S/FTP: Bundle of FTP cables with overall braided shield.
5. S/UTP: Bundle of UTP cables with overall braided shield.
6. UTP: Unshielded twisted pair.

B. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

C. EMI: Electromagnetic interference.

D. IDC: Insulation displacement connector.

1.3 SEQUENCING

A. Wet-work in spaces must be completely dry, and HVAC system must be operating and maintaining ambient temperature and humidity conditions within manufacturer's recommended limits, before delivering and installing cables and connecting materials.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Backbone communications cable.
2. Communications-, audio/video-, data-, and other signaling-circuit accessories.

B. Shop Drawings:

1. Cable labeling schedules.
2. Cabling administration diagrams.
3. Wiring diagrams.
4. Cross-connect and patch panel details.
5. Twisted-pair cable testing plan.

C. Field quality-control reports.

D. Sustainable design submittals.

1. Backbone communications cable.

1.5 INFORMATIONAL SUBMITTALS

A. Manufacturers' Published Instructions:

1. Backbone communications cable.
2. Communications-, audio/video-, data-, and other signaling-circuit accessories.

B. Field Reports:

1. Factory Test Reports:

a. Backbone communications cable.

1.6 CLOSEOUT SUBMITTALS

A. Warranty documentation.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Spare Parts: For communications-, audio/video-, data-, and other signaling-circuit accessories.

B. Special Tools: For communications-, audio/video-, data-, and other signaling-circuit accessories.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test each pair of twisted-pair cable for open and short circuits.

1.9 WARRANTY FOR COMMUNICATIONS COPPER BACKBONE CABLE ASSEMBLIES

A. Special Installer Extended Warranty: Installer warrants that fabricated and installed communications copper backbone cable assemblies perform in accordance with specified requirements and agrees to repair or replace cable assemblies that fail to perform as specified within extended-warranty period.

1. Extended-Warranty Period: Two years from date of Beneficial Occupancy; full coverage for labor, materials, and equipment.

PART 2 - PRODUCTS

2.1 BACKBONE COMMUNICATIONS CABLES

A. Description: This category covers multiple conductor jacketed communications cable for telephone and other communications circuits for use in risers and plenums as described in Article 800 of NFPA 70.

B. Performance Criteria:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2. Listing Criteria:

a. Certified Cable: UL CCN DUZX; including UL 444.
b. Verified Cable: UL CCN DVBI; including TIA-568.2.
c. Type CMP: NFPA 262.
d. Type CMR: UL 1666.
e. Limited Smoke: Marked "-LS" in accordance with UL 1685.
f. Halogen-Free: Marked "-HF" in accordance with UL Subject 2885.
g. Low Smoke and Halogen-Free: Marked "-LSHF" in accordance with IEC 61034-2.
h. Cable Heating Test: Marked "-LP" with current rating and temperature rating.

C. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Sustainable Design Submittals: Prepare and submit documentation for the following:

    a. Ensure that all cables meet sustainable design criteria, including reduced lead content to align with environmental standards and regulatory compliance
    b. Provide Environmental Product Declarations (EPDs) and Health Product Declarations (HPDs) for all materials used, ensuring transparency and alignment with sustainable design principle.

3. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.
4. Factory Tests:

    a. The State will witness required factory tests. Notify the State at least 14 days before date of tests and indicate their approximate duration.
    b. Testing Administrant: The State will engage qualified electrical testing agency to evaluate cable reels.
    c. Factory Tests and Inspections: Test and inspect cable on reels, by, or under supervision of, qualified electrical testing laboratory recognized by authorities having jurisdiction, in accordance with TIA-568.2 before delivering to site. Affix label with name and date of manufacturer's certification of system compliance.
    d. Nonconforming Work:

        1) Cable reels that do not pass tests and inspections will be considered defective.

    e. Factory Test Reports: Prepare and submit factory test and inspection reports.

D. UL DUZX and DVBI - Type CMP, Category 5e Communications Cable

E. UL DUZX and DVBI - Type CMP, Category 6 Communications Cable:
1. Product Marking: Type CMP; Category 6.
2. Options:

    a. Quantity of Pairs: Four.
    b. Shielding/Screening: UTP.
    c. Jacket: Blue thermoplastic.

2.2 COMMUNICATIONS-, AUDIO/VIDEO-, DATA-, AND OTHER SIGNALING-CIRCUIT ACCESSORIES

A. Description: This category covers devices intended for use in residential or commercial communications-station applications for connections to communications circuit as defined in Article 800 of NFPA 70.

B. Performance Criteria:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2. Listing Criteria:

a. Communications-Circuit Accessories: UL CCN DUXR; including UL 1863.
b. Audio/Video-, Data-, and Other Signaling-Circuit Accessories: UL CCN DUXR; including UL 1977.
c. For Use in Air-Handling Spaces: UL 2043.

C. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

D. UL DUXR - Connecting Block:

1. Options:

a. Configuration: 110-style IDC for Category 6.
b. Quantity of Terminations: Number of cables terminated on block, plus 25 percent spare, integral with connector bodies, including plugs and jacks where indicated.

E. UL DUXR - Cross-:

1. Options:

a. Number of Terminals per Field: One for each conductor in assigned cables.
b. Performance Rating: Category 6.

F. UL DUXR - Patch Panel:

1. General Characteristics:

a. Universal T568A and T568B wiring labels.
b. Labeling areas adjacent to conductors.
c. Replaceable connectors.

d. 24 or 48 ports.
e. Construction: 16-gauge steel and mountable on 19 inch (483 mm) equipment racks.

2. Options:

a. Number of Jacks per Field: One for each four-pair twisted-pair cable indicated.
b. Performance Rating: Category 6.

G. UL DUXR - 8P8C Jacks and Jack Assemblies:

1. Panduit or the State approved equal.
2. BLUE Panduit Mini-Jack ® Category 6 Modular Jacks, configured 568B
3. General Characteristics:

a. Female; 8P8C; color-coded modular telecommunications connector designed for termination of a single, four-pair, 100 Ω UTP or FTP cable.
b. Designed to snap into patch panel or cover plate.
c. Marked to indicate transmission performance.

4. Options:

a. Performance Rating: Category 6.

H. UL DUXR - Patch Cords:

1. Allen Tel Products, Panduit or the State approved equal.
2. General Characteristics:

a. Factory-made, four-pair cables; terminated with an 8P8C plug at each end.
b. Bend-relief-compliant boots and color-coded icons to ensure Category 6 performance.
c. Latch guards to protect against snagging.
d. Color-coded boots for circuit identification.
e. Refer to DMV official product details document Exhibit “B”, page 38.

3. Options:

a. Length: Refer to DMV official product details document Exhibit “B”, page 38 for specific length per application.
b. Performance Rating: Category 5e or Category 6. Refer to DMV official product details document Exhibit “B”, page 38 for specific length per application.

PART 3 - EXECUTION

3.1 PREPARATION

A. Shop Drawings: Prepare and submit the following:

1. Cable Labeling Schedules: Submit electronic files using software and format requested by the State.
2. Cabling Administration Diagrams: Submit diagrams and supporting electronic files using software and format requested by the State.

    a. Coordinate layout and installation of telecommunications pathways and cabling with the State's telecommunications and LAN equipment and service suppliers.

3. Wiring Diagrams:

    a. Telecommunications rooms plans and elevations.
    b. Telecommunications pathways.
    c. Telecommunications system access points.
    d. Telecommunications grounding system.
    e. Cross-connects.
    f. Patch panels.
    g. Patch cords.

4. Cross-Connect and Patch Panel Details: Include mounting assemblies, elevations, and physical relationship between installed components.
5. Twisted-Pair Cable Testing Plan: Include list of cables to be tested, identification of tests to be performed, pass/fail criteria, and copy of testing procedures (may be separate volume). Indicate Installer's required tests for warranty compliance.

3.2 SELECTION OF COMMUNICATIONS COPPER BACKBONE CABLING

A. Air-Handling Spaces:

1. Type CMP in listed plenum communications raceway in listed cable routing assembly.
2. Type CMR or Type CMP in metallic conduit installed in accordance with Rule 300.22 of NFPA 70.

B. Vertical Chases:

1. Type CMR.
2. Type CMP or Type CMR in listed plenum or riser communications raceway.

3.3 INSTALLATION OF COMMUNICATIONS COPPER BACKBONE CABLING

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation:

1. Communications Cable Assemblies: Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with BICSI N1.
2. Consult the State for resolution of conflicting requirements.

C. Special Installation Techniques:

1. Cabling system consists of backbone cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for backbone-to-backbone cross-connection.

    a. Provide interconnections between communications equipment rooms, main terminal space, and entrance facilities in the telecommunications cabling system structure.
    b. Backbone cabling cross-connects may be located in communications equipment rooms or at entrance facilities. Bridged taps and splitters may not be used as part of backbone cabling.

2. Wiring Methods:

    a. Raceway and Tray: Install cables in raceways and cable trays, except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, attics, and gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables, except in unfinished spaces.

        1) Install plenum cable in environmental air spaces, including plenum ceilings.
        2) Comply with requirements for raceways and boxes specified in Section 27 05 28 "Pathways for Communications Systems."

    b. Open-Cable: Route conductors and cables in accessible ceilings, walls, and floors where possible.
    c. Within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools. Install cables parallel with or at right angles to sides and back of enclosure.

3. General Requirements for Cabling:

    a. Install 110-style IDC termination hardware unless otherwise indicated.
    b. Do not untwist twisted-pair cables more than 1/2 inch (12 mm) from the point of termination to maintain cable geometry.
    c. Terminate all conductors; no cable may contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
    d. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inch (760 mm) and not more than 6 inch (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
    e. Install lacing bars to restrain cables, prevent straining connections, and prevent bending cables to smaller radii than minimums recommended by manufacturer.
    f. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii. Use lacing bars and distribution spools.

g. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation, and replace it with new cable.
h. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps may not be used for heating.
i. In the communications equipment room, install 10 ft (3 m) long service loop on each end of cable.
j. Pulling Cable: Monitor cable pull tensions.

4. Open-Cable Installation:

a. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
b. Suspend twisted-pair cabling, not in a wireway or pathway, a minimum of 8 inch (200 mm) above ceilings by cable supports not more than 5 ft (1.5 m) apart.
c. Cable may not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

5. Installation of Cable Routed Exposed under Raised Floors:

a. Install plenum-rated cable only.
b. Install cabling after the flooring system has been installed in raised floor areas.
c. Coil cable 6 ft (1.8 m) long not less than 12 inch (300 mm) in diameter below each feed point.

6. Group connecting hardware for cables into separate logical fields.
7. Separation from EMI Sources:

a. Comply with BICSI N1 for separating unshielded copper communication cable from potential EMI sources, including electrical power lines and equipment.
b. Separate open communications cables or cables in nonmetallic raceways from unshielded power conductors and electrical equipment as follows:

1) Power Rating Less Than 2 kVA: Minimum 5 inch (127 mm).
2) Power Rating between 2 and 5 kVA: Minimum 12 inch (300 mm).
3) Power Rating More Than 5 kVA: Minimum 24 inch (600 mm).

c. Separate communications cables in grounded metallic raceways from unshielded power lines or electrical equipment as follows:

1) Power Rating Less Than 2 kVA: Minimum 2-1/2 inch (64 mm).
2) Power Rating between 2 and 5 kVA: Minimum 6 inch (150 mm).
3) Power Rating More Than 5 kVA: Minimum 12 inch (300 mm).

d. Separate communications cables in grounded metallic raceways from power lines and electrical equipment located in grounded metallic conduits or enclosures as follows:

1) Power Rating Less Than 2 kVA: No minimum distance.
2) Power Rating between 2 and 5 kVA: Minimum 3 inch (76 mm).
3) Power Rating More Than 5 kVA: Minimum 6 inch (150 mm).

e. Separate communications cables from electrical motors and transformers rated 5 kVA or 5 HP and larger minimum 48 inch (1200 mm).
f. Separate communications cables from fluorescent luminaires minimum 5 inch (127 mm).

8. Identify system components, wiring, and cabling in accordance with TIA-606.

a. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.
b. Paint and label colors for equipment identification must comply with TIA-606 for Class 2 level of administration, including optional identification requirements of this standard.

9. Cable and Wire Identification:

a. Label each cable within 4 inch (100 mm) of each termination and tap, where it is accessible in cabinet or junction or outlet box, and elsewhere as indicated.
b. Each wire connected to building-mounted devices is not required to be numbered at device if wire color is consistent with associated wire connected and numbered within panel or cabinet.
c. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 ft (4.5 m).
d. Label each terminal strip, and screw terminal in each cabinet, rack, or panel.

1) Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group, extended from panel or cabinet to building-mounted device, with name and number of particular device.
2) Label each unit and field within distribution racks and frames.

e. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and -connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use different color for jacks and plugs of each service.

10. Cable Schedule: Install in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish electronic copy of final comprehensive schedules for Project.
11. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and

workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.

D. Interfaces with Other Work:

1. Entrance Facilities: Coordinate backbone cabling with Section 27 11 00 "Communications Equipment Room Fittings" for cabinets, racks, and protectors and demarcation point provided by communications service provider.
2. Coordinate with Section 07 84 13 "Penetration Firestopping" for sealing fire-rated penetrations.
3. Coordinate with Section 26 05 33.16 "Boxes and Covers for Electrical Systems" for installation of outlet boxes and cover plates.
4. Coordinate with Section 27 05 26 "Grounding and Bonding for Communications Systems" for grounding communications cabling and connectors.
5. Coordinate with Section 27 05 28 "Pathways for Communications Systems" for installation of provisions for routing and terminating cable assemblies.
6. Coordinate with Section 27 05 29 "Hangers and Supports for Communications Systems" for installation of cable supports.
7. Coordinate with Section 27 05 36 "Cable Trays for Communications Systems" for installation of cable trays.

3.4 FIELD QUALITY CONTROL OF COMMUNICATIONS COPPER BACKBONE CABLING

A. Acceptance Testing Preparation:

1. Verify that copper backbone cabling installation complies with project specifications and industry standards.
2. Ensure all connections, terminations, and splices are secure and properly labeled.
3. Test cable performance using approved methods to confirm bandwidth, attenuation, and continuity meet specified requirements.
4. Document all test results, including any discrepancies and corrective actions taken.

B. Field tests and inspections must be witnessed by the State.

C. Tests and Inspections:

1. Perform manufacturer's recommended tests and inspections.
2. Visually inspect jacket materials for certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA-568.1.
3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
4. Test cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.

a. Test instruments must meet or exceed applicable requirements in TIA-568.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

D. Nonconforming Work:

1. Cable assemblies will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective cable assemblies and retest.

E. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.

3.5 PROTECTION

A. After installation, protect cable assemblies and accessories from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by the State.

END OF SECTION 27 13 13

SECTION 27 15 13

COMMUNICATIONS COPPER HORIZONTAL CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Category 3 twisted pair cable.
2. Category 5e twisted pair cable.
3. Category 6 twisted pair cable.
4. Category 6a twisted pair cable.
5. Category 7 twisted pair cable.
6. Twisted pair cable hardware.
7. Multiuser telecommunications outlet assembly (MUTOA).
8. Cable management system.
9. Identification products.

B. Related Requirements:

1. Section 27 05 13 "Conductors and Cables for Communications Systems" for data cabling associated with system panels and devices.

1.2 DEFINITIONS

A. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

B. EMI: Electromagnetic interference.

C. FTP: Shielded twisted pair.

D. F/FTP: Overall foil screened cable with foil screened twisted pair.

E. F/UTP: Overall foil screened cable with unscreened twisted pair.

F. IDC: Insulation displacement connector.

G. Jack: Also commonly called an "outlet," it is the fixed, female connector.

H. LAN: Local area network.

I. Plug: Also commonly called a "connector," it is the removable, male telecommunications connector.

J. RCDD: Registered Communications Distribution Designer.

K. Screen: A metallic layer, either a foil or braid, placed around a pair or group of conductors.

L. Shield: A metallic layer, either a foil or braid, placed around a pair or group of conductors.

M. S/FTP: Overall braid screened cable with foil screened twisted pair.

N. S/UTP: Overall braid screened cable with unscreened twisted pairs.

O. UTP: Unscreened (unshielded) twisted pair.

1.3 COPPER HORIZONTAL CABLING DESCRIPTION

A. Horizontal cable cabling system shall provide interconnections between Distributor A, Distributor B, or Distributor C, and the equipment outlet, otherwise known as "Cabling Subsystem 1," in the telecommunications cabling system structure. Cabling system consists of horizontal cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for horizontal-to-horizontal cross-connection.

1. TIA-568-C.1 requires that a minimum of two equipment outlets be installed for each work area.
2. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications equipment outlet.
3. Bridged taps and splices shall not be installed in the horizontal cabling.

B. A work area is approximately 100 sq. ft. (9.3 sq. m), and includes the components that extend from the equipment outlets to the station equipment.

C. The maximum allowable horizontal cable length is 295 feet (90 m). This maximum allowable length does not include an allowance for the length of 16 feet (4.9 m) to the workstation equipment or in the horizontal cross-connect.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Category 3 twisted pair cable.
2. Category 5e twisted pair cable.
3. Category 6 twisted pair cable.
4. Category 6a twisted pair cable.
5. Category 7 twisted pair cable.
6. Twisted pair cable hardware.
7. Multiuser telecommunications outlet assembly (MUTOA).
8. Cable management system.
9. Identification products.

B. Shop Drawings: Reviewed and stamped by RCDD.

1. System Labeling Schedules:

a. Electronic copy of labeling schedules, in software and format selected by the State.
b. Electronic copy of labeling schedules that are part of cabling and asset identification system of software.

2. Cabling administration Drawings and printouts.
3. Wiring diagrams and installation details of telecommunications equipment, to show location and layout of telecommunications equipment, including the following:

a. Telecommunications rooms plans and elevations.
b. Telecommunications pathways.
c. Telecommunications system access points.
d. Telecommunications grounding system.
e. Telecommunications conductor drop locations.
f. Typical telecommunications details.
g. Mechanical, electrical, and plumbing systems.

C. Twisted pair cable testing plan.

D. Sustainable Design Submittals:

1. Lead Content: Provide documentation confirming compliance with sustainable design goals, including the reduction or elimination of lead content in materials, in accordance with applicable environmental standards.
2. EPDs and HPDs: Submit Environmental Product Declarations (EPDs) and Health Product Declarations (HPDs) for all relevant products, ensuring transparency and alignment with sustainability criteria.

E. Samples: For telecommunications jacks and plugs, in specified finish, one for each type and configuration and cover plates for color selection and evaluation of technical features.

F. Field quality-control reports.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For RCDD, Installer, installation supervisor, and field inspector.

B. Product Certificates: For each type of product.

C. Source quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For splices and connectors to include in maintenance manuals.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On USB media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings and cabling administration Drawings, cabling administration Drawings, and field testing program development by an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
3. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

B. Testing Agency Qualifications: Testing agency must have personnel certified by BICSI on staff.

1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test each pair of twisted pair cable for open and short circuits.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.10 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with the State's telecommunications and LAN equipment and service suppliers.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA-568-C.1, when tested according to test procedures of this standard.

B. Telecommunications Pathways and Spaces: Comply with TIA-569-D.

C. Grounding: Comply with TIA-607-B.

2.2 GENERAL CABLE CHARACTERISTICS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with the applicable standard and NFPA 70 for the following types:

1. Communications, Plenum Rated:

a. Type CMP complying with UL 1685 or Type CMP in listed plenum communications raceway or Type CMP in listed cable routing assembly.
b. Type CM, Type CMG, Type CMP, Type CMR, or Type CMX in metallic conduit installed according to NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."

2. Communications, Non-Plenum Rated:

a. Type CMR complying with UL 1666 and ICEA S-103-701.
b. Type CMP or Type CMR in listed plenum or riser communications raceway.
c. Type CMP or Type CMR in metallic conduit installed according to NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."

B. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

C. RoHS compliant.

2.3 CATEGORY 6 TWISTED PAIR CABLE

A. Category 6 Twisted Pair Cable: Four-pair, balanced -twisted pair cable, with internal spline, certified to meet transmission characteristics of Category 6 cable at frequencies up to 250 MHz.

B. Panduit or DMV approved equal.

C. Standard: Comply with NEMA WC 66/ICEA S-116-732 and TIA-568-C.2 for Category 6 cables.

D. Conductors: 100-ohm, 23 AWG solid copper.

E. Provide documentation demonstrating compliance with sustainable design principles, emphasizing the reduction or elimination of lead content in materials to align with environmental standards.

F. Shielding/Screening: Shielded twisted pairs (FTP).

G. Cable Rating: Plenum.

H. Jacket: Yellow thermoplastic.

2.4 TWISTED PAIR CABLE HARDWARE

A. Twisted Pair Cable Hardware: Hardware designed to connect, splice, and terminate twisted pair copper communications cable.

B. Panduit or DMV approved equal

C. General Requirements for Twisted Pair Cable Hardware:

1. Comply with the performance requirements of Category 5e or Category 6 depending on application.
2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
3. Cables shall be terminated with connecting hardware of same category or higher.
4. BLUE Panduit Mini-Jack ® Category 6 Modular Jacks, configured 568B

D. Source Limitations: Obtain twisted pair cable hardware from single source from single manufacturer.

E. Connecting Blocks:

1. 110-style IDC for Category 5e.
2. 66-style IDC for Category 5e.
3. 110-style IDC for Category 6.
4. Provide blocks for the number of cables terminated on the block, plus 25 percent spare, integral with connector bodies, including plugs and jacks where indicated.
5. Number of Terminals per Field: One for each conductor in assigned cables.

F. Patch Panel: Modular panels housing numbered jack units with IDC-type connectors at each jack location for permanent termination of pair groups of installed cables.

1. Features:

a. Universal T568A and T568B wiring labels.
b. Labeling areas adjacent to conductors.
c. Replaceable connectors.

d. 24 or 48 ports.

2. Construction: 16-gauge steel and mountable on 19-inch (483 mm) equipment racks.
3. Number of Jacks per Field: One for each four-pair cable indicated conductor group of indicated cables, plus spares and blank positions adequate to suit specified expansion criteria.

G. Plugs and Plug Assemblies:

1. Male; eight position; color-coded modular telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
2. Standard: Comply with TIA-568-C.2.
3. BLUE Panduit Mini-Jack ® Category 6 Modular Jacks, configured 568B
4. Marked to indicate transmission performance.

H. Jacks and Jack Assemblies:

1. Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
2. Designed to snap-in to a patch panel or cover plate.
3. Standard: Comply with TIA-568-C.2.
4. BLUE Panduit Mini-Jack ® Category 6 Modular Jacks, configured 568B
5. BLUE “The Mini-Com ® Cat 6 UTP RJ45 TG Jack Module”
6. Marked to indicate transmission performance.

I. Cover Plate:

1. Two or Four port, vertical single gang cover plates designed to mount to single gang wall boxes.
2. Plastic Cover Plate: High-impact plastic. Coordinate color with Section 26 05 33.16 "Boxes and Covers for Electrical Systems."
3. For use with snap-in jacks accommodating any combination of twisted pair, optical fiber, and coaxial work area cords.

a. Flush mounting jacks, positioning the cord at a 45-degree angle.

J. Legend:

1. Machine printed, in the field, using adhesive-tape label.
2. Snap-in, clear-label covers and machine-printed paper inserts.

2.5 CABLE MANAGEMENT SYSTEM

A. Cable Management System: Computer-based cable management system, with integrated database and graphic capabilities.

B. Document physical characteristics by recording the network, TIA details, and connections between equipment and cable.

C. Information shall be presented in database view, schematic plans, or technical drawings.

1. AutoCAD drawing software shall be used as drawing and schematic plans software.

D. System shall interface with the following testing and recording devices:

1. Direct upload tests from circuit testing instrument into the personal computer.
2. Direct download circuit labeling into labeling printer.

2.6 IDENTIFICATION PRODUCTS

A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.7 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory test cables on reels according to TIA-568-C.1.

C. Factory test twisted pair cables according to TIA-568-C.2.

D. Cable will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 WIRING METHODS

A. Routing:

1. Install cables in raceways and cable trays, except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, attics, and gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables, except in unfinished spaces.

a. Install plenum cable in environmental air spaces, including plenum ceilings.
b. Comply with requirements for raceways and boxes specified in Section 27 05 28 "Pathways for Communications Systems."

2. Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

B. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools. Install conductors parallel with or at right angles to sides and back of enclosure.

3.2 INSTALLATION OF PATHWAYS

A. Comply with requirements for demarcation point, cabinets, and racks specified in Section 27 11 00 "Communications Equipment Room Fittings."

B. Comply with Section 27 05 28 "Pathways for Communications Systems."

C. Comply with Section 26 05 29 "Hangers and Supports for Electrical Systems."

D. Comply with Section 26 05 36 "Cable Trays for Electrical Systems."

3.3 INSTALLATION OF TWISTED PAIR HORIZONTAL CABLES

A. Comply with NECA 1 and NECA/BICSI 568.

B. General Requirements for Cabling:

1. Comply with TIA-568-C.0, TIA-568-C.1, and TIA-568-C.2.
2. Comply with BICSI's "Information Transport Systems Installation Methods Manual (ITSIMM), Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section.
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. Do not untwist twisted pair cables more than 1/2 inch (12 mm) from the point of termination to maintain cable geometry.
5. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
6. MUTOA shall not be used as a cross-connect point.
7. Consolidation points may be used only for making a direct connection to equipment outlets:

    a. Do not use consolidation point as a cross-connect point, as a patch connection, or for direct connection to workstation equipment.
    b. Locate consolidation points for twisted pair cables at least 49 feet (15 m) from communications equipment room.

8. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
9. Install lacing bars to restrain cables, prevent straining connections, and prevent bending cables to smaller radii than minimums recommended by manufacturer.
10. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI Information Transport Systems Installation Methods Manual, Ch. 5,

"Copper Structured Cabling Systems," "Cable Termination Practices" Section. Use lacing bars and distribution spools.

11. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation, and replace it with new cable.
12. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
13. In the communications equipment room, install a 10-foot- (3-m-) long service loop on each end of cable.
14. Pulling Cable: Comply with BICSI Information Transport Systems Installation Methods Manual, Ch. 5, "Copper Structured Cabling Systems," "Pulling and Installing Cable" Section. Monitor cable pull tensions.

C. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend twisted pair cabling, not in a wireway or pathway, a minimum of 8 inches (200 mm) above ceilings by cable supports not more than 60 inches (1524 mm) apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

D. Installation of Cable Routed Exposed under Raised Floors:

1. Install plenum-rated cable only.
2. Install cabling after the flooring system has been installed in raised floor areas.
3. Coil cable 6 feet (1800 mm) long not less than 12 inches (300 mm) in diameter below each feed point.

E. Group connecting hardware for cables into separate logical fields.

F. Separation from EMI Sources:

1. Comply with recommendations from BICSI's "Telecommunications Distribution Methods Manual" and TIA-569-D for separating unshielded copper communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches (300 mm).
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches (600 mm).

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches (64 mm).
b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches (150 mm).
c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches (300 mm).

4. Separation between communications cables in grounded metallic raceways, power lines, and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches (76 mm).
c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches (150 mm).

5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

3.4 FIRESTOPPING

A. Comply with requirements in Section 07 84 13 "Penetration Firestopping."

B. Comply with TIA-569-D, Annex A, "Firestopping."

C. Comply with "Firestopping Systems" Article in BISCI's "Telecommunications Distribution Methods Manual."

3.5 GROUNDING

A. Comply with requirements in Section 26 05 26 "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.

B. Install grounding according to the "Grounding, Bonding, and Electrical Protection" chapter in BICSI's "Telecommunications Distribution Methods Manual."

C. Comply with TIA-607-B and NECA/BICSI-607.

D. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall, allowing at least a 2-inch (50-mm) clearance behind the grounding bus bar. Connect grounding bus bar to suitable electrical building ground, using a minimum No. 4 AWG grounding electrode conductor.

E. Bond metallic equipment to the grounding bus bar, using not smaller than a No. 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA-606-B. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

1. Administration Class: Class 1.
2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.

B. Paint and label colors for equipment identification shall comply with TIA-606-B for Class 2 level of administration, including optional identification requirements of this standard.

C. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

D. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.

E. Cable and Wire Identification:

1. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at the device if wire color is consistent with associated wire connected and numbered within panel or cabinet.
3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet (4.5 m).
4. Label each terminal strip, and screw terminal in each cabinet, rack, or panel.
    a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group, extended from a panel or cabinet to a building-mounted device, with the name and number of a particular device.
    b. Label each unit and field within distribution racks and frames.
5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and -connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

F. Labels shall be preprinted or computer-printed type, with a printing area and font color that contrast with cable jacket color but still comply with TIA-606-B requirements for the following:

1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.7 FIELD QUALITY CONTROL

A. Acceptance Testing Preparation:

1. Verify that all systems and components are installed in accordance with project specifications and industry standards.
2. Ensure that testing equipment is calibrated and ready for use, meeting all relevant standards.
3. Confirm that all connections, terminations, and labels are accurate and complete.
4. Prepare a detailed test plan, including acceptance criteria and procedures, and share it with relevant stakeholders.
5. Document any discrepancies or issues identified during preparation and address them before testing begins.

B. Field tests and inspections must be witnessed by the State.

C. Tests and Inspections:

1. Visually inspect jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA-568-C.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test twisted pair cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.

    a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

D. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similarly to Table 10.1 in BICSI's "Telecommunications Distribution Methods Manual," or shall be transferred from the instrument to the computer, saved as text files, printed, and submitted.

E. Nonconforming Work:

1. End-to-end cabling will be considered defective if it does not pass tests and inspections.
2. Remove and replace cabling where test results indicate that they do not comply with specified requirements.

F. Collect, assemble, and submit test and inspection reports.

G. Manufacturer Services:

1. Engage factory-authorized service representative to support field tests and inspections.

3.8 MAINTENANCE

A. Software Service Agreement:

1. Technical Support: Beginning at Beneficial Occupancy, verify that software service agreement includes software support for two years.
2. Upgrade Service: At Beneficial Occupancy, update software to latest version. Install and program software upgrades that become available within two years from date of Beneficial Occupancy.

    a. Upgrade Notice: No fewer than 30 days to allow the State to schedule and access the system and to upgrade computer equipment if necessary.

3. Upgrade Reports: Prepare report after each update, documenting upgrades installed.

END OF SECTION 27 15 13

SECTION 28 15 23

INTERCOM ENTRY SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Digital audio intercom entry systems.
2. Digital audio-video intercom entry systems.

B. Related Requirements:

1. Section 26 00 11 "Facility Performance Requirements for Electrical" for seismic-load, wind-load, acoustical, and other field conditions applicable to Work specified in this Section.
2. Section 28 00 10 "Supplemental Requirements for Electronic Safety and Security" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Coordination Meeting(s): For intercom entry system. Conduct meeting(s) as videoconference or at Project site before beginning construction. Coordinate with DMV for meeting method.

1. Attendees: Installers, fabricators, representatives of manufacturers, representatives from telecommunications, the State's security representatives and administrants for field tests and inspections. Notify the State's Commissioning Authority of scheduled meeting dates.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Digital audio intercom entry systems.
2. Digital audio-video intercom entry systems.

B. Shop Drawings:

1. Project general notes.
2. Device layout.
3. Block diagram and cable/conduit routing.
4. System communications details.

5. System mounting details.
6. Secondary power calculations.

C. Field Quality-Control Submittals:

1. Field quality-control reports.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturers' Published Instructions: Record copy of official installation and testing instructions issued to Installer by manufacturer for the following:

1. Installation and startup instructions for intercom entry systems.
2. Manufacturer's recommended tests and inspections for intercom entry systems.

B. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Contracts:

1. Software and firmware service agreement.

B. Warranty documentation.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Special Tools: Furnish to the State proprietary equipment, keys, and software required to operate, maintain, repair, adjust, or implement future changes to intercom entry system, that are packaged with protective covering for storage on-site and identified with labels describing contents.

1.7 WARRANTY

A. Special Installer Extended Warranty: Installer warrants that fabricated and installed intercom entry system perform in accordance with specified requirements and agrees to repair or replace components or products that fail to perform as specified within extended-warranty period.

1. Extended-Warranty Period: Two years from date of Beneficial Occupancy; full coverage for labor, materials, and equipment.

PART 2 - PRODUCTS

2.1 DIGITAL AUDIO INTERCOM ENTRY SYSTEMS

A. Description: This category covers digital audio intercom entry systems, together with controls and accessories for use with such operators, and similar devices.

B. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria: UL CCN ALVY; including UL 294.

C. Options:

1. Operating Temperature: Minus 29 to plus 150 deg F (Minus 34 to plus 65 deg C).
2. Input Power: 18 to 24 V(dc).
3. Connectivity: Hardwired.
4. Minimum Ring Voltage: 25 V(ac rms).
5. Maximum Ring Voltage: 90 V(ac rms).
6. Speaker Volume: Approximately 70 dB maximum at 1 m.
7. Materials: Stainless steel.
8. Finishes: Coordinate with DMV
9. Climate: Indoor and outdoor.
10. Mounting: Devices must be wall and desk mounted.
11. Push-to-talk button.

D. Accessories:

1. Recessed back box.
2. External keypad.
3. Mounting adaptor plate.
4. Mullion mounting bracket.
5. Desk stand.

2.2 DIGITAL AUDIO-VIDEO INTERCOM ENTRY SYSTEMS

A. Description: This category covers digital audio-video intercom entry systems, together with controls and accessories for use with such operators, and similar devices.

B. AI Phone or DMV approved equal.

C. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria: UL CCN ALVY; including UL 294.

D. Options:

1. Operating Temperature: Minus 29 to plus 150 deg F (Minus 34 to plus 65 deg C).
2. Input Power: 18 to 24 V(dc).
3. Connectivity: Hardwired.
4. Minimum Ring Voltage: 25 V(ac rms).
5. Maximum Ring Voltage: 90 V(ac rms).
6. Speaker Volume: Approximately 70 dB maximum at 1 m.
7. Materials: Stainless steel.
8. Finishes: Coordinate with DMV
9. Climate: Indoor and outdoor.
10. Mounting: Devices must be wall mounted.
11. Video Camera:

    a. Display: 11 inch (279 mm) full-color
    b. Camera Input Power: 12 V(dc) adapter.
    c. Camera Field of View: 80 degrees horizontal, 60 degrees vertical, and 100 degrees diagonal.
    d. Camera Tilt/Swivel Adjustment: Vertical plus-or-minus 20 degrees; horizontal plus-or-minus 30 degrees.

E. Accessories:

1. Recessed back box.
2. External keypad.
3. Mounting adaptor plate.
4. Mullion mounting bracket.
5. Desk stand.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's published instructions.

B. Interfaces with Other Work:

1. Coordinate installation of new products for intercom entry systems with existing conditions.

3.2 FIELD QUALITY CONTROL

A. Acceptance Testing Preparation:

1. Verify that all systems, equipment, and connections are installed per project specifications.
2. Ensure that testing equipment is calibrated and ready for use according to industry standards.

3. Confirm proper functioning of all components prior to testing commencement.
4. Provide documentation and report any discrepancies or issues discovered during preparation.

B. Field tests and inspections must be witnessed by engineer of record

C. Tests and Inspections:

1. Perform manufacturer's recommended tests and inspections.

D. Nonconforming Work:

1. System will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

E. Collect, assemble, and submit test and inspection reports.

3.3 SYSTEM STARTUP

A. Perform startup service.

1. Complete installation and startup checks in accordance with manufacturer's published instructions.

3.4 PROTECTION

A. After installation, protect intercom entry system from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by the State.

3.5 MAINTENANCE

A. Software and Firmware Service Agreement:

1. Technical Support: Beginning at Beneficial Occupancy, verify that software and firmware service agreement includes software and firmware support for two years.
2. Upgrade Service: At Beneficial Occupancy, update software and firmware to latest version. Install and program software and firmware upgrades that become available within two years from date of Beneficial Occupancy.

a. Upgrade Notice: No fewer than 30 days to allow the State to schedule and access the system.

3. Upgrade Reports: Prepare report after each update, documenting upgrades installed.

END OF SECTION 28 15 23

SECTION 28 31 00

INTRUSION DETECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Intrusion detection with communication links to perform monitoring, alarm, and control functions.
2. Integration of other electronic and electrical systems and equipment.

B. Related Sections:

1. Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" for power cabling between master control units and field-mounted devices and control units.
2. Section 27 13 13 "Communications Copper Backbone Cabling" for Category 5e, 6, and 7 backbone (riser-rated) cabling.
3. Section 27 13 23 "Communications Optical Fiber Backbone Cabling" for multi- and single-mode backbone (riser-rated) optical fiber.
4. Section 27 15 13 "Communications Copper Horizontal Cabling" for Category 5e, 6, and 7 horizontal (general use, riser-, and plenum-rated) cabling.
5. Section 27 15 23 "Communications Optical Fiber Horizontal Cabling" for multi- and single-mode horizontal (general use, riser-, and plenum-rated) optical fiber.
6. Section 28 13 00 "Access Control System Software and Database Management" for applications, interfaces, and workstations.
7. Section 28 31 21 "Perimeter Security Systems" for outdoor intrusion detection devices, including lighting and communications associated with chain-link fence gates.
8. Section 28 20 00 "Video Surveillance" for CCTV cameras that are used as devices for video motion detection.

1.2 DEFINITIONS

A. CCTV: Closed-circuit television.

B. PIR: Passive infrared.

C. RFI: Radio-frequency interference.

D. UPS: Uninterruptible power supply.

E. Control Unit: System component that monitors inputs and controls outputs through various circuits.

F. Master Control Unit: System component that accepts inputs from other control units and may also perform control-unit functions. The unit has limited capacity for the number of protected zones and is installed at an unattended location or at a location where it is not the attendant's primary function to monitor the security system.

G. Monitoring Station: Facility that receives signals and has personnel in attendance at all times to respond to signals. A central station is a monitoring station that is listed.

H. Protected Zone: A protected premises or an area within a protected premises that is provided with means to prevent an unwanted event.

I. Standard Intruder: A person who weighs 100 lb (45 kg) or less and whose height is 60 inches (1525 mm) or less; dressed in a long-sleeved shirt, slacks, and shoes unless environmental conditions at the site require protective clothing.

J. Standard-Intruder Movement: Any movement, such as walking, running, crawling, rolling, or jumping, of a "standard intruder" in a protected zone.

K. Systems Integration: The bringing together of components of several systems containing interacting components to achieve indicated functional operation of combined systems.

L. Zone. A defined area within a protected premises. It is a space or area for which an intrusion must be detected and uniquely identified. The sensor or group of sensors must then be assigned to perform the detection, and any interface equipment between sensors and communication must link to master control unit.

1.3 ACTION SUBMITTALS

A. Product Data: Components for sensing, detecting, systems integration, and control, including dimensions and data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: Detail assemblies of standard components that are custom assembled for specific application on this Project.

1. Functional Block Diagram: Show single-line interconnections between components including interconnections between components specified in this Section and those furnished under other Sections. Indicate methods used to achieve systems integration. Indicate control, signal, and data communication paths and identify programmable logic controllers networks and control interface devices and media to be used. Describe characteristics of network and other data communication lines.

    a. Indicate methods used to achieve systems integration.
    b. Indicate control, signal, and data communication paths and identify PLCs, networks, control interface devices, and media to be used.
    c. Describe characteristics of network and other data communication lines.
    d. Describe methods used to protect against power outages and transient voltages including types and ratings of isolation and surge suppression

devices used in data, communication, signal, control, and ac and dc power circuits.

2. Raceway Riser Diagrams: Detail raceway runs required for intrusion detection and for systems integration. Include designation of devices connected by raceway, raceway type and size, and type and size of wire and cable fill for each raceway run.
3. UPS: Sizing calculations.
4. Site and Floor Plans: Indicate final outlet and device locations, routing of raceways, and cables inside and outside the building. Include room layout for master control-unit console, terminal cabinet, racks, and UPS.
5. Master Control-Unit Console Layout: Show required artwork and device identification.
6. Device Address List: Coordinate with final system programming.
7. System Wiring Diagrams: Include system diagrams unique to Project. Show connections for all devices, components, and auxiliary equipment. Include diagrams for equipment and for system with all terminals and interconnections identified.
8. Details of surge-protection devices and their installation.
9. Sensor detection patterns and adjustment ranges.

C. Design Data: Include method of operation and supervision of each component and each type of circuit. Show sequence of operations for manually and automatically initiated system or equipment inputs. Description must cover this specific Project; manufacturer's standard descriptions for generic systems are unacceptable.

D. Samples for Initial Selection: For units with factory-applied color finishes.

E. Samples for Verification: For each type of exposed finish required.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For intrusion detection systems integrator.

B. Field quality-control reports.

1. Anchor inspection reports documenting inspections of built-in and cast-in anchors.

C. Product Warranty: Sample of special warranty.

D. Field Test Reports: Test plan and report defining all tests required to ensure that system meets technical, operational, and performance specifications within 60 days of date of Contract award.

E. Evaluation Reports: Examination reports documenting inspections of substrates, areas, and conditions.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For intrusion detection system to include in emergency, operation, and maintenance manuals. Include the following:

1. Data for each type of product, including features and operating sequences, both automatic and manual.
2. Master control-unit hardware and software data.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Intrusion Detection Devices: Furnish quantity equal to five percent of the number of units of each type installed, but no fewer than one of each type.
2. Fuses: Three of each kind and size.
3. Tool Kit: Provide Three sets of tools for use with security fasteners, each packaged in a compartmented kit configured for easy handling and storage.
4. Security Fasteners: Furnish no fewer than 1 box for every 50 boxes or fraction thereof, of each type and size of security fastener installed.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:

1. An employer of workers, at least one of whom is a Certified Alarm Technician, Level 1.
2. Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
3. Layout Responsibility: Preparation of Shop Drawings and cabling administration Drawings, cabling administration Drawings, and field testing program development by a Technician.
4. Installation Supervision: Installation shall be under the direct supervision of Level 2 Commercial Installer, who shall be present at all times when Work of this Section is performed at Project site.
5. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

B. Intrusion Detection Systems Integrator Qualifications: An experienced intrusion detection equipment supplier and Installer who has completed systems integration work for installations 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.

1. At least one of whom is a Certified Systems Integrator.

C. Testing Agency Qualifications: Certified by BICSI.

1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

1.8 PROJECT CONDITIONS

A. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Altitude: Sea level to 4000 feet (1220 m).
2. Master Control Unit: Rated for continuous operation in an ambient of 60 to 85 deg F (16 to 29 deg C) and a relative humidity of 20 to 80 percent, noncondensing.
3. Interior, Controlled Environment: System components, except master control unit, installed in temperature-controlled interior environments shall be rated for continuous operation in ambients of 36 to 122 deg F (2 to 50 deg C) dry bulb and 20 to 90 percent relative humidity, noncondensing.
4. Interior, Uncontrolled Environment: System components installed in non-temperature-controlled interior environments shall be rated for continuous operation in ambients of 0 to 122 deg F (minus 18 to plus 50 deg C) dry bulb and 20 to 90 percent relative humidity, noncondensing.
5. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambients of minus 30 to plus 122 deg F (minus 34 to plus 50 deg C) dry bulb and 20 to 90 percent relative humidity, condensing. Comply with UL 294 and UL 639 for outdoor-use equipment. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph (137 km/h) and snow cover up to 24 inches (610 mm) thick.
6. Hazardous Environment: System components located in areas where fire or explosion hazards may exist because of flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers or flyings shall be rated, listed, and installed according to NFPA 70.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer and Installer agree to repair or replace components of intrusion detection devices and equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Beneficial Occupancy.

PART 2 - PRODUCTS

2.1 FUNCTIONAL DESCRIPTION OF SYSTEM

A. Description: Hard-wired, modular, microprocessor-based controls, intrusion sensors and detection devices, and communication links to perform monitoring, alarm, and control functions.

B. Supervision: System components shall be continuously monitored for normal, alarm, supervisory, and trouble conditions. Indicate deviations from normal conditions at any location in system. Indication includes identification of device or circuit in which deviation has occurred and whether deviation is an alarm or malfunction.

1. Alarm Signal: Display at master control unit and actuate audible and visual alarm devices.
2. Trouble Condition Signal: Distinct from other signals, indicating that system is not fully functional. Trouble signal shall indicate system problems such as battery failure, open or shorted transmission line conductors, or control-unit failure.
3. Supervisory Condition Signal: Distinct from other signals, indicating an abnormal condition as specified for the particular device or control unit.

C. System Control: Master control unit shall directly monitor intrusion detection units and connecting wiring.

D. System Control: Master control unit shall directly monitor intrusion detection devices, perimeter detection units, control units associated with perimeter detection units, and connecting wiring in a multiplexed distributed control system or as part of a network.

E. System shall automatically reboot program without error or loss of status or alarm data after any system disturbance.

F. Operator Commands:

1. Help with System Operation: Display all commands available to operator. Help command, followed by a specific command, shall produce a short explanation of the purpose, use, and system reaction to that command.
2. Acknowledge Alarm: To indicate that alarm message has been observed by operator.
3. Place Protected Zone in Access: Disable all intrusion-alarm circuits of a specific protected zone. Tamper circuits may not be disabled by operator.
4. Place Protected Zone in Secure: Activate all intrusion-alarm circuits of a protected zone.
5. Protected Zone Test: Initiate operational test of a specific protected zone.
6. System Test: Initiate system-wide operational test.
7. Print reports.

G. Timed Control at Master Control Unit: Allow automatically timed "secure" and "access" functions of selected protected zones.

H. Automatic Control of Related Systems: Alarm or supervisory signals from certain intrusion detection devices control the following functions in related systems:

1. Switch selected lights.
2. Shift elevator control to a different mode.
3. Open a signal path between certain intercommunication stations.
4. Shift sound system to "listening mode" and open a signal path to certain system speakers.
5. Switch signal to selected monitor from CCTV camera in vicinity of sensor signaling an alarm.

I. Printed Record of Events: Print a record of alarm, supervisory, and trouble events on system printer. Sort and report by protected zone, device, and function. When master control unit receives a signal, print a report of alarm, supervisory, or trouble condition. Report type of signal (alarm, supervisory, or trouble), protected zone description, date, and time of occurrence. Differentiate alarm signals from other indications. When system is reset, report reset event with the same information concerning device, location, date, and time. Commands shall initiate the reporting of a list of current alarm, supervisory, and trouble conditions in system or a log of past events.

J. Response Time: Two seconds between actuation of any alarm and its indication at master control unit.

K. Circuit Supervision: Supervise all signal and data transmission lines, links with other systems, and sensors from master control unit. Indicate circuit and detection device faults with both protected zone and trouble signals, sound a distinctive audible tone, and illuminate an LED. Maximum permissible elapsed time between occurrence of a trouble condition and indication at master control unit is 20 seconds. Initiate an alarm in response to opening, closing, shorting, or grounding of a signal or data transmission line.

L. Programmed Secure-Access Control: System shall be programmable to automatically change status of various combinations of protected zones between secure and access conditions at scheduled times. Status changes may be preset for repetitive, daily, and weekly; specially scheduled operations may be preset up to a year in advance. Manual secure-access control stations shall override programmed settings.

M. Manual Secure-Access Control: Coded entries at manual stations shall change status of associated protected zone between secure and access conditions.

2.2 SYSTEM COMPONENT REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Control Units, Devices, and Communications with Monitoring Station: Listed and labeled by a qualified testing agency for compliance with SIA CP-01.

C. FM Global Compliance: FM-Approved and -labeled intrusion detection devices and equipment.

D. Comply with NFPA 70.

E. Compatibility: Detection devices and their communication features, connecting wiring, and master control unit shall be selected and configured with accessories for full compatibility with the following equipment:

1. Door hardware specified in Section 08 71 00 "Door Hardware."
2. Door hardware specified in Section 08 71 11 "Door Hardware (Descriptive Specification)."
3. Elevators specified in Section 14 21 00 "Electric Traction Elevators."
4. Elevators specified in Section 14 24 00 "Hydraulic Elevators."
5. Lighting controls specified in Section 26 09 23 "Lighting Control Devices."
6. Lighting controls specified in Section 26 09 43.16 "Addressable-Luminaire Lighting Controls" and Section 26 09 43.23 "Relay-Based Lighting Controls."
7. Intercom and program systems specified in Section 27 51 23.20 "Commercial Intercommunications and Program Systems."
8. Intercom and program systems specified in Section 27 51 23.50 "Educational Intercommunications and Program Systems."
9. Public address and mass notification systems specified in Section 27 51 16 "Public Address and Mass Notification Systems."
10. Access control system specified in Section 28 13 00 "Access Control System Software and Database Management."
11. Fire alarm system specified in Section 28 46 21.11 "Addressable Fire-Alarm Systems."
12. Fire alarm system specified in Section 28 46 21.13 "Conventional Fire-Alarm Systems."
13. Perimeter security system specified in Section 28 31 21 "Perimeter Security Systems."
14. Video surveillance system specified in Section 28 20 00 "Video Surveillance."

F. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor entry connection to components.

1. Minimum Protection for Power Lines 120 V and More: Auxiliary panel suppressors complying with requirements in Section 26 43 13 "Surge Protection for Low-Voltage Electrical Power Circuits."
2. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Lines: Listed and labeled by a qualified testing agency for compliance with NFPA 731.

G. Intrusion Detection Units: Listed and labeled by a qualified testing agency for compliance with UL 639.

H. Interference Protection: Components shall be unaffected by radiated RFI and electrical induction of 15 V/m over a frequency range of 10 to 10,000 MHz and conducted

interference signals up to 0.25-V rms injected into power supply lines at 10 to 10,000 MHz.

I. Tamper Protection: Tamper switches on detection devices, control units, annunciators, pull boxes, junction boxes, cabinets, and other system components shall initiate a tamper-alarm signal when unit is opened or partially disassembled and when entering conductors are cut or disconnected. Master control-unit alarm display shall identify tamper alarms and indicate locations.

J. Self-Testing Devices: Automatically test themselves periodically, but not less than once per hour, to verify normal device functioning and alarm initiation capability. Devices transmit test failure to master control unit.

K. Antimasking Devices: Automatically check operation continuously or at intervals of a minute or less, and use signal-processing logic to detect blocking, masking, jamming, tampering, or other operational dysfunction. Devices transmit detection of operational dysfunction to master control unit as an alarm signal.

L. Addressable Devices: Transmitter and receivers shall communicate unique device identification and status reports to master control unit.

M. Remote-Controlled Devices: Individually and remotely adjustable for sensitivity and individually monitored at master control unit for calibration, sensitivity, and alarm condition.

2.3 ENCLOSURES

A. Interior Sensors: Enclosures that protect against dust, falling dirt, and dripping noncorrosive liquids.

B. Interior Electronics: NEMA 250, Type 12.

C. Exterior Electronics: NEMA 250, Type 4X, stainless steel.

D. Corrosion Resistant: NEMA 250, Type 4X, stainless steel.

E. Screw Covers: Where enclosures are readily accessible, secure with security fasteners of type appropriate for enclosure.

2.4 SECURE AND ACCESS DEVICES

A. Keypad and Display Module: Arranged for entering and executing commands for system-status changes and for displaying system-status and command-related data.

B. Key-Operated Switch: Change protected zone between secure and access conditions.

2.5 DOOR AND WINDOW SWITCHES

A. Description: Balanced-magnetic switch, complying with UL 634, installed on frame with integral overcurrent device to limit current to 80 percent of switch capacity. Bias magnet and minimum of three encapsulated reed switches shall resist compromise from introduction of foreign magnetic fields.

B. Flush-Mounted Switches: Unobtrusive and flush with surface of door and window frame.

C. Overhead Door Switch: Balanced-magnetic type, listed for outdoor locations, and having door-mounted magnet and floor-mounted switch unit.

D. Remote Test: Simulate movement of actuating magnet from master control unit.

2.6 PIR SENSORS

A. Listed and labeled by a qualified testing agency for compliance with SIA PIR-01.

B. Description: Sensors detect intrusion by monitoring infrared wavelengths emitted from a human body within their protected zone and by being insensitive to general thermal variations.

1. Wall-Mounted Unit Maximum Detection Range: 125 percent of indicated distance for individual units and not less than 50 feet (15 m). Provide adjustable coverage pattern as indicated.
2. Ceiling-Mounted Unit Spot-Detection Pattern: Full 360-degree conical.
3. Ceiling-Mounted Unit Pattern Size: 84-inch (2135-mm) diameter at floor level for units mounted 96 inches (2440 mm) above floor; 18-foot (5.5-m) diameter at floor level for units mounted 25 feet (7.6 m) above floor.

C. Device Performance:

1. Sensitivity: Adjustable pattern coverage to detect a change in temperature of 2 deg F (1 deg C) or less, and standard-intruder movement within sensor's detection patterns at any speed between 0.3 to 7.5 fps (0.09 to 2.3 m/s) across two adjacent segments of detector's field of view.
2. Test Indicator: LED test indicator that is not visible during normal operation. When visible, indicator shall light when sensor detects an intruder. Locate test enabling switch under sensor housing cover.
3. Remote Test: When initiated by master control unit, start a test sequence for each detector element that simulates standard-intruder movement within sensor's detection patterns, causing an alarm.

2.7 MICROWAVE INTRUSION DETECTORS (INTERIOR)

A. Device Performance: Microwave transmitter establishes an electromagnetic field in an adjustable detection pattern and detects intrusion by monitoring changes in that pattern.

1. Sensitivity: Adjustable, able to detect standard-intruder movement within sensor's detection pattern at any speed between 0.3 to 7.5 fps (0.09 to 2.3 m/s). Sensor sensitivity adjustments shall be accessible only when sensor housing is removed, and sensors shall comply with 47 CFR 15.
2. Activation Indicator: LED indicator shall not be visible during normal operation. Indicator shall light when sensor detects a standard intruder. Locate test-enabling switch under sensor housing cover.
3. Remote Test: When initiated by master control unit, start a test sequence for each detector element that simulates standard-intruder movement within sensor's detection patterns, causing an alarm.

2.8 ACOUSTIC-TYPE, GLASS-BREAK SENSORS

A. Listed and labeled by a qualified testing agency for compliance with SIA GB-01.

B. Device Performance: Detect unique, airborne acoustic energy spectrum caused by breaking glass.

1. Sensor Element: Microprocessor-based, digital device to detect breakage of plate, laminate, tempered, and wired glass while rejecting common causes of false alarms. Detection pattern shall be at least a 20-foot (6-m) range.
2. Hookup Cable: Factory installed, not less than 72 inches (1830 mm).
3. Activation Indicator: LED on sensor housing that lights when responding to vibrations, remaining on until manually reset at sensor control unit or at master control unit.
4. Control Unit: Integral with sensor housing or in a separate assembly, locally adjustable by control under housing cover.
5. Glass-Break Simulator: A device to induce frequencies into protected glass pane that simulate breaking glass without causing damage to glass.

2.9 PIEZOELECTRIC-TYPE, GLASS-BREAK SENSORS

A. Listed and labeled by a qualified testing agency for compliance with SIA GB-01.

B. Device Performance: Detect unique, high-frequency vibrations caused by breaking glass.

1. Sensor Element: Piezoelectric crystals in a housing designed to mount directly to glass surface with adhesive provided by element manufacturer. Circular detection pattern, with at least a 60-inch (1525-mm) radius on a continuous glass pane. Sensor element shall not be larger than 4 sq. in. (25.80 sq. cm).
2. Hookup Cable: Factory installed, not less than 72 inches (1830 mm).
3. Activation Indicator: LED on sensor housing that lights when responding to vibrations, remaining on until manually reset at sensor control unit or at master control unit.
4. Control Unit: Integral with sensor housing or in a separate assembly, locally adjustable by control under housing cover.
5. Glass-Break Simulator: A device to induce frequencies into protected glass pane that simulate breaking glass without causing damage to glass.

2.10 VIBRATION SENSORS

A. Listed and labeled by a qualified testing agency for compliance with SIA GB-01.

B. Description: A sensor control unit and piezoelectric crystal sensor elements that are designed to be rigidly mounted to structure being protected.

C. Device Performance: Detects high-frequency vibrations generated by use of such tools as oxyacetylene torches, oxygen lances, high-speed drills and saws, and explosives that penetrate a structure while not responding to any other mechanical vibration.

1. Circular detection pattern, with at least a 72-inch (1830-mm) radius on protected structure.
2. Hookup Cable: Factory installed, not less than 72 inches (1830 mm).
3. Control Unit: Integral with sensor housing or in a separate assembly, locally adjustable by control under housing cover.
4. Glass-Break Simulator: A device to induce frequencies to protected glass pane that simulate breaking glass without causing damage to glass.

2.11 PHOTOELECTRIC SENSORS

A. Device Performance: Detect an interruption of a pulsed, infrared, light beam that links transmitter and receiver.

1. Sensitivity: Detect standard-intruder movement within sensor's detection patterns at any speed of less than 7.5 fps (2.3 m/s) though the beam. Allow installation of multiple sensors within same protected zone that will not interfere with each other.
2. Activation Indicator: LED indicator shall not be visible during normal operation. Indicator shall light when sensor detects a standard intruder. Locate test enabling switch under sensor housing cover.
3. Remote Test: When initiated by master control unit, start a test sequence for each detector element that simulates standard-intruder movement within sensor's detection patterns, causing an alarm.

2.12 MICROWAVE-PIR DUAL-TECHNOLOGY SENSORS

A. Description: Single unit combining a sensor that detects changes in microwave signals and a PIR sensor that detects changes in ambient level of infrared emissions caused by standard-intruder movement within detection pattern.

B. Listed and labeled by a qualified testing agency for compliance with SIA PIR-01.

C. Device Performance: An alarm is transmitted when either sensor detects a standard intruder within a period of three to eight seconds from when the other sensor detects a standard intruder.

1. Minimum Detection Pattern: A room 20 by 30 feet (6 by 9 m).

2. PIR Sensor Sensitivity: Adjustable pattern coverage to detect a change in temperature of 2 deg F (1 deg C) or less, and standard-intruder movement within sensor's detection patterns at any speed between 0.3 to 7.5 fps (0.09 to 2.3 m/s) across two adjacent segments of detector's field of view.
3. Microwave Sensor Sensitivity: Adjustable, able to detect standard-intruder movement within sensor's detection pattern at any speed between 0.3 to 7.5 fps (0.09 to 2.3 m/s). Sensor sensitivity adjustments shall be accessible only when sensor housing is removed, and sensors shall comply with 47 CFR 15.
4. Activation Indicator: LED indicator shall not be visible during normal operation. Indicator shall light when sensor detects a standard intruder. Locate test enabling switch under sensor housing cover.
5. Remote Test: When initiated by master control unit, start a test sequence for each detector element that simulates standard-intruder movement within sensor's detection patterns, causing an alarm.

2.13 DURESS-ALARM SWITCHES/PANIC BUTTON

A. Description: A switch with a shroud over the activating lever that allows an individual to covertly send a duress signal to master control unit, with no visible or audible indication when activated. Switch shall lock in activated position until reset with a key.

1. Minimum Switch Rating: 50,000 operations.
2. Foot Rail: Foot activated, floor mounting.
3. Push Button: Finger activated, suitable for mounting on horizontal or vertical surface.

2.14 VIDEO MOTION SENSORS (INTERIOR)

A. Device Performance: Detect changes in video signal within a user-defined protected zone. Provide an alarm output for each video input.

1. Detect movement within protected zone of standard intruders wearing clothing with a reflectivity that differs from that of background scene by a factor of 2. Reject all other changes in video signal.
2. Modular design that allows for expansion or modification of number of inputs.
3. Controls:

    a. Number of detection zones.
    b. Size of detection zones.
    c. Sensitivity of detection of each protected zone.

4. Mounting: Standard 19-inch (480-mm) rack as described in EIA/ECA 310-E.

2.15 MASTER CONTROL UNIT

A. Description: Supervise sensors and detection subsystems and their connecting communication links, status control (secure or access) of sensors and detector

subsystems, activation of alarms and supervisory and trouble signals, and other indicated functions.

1. System software and programs shall be held in flash electrically erasable programmable read-only memory (EEPROM), retaining the information through failure of primary and secondary power supplies.
2. Include a real-time clock for time annotation of events on the event recorder and printer.
3. Addressable initiation devices that communicate device identity and status.
4. Control circuits for operation of mechanical equipment in response to an alarm.

B. Construction: Desk-mounted console, modular, with separate and independent alarm and supervisory system modules. Alarm-initiating protected zone boards shall be plug-in cards. Arrangements that require removal of field wiring for module replacement are unacceptable.

C. Console Controls and Displays: Arranged for interface between human operator at master control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: LCD, three line(s) of 80 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.
3. Control-Unit Network: Automatic communication of alarm, status changes, commands, and other communications required for system operation. Communication shall return to normal after partial or total network interruption such as power loss or transient event. Total or partial signaling network failures shall identify the failure and record the failure at the annunciator display and at the system printer.
4. Field Device Network: Communicate between the control unit and field devices of the system. Communications shall consist of alarm, network status, and status and control of field-mounted processors. Each field-mounted device shall be interrogated during each interrogation cycle.
5. Operator Controls: Manual switches and push-to-test buttons that do not require a key to operate. Prevent resetting of alarm, supervisory, or trouble signals while alarm or trouble condition persists. Include the following:

    a. Acknowledge alarm.
    b. Silence alarm.
    c. System reset.
    d. LED test.

6. Timing Unit: Solid state, programmable, 365 days.
7. Confirmation: Relays, contactors, and other control devices shall have auxiliary contacts that provide confirmation signals to system for their on or off status. Software shall interpret such signals, display equipment status, and initiate failure signals.
8. Alarm Indication: Audible signal sounds and an LED lights at master control unit identifying the protected zone originating the alarm. Annunciator panel displays a common alarm light and sounds an audible tone.

9. Alarm Indication: Audible signal sounds and a plain-language identification of the protected zone originating the alarm appears on LED or LCD display at master control unit. Annunciator panel displays a common alarm light and sounds an audible tone.
10. Alarm Indication: Audible signal sounds and a plain-language identification of the protected zone originating the alarm appears on LED, LCD or cathode-ray-tube display at master control unit. Annunciator panel alarm light and audible tone identify protected zone signaling an alarm.
11. Alarm activation sounds a bell or siren and strobe.

D. Protected Zones: Quantity of alarm and supervisory zones as indicated, with capacity for expanding number of protected zones by a minimum of 25 percent.

E. Power Supply Circuits: Master control units shall provide power for remote power-consuming detection devices. Circuit capacity shall be adequate for at least a 25 percent increase in load.

F. UPS: UPS shall be sized to provide a minimum of six hours of master control-unit operation.

G. Cabinet: Lockable, steel enclosure arranged so operations required for testing, normal operation, and maintenance are performed from front of enclosure. If more than a single cabinet is required to form a complete control unit, provide exactly matching modular enclosures. Accommodate all components and allow ample gutter space for field wiring. Identify each enclosure by an engraved, laminated, phenolic-resin nameplate. Lettering on enclosure nameplate shall not be less than 1 inch (25 mm) high. Identify, with permanent labels, individual components and modules within cabinets.

H. Transmission to Monitoring Station: A communications device to automatically transmit alarm, supervisory, and trouble signals to the monitoring station, operating over a standard voice grade telephone leased line. Comply with UL 1635.

I. Printout of Events: On receipt of signal, print alarm, supervisory, and trouble events. Identify zone, device, and function. Include type of signal (alarm, supervisory, or trouble) and date and time of occurrence. Differentiate alarm signals from all other printed indications. Also print system reset event, including same information for device, location, date, and time. Commands initiate the printing of a list of existing alarm, supervisory, and trouble conditions in the system and a historical log of events.

2.16 AUDIBLE AND VISUAL ALARM DEVICES

A. Bell: 10 inches (254 mm) in diameter, rated to produce a minimum sound output of 84 dB at 10 feet (3 m) from master control unit.

1. Enclosure: Weather-resistant steel box equipped with tamper switches on cover and on back of box.

B. Klaxon Weatherproof Motor-Driven Hooter: UL listed, rated to produce a minimum sound output of 120 dB at 3 feet (1 m), plus or minus 3 dB, at a frequency of 470 Hz. Rated for intermittent use: two minutes on and five minutes off.

1. Designed for use in industrial areas and in high-noise, severe-weather marine environments.

C. Siren: 30-W speaker with siren driver, rated to produce a minimum sound output of 103 dB at 10 feet (3 m) from master control unit.

1. Enclosure: Weather-resistant steel box with tamper switches on cover and on back of box.

D. Strobe: Xenon light complying with UL 1638, with a clear polycarbonate lens.

1. Light Output: 115 cd, minimum.
2. Flash Rate: 60 per minute.

2.17 SECURITY FASTENERS

A. Operable only by tools produced for use on specific type of fastener by fastener manufacturer or other licensed fabricator. Drive system type, head style, material, and protective coating as required for assembly, installation, and strength.

B. Drive System Types: Pinned Torx-Plus pinned Torx or pinned hex (Allen).

C. Socket Flat Countersunk Head Fasteners:

1. Heat-treated alloy steel, ASTM F835 (ASTM F835M).
2. Stainless steel, ASTM F879 (ASTM F879M), Group 1 CW.

D. Socket Button Head Fasteners:

1. Heat-treated alloy steel, ASTM F835 (ASTM F835M).
2. Stainless steel, ASTM F879 (ASTM F879M), Group 1 CW.

E. Socket Head Cap Fasteners:

1. Heat-treated alloy steel, ASTM A574 (ASTM A574M).
2. Stainless steel, ASTM F837 (ASTM F837M), Group 1 CW.

F. Protective Coatings for Heat-Treated Alloy Steel:

1. Zinc chromate, ASTM F1135, Grade 3 or Grade 4, for exterior applications and interior applications where indicated.
2. Zinc phosphate with oil, ASTM F1137, Grade I, or black oxide unless otherwise indicated.

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 intrusion detection.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations of intrusion detection connections before intrusion detection installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of intrusion detection.

D. Inspect built-in and cast-in anchor installations, before installing intrusion detection, to verify that anchor installations comply with requirements. Prepare inspection reports.

1. Remove and replace anchors where inspections indicate that they do not comply with requirements. Reinspect after repairs or replacements are made.
2. Perform additional inspections to determine compliance of replaced or additional anchor installations. Prepare inspection reports.

E. For material whose orientation is critical for its performance as a ballistic barrier, verify installation orientation.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SYSTEM INTEGRATION

A. Integrate intrusion detection system with the following systems and equipment:

1. Electronic door hardware.
2. Elevators.
3. Network lighting controls.
4. Intercommunications and program systems.
5. Public address and mass notification systems.
6. Access control.
7. Fire-alarm system.
8. Perimeter security system.
9. Video surveillance.

3.3 SYSTEM INSTALLATION

A. Comply with UL 681 and NFPA 731.

B. Equipment Mounting: Install master control unit on finished floor with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.

1. Comply with requirements for seismic-restraint devices.

C. Install wall-mounted equipment, with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.

1. Comply with requirements for seismic-restraint devices.

D. Connecting to Existing Equipment: Verify that existing perimeter security system is operational before making changes or connections.

1. Connect new equipment to existing control panel in existing part of the building.
2. Connect new equipment to existing monitoring equipment at the Supervising Station.
3. Expand, modify, and supplement existing monitoring equipment as necessary to extend existing monitoring functions to the new points. New components shall be capable of merging with existing configuration without degrading the performance of either system.

E. Security Fasteners: Where accessible to inmates, install intrusion detection components using security fasteners with head style appropriate for fabrication requirements, strength, and finish of adjacent materials except that a maximum of two different sets of tools shall be required to operate security fasteners for Project. Provide stainless-steel security fasteners in stainless-steel materials.

3.4 WIRING INSTALLATION

A. Wiring Method: Install wiring in metal raceways according to Section 27 05 28 "Pathways for Communications Systems." Conceal raceway except in unfinished spaces and as indicated. Minimum conduit size shall be 1/2 inch (13 mm). Control and data transmission wiring shall not share conduit with other building wiring systems.

B. Wiring Method: Install wiring in metal raceways according to Section 27 05 28 "Pathways for Communications Systems," except in accessible indoor ceiling spaces and in interior hollow gypsum board partitions where cable may be used. Conceal raceways and wiring except in unfinished spaces and as indicated. Minimum conduit size shall be 1/2 inch (13 mm). Control and data transmission wiring shall not share conduit with other building wiring systems.

C. Wiring Method: Cable, concealed in accessible ceilings, walls, and floors when possible.

D. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Use lacing bars and distribution spools. Separate power-limited and non-power-limited conductors as recommended in writing by manufacturer. Install conductors parallel with or at right angles to sides and back of enclosure. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with intrusion system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

E. Wires and Cables:

1. Conductors: Size as recommended in writing by system manufacturer unless otherwise indicated.
2. 120-V Power Wiring: Install according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" unless otherwise indicated.
3. Control and Signal Transmission Conductors: Install unshielded, twisted-pair cable unless otherwise indicated or if manufacturer recommends shielded cable, according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."
4. Data and Television Signal Transmission Cables: Install according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

F. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

G. Install power supplies and other auxiliary components for detection devices at control units unless otherwise indicated or required by manufacturer. Do not install such items near devices they serve.

H. Identify components with engraved, laminated-plastic or metal nameplate for master control unit and each terminal cabinet, mounted with corrosion-resistant screws.

3.5 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals.

B. Install instructions frame in a location visible from master control unit.

3.6 GROUNDING

A. Ground the master control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to master control unit.

B. Ground system components and conductor and cable shields to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

C. Signal Ground Terminal: Locate at main equipment rack or cabinet. Isolate from power system and equipment grounding. Provide 5-ohm ground. Measure, record, and report ground resistance.

D. Install grounding electrodes of type, size, location, and quantity indicated.

3.7 FIELD QUALITY CONTROL

A. Pretesting: After installation, align, adjust, and balance system and perform complete pretesting to determine compliance of system with requirements in the Contract Documents. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new ones and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results.

1. Report of Pretesting: After pretesting is complete, provide a letter certifying that installation is complete and fully operable; include names and titles of witnesses to preliminary tests.

B. Testing Agency: The State will engage a qualified testing agency to perform tests and inspections.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

D. 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.

E. Tests and Inspections: Comply with provisions in NFPA 731, Ch. 9, "Testing and Inspections."

1. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified.
2. Test Methods: Intrusion detection systems and other systems and equipment that are associated with detection and accessory equipment shall be tested according to Table "Test Methods" and Table "Test Methods of Initiating Devices."

F. Documentation: Comply with provisions in NFPA 731, Ch. 4, "Documentation."

G. Tag all equipment, stations, and other components for which tests have been satisfactorily completed.

3.8 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Beneficial Occupancy, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to 3 visits to Project during other-than-normal occupancy hours for this purpose. Visits for this purpose shall be in addition to any required by warranty.

3.9 DEMONSTRATION

A. Train the State’s maintenance personnel to adjust, operate, and maintain the intrusion detection system. Comply with documentation provisions in NFPA 731, Ch. 4, "Documentation and User Training."

END OF SECTION 28 31 00

SECTION 28 46 21.11

ADDRESSABLE FIRE-ALARM SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Addressable fire-alarm system.
2. Fire-alarm control unit (FACU).
3. Manual fire-alarm boxes.
4. System smoke detectors.
5. Fire-alarm notification appliances.
6. Fire-alarm remote annunciators.
7. Fire-alarm addressable interface devices.
8. Digital alarm communicator transmitters (DACTs).

B. Related Requirements:

1. Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" or Section 26 05 23 "Control Voltage Electrical Power Cables" for cables and conductors for fire-alarm systems.

1.2 DEFINITIONS

A. DACT: Digital alarm communicator transmitter.

B. EMT: Electrical metallic tubing.

C. FACU: Fire-alarm control unit.

D. High-Performance Building: A building that integrates and optimizes on a life-cycle basis all major high-performance attributes, including energy conservation, environment, safety, security, durability, accessibility, cost-benefit, productivity, sustainability, functionality, and operational considerations.

E. Mode: The terms "Active Mode," "Off Mode," and "Standby Mode" are used as defined in the 2007 Energy Independence and Security Act (EISA).

F. NICET: National Institute for Certification in Engineering Technologies.

G. PC: Personal computer.

H. Voltage Class: For specified circuits and equipment, voltage classes are defined as follows:

1. Control Voltage: Listed and labeled for use in remote-control, signaling, and power-limited circuits supplied by a Class 2 or Class 3 power supply having rated output not greater than 150 V and 5 A, allowing use of alternate wiring methods complying with NFPA 70, Article 725.
2. Low Voltage: Listed and labeled for use in circuits supplied by a Class 1 or other power supply having rated output not greater than 1000 V, requiring use of wiring methods complying with NFPA 70, Article 300, Part I.

1.3 ACTION SUBMITTALS

A. Approved Permit Submittal: Submittals must be approved by authorities having jurisdiction prior to submitting them to the State.

B. Product Data: For each type of product, including furnished options and accessories.

1. Include construction details, material descriptions, dimensions, profiles, and finishes.
2. Include rated capacities, operating characteristics, and electrical characteristics.

C. Shop Drawings: For fire-alarm system.

1. Comply with recommendations and requirements in "Documentation" section of "Fundamentals" chapter in NFPA 72.
2. Include plans, elevations, sections, and details, including details of attachments to other Work.
3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
4. Annunciator panel details as required by authorities having jurisdiction.
5. Detail assembly and support requirements.
6. Include voltage drop calculations for notification-appliance circuits.
7. Include battery-size calculations.
8. Include input/output matrix.
9. Include written statement from manufacturer that equipment and components have been tested as a system and comply with requirements in this Section and in NFPA 72.
10. Include performance parameters and installation details for each detector.
11. Verify that each duct detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
12. Provide program report showing that air-sampling detector pipe layout balances pneumatically within airflow range of air-sampling detector.
13. Provide control wiring diagrams for fire-alarm interface to HVAC; coordinate location of duct smoke detectors and access to them.

    a. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators.
    b. Show field wiring and equipment required for HVAC unit shutdown on alarm.
    c. Locate detectors in accordance with manufacturer's written instructions.

d. Show air-sampling detector pipe routing.

14. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits and point-to-point wiring diagrams.

D. Delegated Design Submittal: For notification appliances and smoke and heat detectors, in addition to submittals listed above, indicate compliance with performance requirements and design criteria, including analysis data signed and sealed by qualified professional engineer responsible for their preparation.

1. Drawings showing location of each notification appliance and smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of device.
2. Design Calculations: Calculate requirements for selecting spacing and sensitivity of detection, complying with NFPA 72. Calculate spacing and intensities for strobe signals and sound-pressure levels for audible appliances.
3. Indicate audible appliances required to produce square wave signal per NFPA 72.

E. Deferred Submittal Approval:

1. Systems shown in these design documents establish design intent, are schematic, and are included for reference only. Contractor must provide complete design submittals with justification of life safety elements and/or system.

2. Specialty (State of California Licensed) Engineer or NICET Level III, minimum must Stamp and wet-sign drawings including supporting calculations.

F. California State Fire Marshal (CSFM) Submittal:

1. Submit complete Shop Drawings and Product Data submittal California State Fire Marshal (CSFM). Resolve CSFM comments and obtain deferred approval.

a. All drawings and diagrams; which must include Contractor's title block, complete with drawing title, Contractor's name and address, date including revisions, and preparer's and reviewer's initials.
b. Reviewed set of Fire Alarm Product Data that includes stamp of Engineer of Record.
c. Complete system bill of material with peripheral device back box size information, part numbers, and device mounting height information.
d. Complete equipment fabrication descriptions and dimensions of equipment cabinets. For each building, indicate the equipment cabinet size(s) required to accommodate the specific equipment required to perform the specified functions.
e. Detailed system operational description, with all specification differences and deviations clearly noted and marked.
f. Riser diagram that individually depicts all control panels, annunciators, addressable devices and notification appliances. Field addressable

devices and notification appliances may be grouped together by specific circuit.

g. FACU point-to-point wiring diagrams, specific for each building. Show all interconnecting wiring of components within the FACU and the termination of all initiating and signaling circuits.

h. Complete 1/8" = 1'-0" scale floor plan drawing locating all system devices, and elevation drawing of all equipment at Fire Control Station.

    1) Floor plans must indicate accurate locations for all control and peripheral devices as well as raceway size and routing, junction boxes, and conductor size and quantity in each raceway.
    2) All notification appliances must be provided with a candela rating and circuit address that corresponds to that depicted on Riser Diagram.
    3) If individual floors need to be segmented to accommodate 1/8" scale requirements, Key Plans and break lines must be provided on plans in an orderly and professional manner.
    4) End-of-line resistors (and values) must be depicted.

i. Control panel wiring and interconnection schematics.

    1) Drawings must depict internal component placement and all internal and field termination points.
    2) Drawings must provide detail indicating where conduit penetrations must be made to avoid conflicts with internally mounted batteries.
    3) For each additional data-gathering panel, provide separate control panel drawing which clearly indicates designation, service and location of control enclosure.

j. Battery calculations: Battery calculations must include the specified spare capacity. Final battery sizes, based on calculations, must be indicated.

k. Complete voltage drop calculations that clearly indicate quantity of devices, device part numbers, supervisory current draw, alarm current draw, voltage drop, and totals for all categories.

l. System (Load and Battery) calculations for each system power supply and control panel, providing power for notification appliance circuits, auxiliary control circuits, and all circuits that draw power from any system power supply.

    1) Battery calculations must reflect all control panel components, remote annunciator, and auxiliary relay current draws.

m. Wiring connection diagrams for each device to be installed or connected by Contractor.

n. Site-wide network configuration:

    1) Submit drawings indicating network design for each network proposed.
    2) Drawings must indicate quantity and designation (building number and device type) of each node on each network.

3) Design must not exceed 80 percent of manufacturer's recommendations for total network length and total nodes per network.
4) Drawings must also indicate the conduit length, as indicated on the Contract Documents, between each node.

2. Incorporate State Representative review comments and submit package to CSFM.
3. Indicate on CSFM approved drawings all comments provided by State Representative and CSFM which were not indicated on original Contract Drawings.
4. After CSFM approval, transmit two electronic media sets, seven bond copies of shop drawings, each bearing the CSFM stamp of approval, to State Representative.
5. System to be installed and inspected utilizing CSFM approved drawings, not original Contract Drawings.
6. In addition to the to the requirements above, submittal packages shall comply with the requirements listed in the Fire Sprinkler, Standpipe System, Fire Pump and Water Tank Submittal Guideline as well as the CalFire Plan Review Triage List published by CSFM.

1.4 INFORMATIONAL SUBMITTALS

A. Certificates:

1. Seismic Performance Certificates: For FACU, accessories, and components, from manufacturer. Include the following information:

a. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
b. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
c. Detailed description of equipment anchorage devices on which certification is based and their installation requirements.

B. Field quality-control reports.

C. Qualification Statements: For Installer.

D. Sample Warranty: Submittal must include line item pricing for replacement parts and labor.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.

1. Include the following and deliver copies to authorities having jurisdiction:

a. Comply with "Records" section of "Inspection, Testing and Maintenance" chapter in NFPA 72.
b. Provide "Fire-Alarm and Emergency Communications System Record of Completion Documents" in accordance with "Completion Documents" Article in "Documentation" section of "Fundamentals" chapter in NFPA 72.
c. Complete wiring diagrams showing connections between devices and equipment. Each conductor must be numbered at every junction point with indication of origination and termination points.
d. Riser diagram.
e. Device addresses.
f. Record copy of site-specific software.
g. Provide "Inspection and Testing Form" in accordance with "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:

1) Equipment tested.
2) Frequency of testing of installed components.
3) Frequency of inspection of installed components.
4) Requirements and recommendations related to results of maintenance.
5) Manufacturer's user training manuals.

h. Manufacturer's required maintenance related to system warranty requirements.
i. Abbreviated operating instructions for mounting at FACU and each annunciator unit.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On USB media.
3. Device address list.
4. Printout of software application and graphic screens.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Material: Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but no fewer than three units.
2. Smoke Detectors: Quantity equal to 10 percent of amount of each type installed, but no fewer than one unit of each type.
3. Detector Bases: Quantity equal to 10 percent of amount of each type installed, but no fewer than one unit of each type.
4. Keys and Tools: One extra set for access to locked or tamperproofed components.
5. Audible and Visual Notification Appliances: three of each type installed.
6. Fuses: Two of each type installed in system. Provide in box or cabinet with compartments marked with fuse types and sizes.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:

1. Personnel must be trained and certified by manufacturer for installation of units required for this Project.
2. Installation must be by personnel certified by NICET as fire-alarm Level II technician.
3. Obtain certification by NRTL in accordance with NFPA 72.
4. Licensed or certified by authorities having jurisdiction.

1.8 FIELD CONDITIONS

A. Seismic Conditions: Unless otherwise indicated on Contract Documents, specified Work in this Section must withstand the seismic hazard design loads determined in accordance with ASCE/SEI 7 for installed elevation above or below grade.

1. The term "withstand" means "unit must remain in place without separation of parts from unit when subjected to applicable seismic design loads and unit must be fully operational after seismic event." Contractor is responsible for determining applicable seismic criteria.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail because of defects in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Beneficial Occupancy.

PART 2 - PRODUCTS

2.1 ADDRESSABLE FIRE-ALARM SYSTEM

A. Description:

1. Noncoded, UL-certified addressable system, with multiplexed signal transmission and horn-and-strobe notification for evacuation.

B. Performance Criteria:

1. Regulatory Requirements:

a. Fire-Alarm Components, Devices, and Accessories: Listed and labeled by a NRTL in accordance with NFPA 70 for use with selected fire-alarm system and marked for intended location and application.

2. General Characteristics:

a. Automatic sensitivity control of certain smoke detectors.
b. Fire-alarm signal initiation must be by one or more of the following devices and systems:

    1) Manual stations.
    2) Smoke detectors.
    3) Automatic sprinkler system water flow.

c. Fire-alarm signal must initiate the following actions:

    1) Continuously operate alarm notification appliances.
    2) Identify alarm and specific initiating device at FACU and remote annunciators.
    3) Transmit alarm signal to remote alarm receiving station.
    4) Record events in system memory.

d. Supervisory signal initiation must be by one or more of the following devices and actions:

    1) Valve supervisory switch.
    2) Zones or individual devices have been disabled.
    3) FACU has lost communication.

e. System trouble signal initiation must be by one or more of the following devices and actions:

    1) Open circuits, shorts, and grounds in designated circuits.
    2) Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
    3) Loss of communication with addressable sensor, input module, relay, control module, remote annunciator, printer interface, or Ethernet module.
    4) Loss of primary power at FACU.
    5) Ground or single break in internal circuits of FACU.
    6) Abnormal ac voltage at FACU.
    7) Break in standby battery circuitry.
    8) Failure of battery charging.
    9) Abnormal position of switch at FACU or annunciator.

f. System Supervisory Signal Actions:

    1) Initiate notification appliances.
    2) Identify specific device initiating event at FACU and remote annunciators.
    3) Record event.
    4) After time delay of 200 seconds, transmit trouble or supervisory signal to remote alarm receiving station.

g. Network Communications:

1) Provide network communications for fire-alarm system in accordance with fire-alarm manufacturer's written instructions.
2) Provide network communications pathway per manufacturer's written instructions and requirements in NFPA 72 and NFPA 70.

h. Document Storage Box:

1) Description: Enclosure to accommodate standard 8-1/2-by-11 inch (216-by-279 mm) manuals and loose document records. Legend sheet will be permanently attached to door for system required documentation, key contacts, and system information. Provide two key ring holders with location to mount standard business cards for key contact personnel.
2) Material and Finish: 18-gauge cold-rolled steel; four mounting holes.
3) Color: Red powder-coat epoxy finish.
4) Labeling: Permanently screened with 1 inch (25 mm) high lettering "SYSTEM RECORD DOCUMENTS" with white indelible ink.
5) Security: Locked with 3/4 inch (19 mm) barrel lock. Provide solid 12 inch (304 mm) stainless steel piano hinge.

2.2 FIRE-ALARM CONTROL UNIT (FACU)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Fire Lite.
2. Silent Knight.
3. EST.
4. Or approved equal.

B. Description: Field-programmable, microprocessor-based, modular, power-limited design with electronic modules.

C. Performance Criteria:

1. Regulatory Requirements: Comply with NFPA 72 and UL 864.
2. General Characteristics:

a. System software and programs must be held in nonvolatile flash, electrically erasable, programmable, read-only memory, retaining information through failure of primary and secondary power supplies.
b. Include real-time clock for time annotation of events on event recorder and printer.
c. Provide communication between FACU and remote annunciators
d. FACU must be listed for connection to central-station signaling system service.
e. Provide nonvolatile memory for system database, logic, and operating system and event history. System must require no manual input to initialize in the event of complete power down condition. FACU must provide minimum 500-event history log.

f. Addressable Initiation Device Circuits: FACU must indicate which communication zones have been silenced and must provide selective silencing of alarm notification appliance by building communication zone.

1) Addressable Control Circuits for Operation of Notification Appliances and Mechanical Equipment: FACU must be listed for releasing service.

g. Fire-Alarm Annunciator: Arranged for interface between human operator at FACU and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and programming and control menu.

1) Annunciator and Display: LCD, 80 characters, minimum.
2) Keypad: Arranged to permit entry and execution of programming, display, and control commands.

h. Initiating-Device, Notification-Appliance, and Signaling-Line Circuits:

1) Pathway Class Designations: NFPA 72, Class B.
2) Pathway Survivability: Level 0.
3) Install no more than 50 addressable devices on each signaling-line circuit.
4) Install fault circuit isolators to comply with circuit performance requirements of NFPA 72 or with manufacturer's written instructions, whichever is more conservative.

i. Serial Interfaces:

1) One dedicated RS 485 port for central-station operation using point ID DACT.
2) One RS 485 port for remote annunciators, Ethernet module, or multi-interface module (printer port).
3) One USB port for PC configuration.

j. Notification-Appliance Circuit:

1) Audible appliances must sound in three-pulse temporal pattern, as defined in NFPA 72.
2) Visual alarm appliances must flash in synchronization where multiple appliances are in same field of view, as defined in NFPA 72.

k. Remote Smoke-Detector Sensitivity Adjustment: Controls must select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and print out final adjusted values on system printer.

l. ter.

m. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to remote alarm station.
n. Primary Power: 24 V(dc) obtained from 120 V(ac) service and power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory and DACT must be powered by 24 V(dc) source.
o. Alarm current draw of entire fire-alarm system must not exceed 80 percent of power-supply module rating.
p. Secondary Power: 24 V(dc) supply system with batteries, automatic battery charger, and automatic transfer switch.
q. Batteries: Sealed lead calcium.

D. Accessories:

1. Instructions: Computer printout or typewritten instruction card mounted behind plastic or glass cover in stainless steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe functional operation of system under normal, alarm, and trouble conditions.

2.3 MANUAL FIRE-ALARM BOXES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Fire Lite.
2. Silent Knight.
3. EST.
4. Or approved equal.

B. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes must be finished in red with molded, raised-letter operating instructions in contrasting color; must show visible indication of operation; and must be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.

1. Double-action mechanism requiring two actions to initiate alarm, plastic-rod pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to FACU.
2. Indoor Protective Shield: Factory-fabricated, clear plastic enclosure hinged at top to permit lifting for access to initiate alarm. Lifting cover actuates integral battery-powered audible horn intended to discourage false-alarm operation.
3. Able to perform at up to 90 percent relative humidity at 90 deg F (32 deg C).
4. Material: Manual stations made of Lexan polycarbonate.
5. Able to be used in indoor areas.

2.4 SYSTEM SMOKE DETECTORS

A. Photoelectric Smoke Detectors:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Fire Lite.
    b. Silent Knight.
    c. EST.
    d. Or approved equal.

2. Performance Criteria:

    a. Regulatory Requirements:

        1) NFPA 72.
        2) UL 268.

    b. General Characteristics:

        1) Detectors must be two-wire type.
        2) Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to FACU.
        3) Base Mounting: Detector and associated electronic components must be mounted in twist-lock module that connects to fixed base. Provide terminals in fixed base for connection to building wiring.
        4) Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
        5) Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.
        6) Detector address must be accessible from FACU and must be able to identify detector's location within system and its sensitivity setting.
        7) Operator at FACU, having designated access level, must be able to manually access the following for each detector:

            a) Primary status.
            b) Device type.
            c) Present average value.
            d) Present sensitivity selected.
            e) Sensor range (normal, dirty, etc.).

        8) Detector must have functional humidity range within 10 to 90 percent relative humidity.
        9) Color: White.
        10) Multiple levels of detection sensitivity for each sensor.

2.5 FIRE-ALARM NOTIFICATION APPLIANCES

A. Fire-Alarm Audible Notification Appliances:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Fire Lite.
b. Silent Knight.
c. EST.
d. Or approved equal.

2. Description: Horns, bells, or other notification devices that cannot output voice messages.
3. Performance Criteria:

a. Regulatory Requirements:

1) NFPA 72.

b. General Characteristics:

1) Individually addressed, connected to signaling-line circuit, equipped for mounting as indicated, and with screw terminals for system connections.
2) Connected to notification-appliance signal circuits, zoned as indicated, equipped for mounting as indicated, and with screw terminals for system connections.
3) Audible notification appliances must have functional humidity range of 10 to 95 percent relative humidity.
4) ISO Temporal 3 Alert Tone: 95 plus or minus 5 dB(A-weighted) at 24 V.
5) Horns: Electric-vibrating-polarized type, 24 V(dc); with provision for housing operating mechanism behind grille. Comply with UL 464. Horns must produce sound-pressure level of 90 dB(A-weighted), measured 10 ft. (3 m) from horn, using coded signal prescribed in UL 464 test protocol.
6) Combination Devices: Factory-integrated audible and visible devices in single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.

B. Fire-Alarm Visible Notification Appliances:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Fire Lite.
b. Silent Knight.
c. EST.
d. Or approved equal.

2. Performance Criteria:

a. Regulatory Requirements:

1) NFPA 72.
2) UL 1971.

b. General Characteristics:

1) Rated Light Output:

a) 15/30/75/110 cd, selectable in field.

2) Clear or nominal white polycarbonate lens mounted on aluminum faceplate.
3) Mounting: Wall mounted unless otherwise indicated.
4) For units with guards to prevent physical damage, light output ratings must be determined with guards in place.
5) Flashing must be in temporal pattern, synchronized with other units.
6) Strobe Leads: Factory connected to screw terminals.
7) Mounting Faceplate: Factory finished, white.

2.6 FIRE-ALARM REMOTE ANNUNCIATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Fire Lite.
2. Silent Knight.
3. EST.
4. Or approved equal.

B. Performance Criteria:

1. Regulatory Requirements:

a. NFPA 72.

2. General Characteristics:

a. Annunciator functions must match those of FACU for alarm, supervisory, and trouble indications. Manual switching functions must match those of FACU, including acknowledging, silencing, resetting, and testing.

1) Mounting: Surface cabinet, NEMA 250, Type 1.

b. Display Type and Functional Performance: Alphanumeric display and LED indicating lights must match those of FACU. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.7 FIRE-ALARM ADDRESSABLE INTERFACE DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Fire Lite.

2. Silent Knight.
3. EST.
4. Or approved equal.

B. Performance Criteria:

1. Regulatory Requirements:

a. NFPA 72.

2. General Characteristics:

a. Include address-setting means on module.
b. Store internal identifying code for control panel use to identify module type.
c. Listed for controlling HVAC fan motor controllers.
d. Monitor Module: Microelectronic module providing system address for alarm-initiating devices for wired applications with normally open contacts.
e. Integral Relay: Capable of providing direct signal to circuit-breaker shunt trip for power shutdown.

1) Allow control panel to switch relay contacts on command.
2) Have minimum of two normally open and two normally closed contacts available for field wiring.

f. Control Module:

1) Operate notification devices.
2) Operate solenoids for use in sprinkler service.

2.8 DIGITAL ALARM COMMUNICATOR TRANSMITTERS (DACTs)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Fire Lite.
2. Silent Knight.
3. EST.
4. Or approved equal.

B. Performance Criteria:

1. Regulatory Requirements:

a. NFPA 72.

2. General Characteristics:

a. DACT must be acceptable to remote central station and must be listed for fire-alarm use.
b. Functional Performance: Unit must receive alarm, supervisory, or trouble signal from FACU and automatically capture two telephone line(s) and dial

preset number for remote central station. When contact is made with central station(s), signals must be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter must initiate local trouble signal and transmit signal indicating loss of telephone line to remote alarm receiving station over remaining line. Transmitter must automatically report telephone service restoration to central station. If service is lost on both telephone lines, transmitter must initiate local trouble signal.

c. er must initiate local trouble signal.
d. r must initiate local trouble signal.
e. tiate local trouble signal.
f. Local functions and display at DACT must include the following:

1) Verification that both telephone lines are available.
2) Programming device.
3) LED display.
4) Manual test report function and manual transmission clear indication.
5) Communications failure with central station or FACU.

g. Digital data transmission must include the following:

1) Address of alarm-initiating device.
2) Address of supervisory signal.
3) Address of trouble-initiating device.
4) Loss of ac supply.
5) Loss of power.
6) Low battery.
7) Abnormal test signal.
8) Communication bus failure.

h. Secondary Power: Integral rechargeable battery and automatic charger.
i. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.

1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed, before installation begins.

B. Examine roughing-in for electrical connections to verify actual locations of connections before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protection of In-Place Conditions: Protect devices during construction unless devices are placed in service to protect facility during construction.

3.3 INSTALLATION OF EQUIPMENT

A. Comply with NECA 305, NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."

1. Devices placed in service before other trades have completed cleanup must be replaced.
2. Devices installed, but not yet placed, in service must be protected from construction dust, debris, dirt, moisture, and damage in accordance with manufacturer's written storage instructions.

B. Equipment Wall Mounting: Install FACU on finished surface.

1. Provide seismic-restraints.

C. Install wall-mounted equipment, with tops of cabinets not more than 78 inch (1980 mm) above finished floor.

D. Manual Fire-Alarm Boxes:

1. Install manual fire-alarm box in normal path of egress within 60 inch (1520 mm) of exit doorway.
2. Mount manual fire-alarm box on background of contrasting color.
3. Operable part of manual fire-alarm box must be between 42 and 48 inch (1060 and 1220 mm) above floor level. Devices must be mounted at same height unless otherwise indicated.

E. Smoke- and Heat-Detector Spacing:

1. Comply with "Smoke-Sensing Fire Detectors" section in "Initiating Devices" chapter in NFPA 72, for smoke-detector spacing.
2. Smooth ceiling spacing must not exceed 30 ft. (9 m).
3. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas must be determined in accordance with Annex A in NFPA 72.
4. HVAC: Locate detectors not closer than 36 inch (910 mm) from air-supply diffuser or return-air opening.
5. Lighting Fixtures: Locate detectors not closer than 12 inch (300 mm) from lighting fixture and not directly above pendant mounted or indirect lighting.

F. Install cover on each smoke detector that is not placed in service during construction. Cover must remain in place except during system testing. Remove cover prior to system turnover.

G. Remote Status and Alarm Indicators: Install in visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.

H. Audible Alarm-Indicating Devices: Install not less than 6 inch (150 mm) below ceiling. Install bells and horns on flush-mounted back boxes with device-operating mechanism concealed behind grille. Install devices at same height unless otherwise indicated.

I. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inch (150 mm) below ceiling. Install devices at same height unless otherwise indicated.

J. Device Location-Indicating Lights: Locate in public space near device they monitor.

3.4 ELECTRICAL CONNECTIONS

A. Connect wiring in accordance with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

B. Ground equipment in accordance with Section 26 05 26 "Grounding and Bonding for Electrical Systems."

C. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.

D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

1. Nameplate must be laminated acrylic or melamine plastic signs, as specified in Section 26 05 53 "Identification for Electrical Systems."
2. Nameplate must be laminated acrylic or melamine plastic signs with black background and engraved white letters at least 1/2 inch (13 mm) high.

3.5 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Connect control wiring in accordance with Section 26 05 23 "Control-Voltage Electrical Power Cables."

C. Install nameplate for each control connection, indicating field control panel designation and I/O control designation feeding connection.

3.6 PATHWAYS

A. Pathways above recessed ceilings and in inaccessible locations may be routed exposed.

1. Exposed pathways located less than 96 inch (2440 mm) above floor must be installed in EMT.

B. Pathways must be installed in EMT.

C. Exposed EMT must be painted red enamel.

3.7 CONNECTIONS

A. Make addressable connections with supervised interface device to the following devices and systems. Install interface device less than 36 inch (910 mm) from device controlled. Make addressable confirmation connection when such feedback is available at device or system being controlled.

1. Supervisory connections at valve supervisory switches.

3.8 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 27 05 53 "Identification for Communications Systems."

B. Install framed instructions in location visible from FACU.

3.9 GROUNDING

A. Ground FACU and associated circuits in accordance with Section 26 05 26 "Grounding and Bonding for Electrical Systems."

B. Ground shielded cables at control panel location only. Insulate shield at device location.

3.10 FIELD QUALITY CONTROL

A. Field tests must be witnessed by authorities having jurisdiction where required.

B. Administrant for Tests and Inspections:

1. Administer and perform tests and inspections with assistance of factory-authorized service representative.

C. Tests and Inspections:

1. Visual Inspection: Conduct visual inspection prior to testing.

a. Inspection must be based on completed record Drawings and system documentation that is required by "Completion Documents, Preparation" table in "Documentation" section of "Fundamentals" chapter in NFPA 72.

b. Comply with "Visual Inspection Frequencies" table in "Inspection" section of "Inspection, Testing and Maintenance" chapter in NFPA 72; retain "Initial/Reacceptance" column and list only installed components.

2. System Testing: Comply with "Test Methods" table in "Testing" section of "Inspection, Testing and Maintenance" chapter in NFPA 72.
3. Test audible appliances for public operating mode in accordance with manufacturer's written instructions. Perform test using portable sound-level meter complying with Type 2 requirements in ASA S1.4 Part 1/IEC 61672-1.
4. Test audible appliances for private operating mode in accordance with manufacturer's written instructions.
5. Test visible appliances for public operating mode in accordance with manufacturer's written instructions.
6. Factory-authorized service representative must prepare "Fire Alarm System Record of Completion" in "Documentation" section of "Fundamentals" chapter in NFPA 72 and "Inspection and Testing Form" in "Records" section of "Inspection, Testing and Maintenance" chapter in NFPA 72.

D. Reacceptance Testing: Perform reacceptance testing to verify proper operation of added or replaced devices and appliances.

E. Fire-alarm system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

G. Annual Test and Inspection: One year after date of Beneficial Occupancy, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.11 DEMONSTRATION

A. Train the State’s maintenance personnel to adjust, operate, and maintain fire-alarm system. Provide transcript of training to the State. Allow the State to record training.

3.12 SOFTWARE SERVICE AGREEMENT

A. Comply with UL 864.

B. Technical Support: Beginning at Beneficial Occupancy, service agreement must include software support for two years.

C. Upgrade Service: At Beneficial Occupancy, update software to latest version. Install and program software upgrades that become available within two years from date of Beneficial Occupancy. Upgrading software must include operating system and new or revised licenses for using software.

1. Upgrade Notice: At least 60 days to allow the State to schedule access to system and to upgrade computer equipment if necessary.

END OF SECTION 28 46 21.11

SECTION 31 20 00
EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Preparing of subgrade for building slabs, walks, and pavements.
2. Drainage fill course for support of building slabs is included as part of this work.
3. Excavating and backflling of trenches within building lines.
4. Excavating and backfilling for underground mechanical and electrical utilities and buried mechanical and electrical appurtenances.

B. This project is required to achieve LEED certification. The green building parameters required for this affect all aspects of construction. Materials in this section may contribute to the requirements of credits MRc2 BPDO Environmental Product Declarations, MRc3 BPDS Sourcing of Raw Materials, and MRc4 BPDO Material Ingredients and/or be subject to the requirements of EQc2 Low-Emitting Materials. In addition, wherever possible:

1. Select materials with qualifying Environmental Product Declarations.
2. Select materials to maximize use of recycled content.
3. Select materials to maximize use of bio-based products.
4. Select only wood materials which are either Forest Stewardship Council certified or USGBC-approved equivalent.
5. Select materials that use any of the qualifying programs to demonstrate the chemical inventory of the product to at least 0.1%.
6. Select materials that participate in qualified take back or buyback program.
7. Give preference to materials that are both sourced and manufactured within 100 miles of the project site

1.2 DEFINITIONS

A. Excavation consists of removal of material in conformance with the soil investigation report and as shown.

B. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of the Geotechnical - Engineer. Unauthorized excavation, as well as remedial work directed by the Geotechnical Engineer, shall be at Contractors expense.

1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to the Geotechnical Engineer.

2. In locations other than those above, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Geotechnical Engineer.

C. Additional Excavation: When excavation has reached required subgrade elevations, notify the Geotechnical Engineer, who will make an inspection of conditions. If the Geotechnical Engineer determines that bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered and replace excavated material as directed by the Geotechnical Engineer. The Contract Sum may be adjusted by an appropriate Contract Modification.

1. Removal of unsuitable material and its replacement as directed will be paid on basis of Conditions of the Contract relative to changes in work.

D. Subgrade: The undisturbed earth or the compacted soil layer immediately below granular subbase, drainage fill, or topsoil materials.

1.3 SUBMITTALS

A. Test Reports: Geotechnical Engineer will submit the reports to the State and Contractor.

1.4 QUALITY ASSURANCE

A. All work shall be per the geotechnical report and geotechnical engineer's requirements.

B Standards:

1. Standard Specifications for Public Works Construction, latest edition.

C. Codes:

1. California Building Code, 2022 Edition

D. Testing and Inspection Service: The State will employ and pay for a qualified independent geotechnical testing and inspection laboratory to perform soil testing and inspection service during earthwork operations.

1.5 PROJECT CONDITIONS

A. Site Information: Data in subsurface investigation reports was used for the basis of the design and are available to the Contractor for information only. Conditions are not intended as representations or warranties of accuracy or continuity between soil borings.

B. Use of Explosives: Use of explosives is not permitted.

C. Protection of Persons and Property: Barricade open excavations occurring as part of this work and post with warning lights.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory and unsatisfactory soil materials are defined as those complying with ASTM D2487 and Geotechnical Engineer for the following:

1. Subbase Material
2. Drainage Fill
3. Backfill and Fill Materials

PART 3 - EXECUTION

3.1 EXCAVATION

A. Excavation consists of removal of material in conformance with the Geotechnical Report and as shown.

3.2 STABILITY OF EXCAVATIONS

A. General: Comply with local codes, ordinances, and requirements of agencies having jurisdiction.

B. Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

3.3 DEWATERING

A. Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.

1. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.
2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or runoff areas. Do not use trench excavations as temporary drainage ditches.

3.4 STORAGE OF EXCAVATED MATERIALS

A. Stockpile excavated materials acceptable for backfill and fill where directed. Place, grade, and shape stockpiles for proper drainage.

1. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.
2. Dispose of excess excavated soil material and materials not acceptable for use as backfill or fill.

3.5 EXCAVATION FOR STRUCTURES

A. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, and other construction and for inspection.

1. Excavations for footings and foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work.

3.6 EXCAVATION FOR PAVEMENTS

A. Cut surface under pavements to comply with cross-sections, elevations and grades as indicated and Geotechnical Report.

3.7 TRENCH EXCAVATION FOR PIPES AND CONDUIT

A. Excavate trenches to uniform width, sufficiently wide to provide ample working room and a minimum of 6 to 9 inches of clearance on both sides of pipe or conduit.

B. Excavate trenches and conduit to depth indicated or required to establish indicated slope and invert elevations and to support bottom of pipe or conduit on undisturbed soil. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

1. Where rock is encountered, carry excavation 6 inches below required elevation and backfill with a 6-inch layer of crushed stone or gravel prior to installation of pipe.
2. For pipes or conduit less than 6 inches in nominal size, and for flat-bottomed, multiple-duct conduit units, do not excavate beyond indicated depths. Handexcavate bottom cut to accurate elevations and support pipe or conduit on undisturbed soil.
3. For pipes and equipment 6 inches or larger in nominal size, shape bottom of trench to fit bottom of pipe for 90 degrees (bottom 114 of the circumference). Fill depressions with tamped sand backfill. At each pipe joint, dig bell holes to relieve pipe bell of loads ensure continuous bearing of pipe barrel on bearing surface.

3.8 BACKFILL AND FILL

A. General: Place soil material in layers to required subgrade elevations, for each area classification listed below, or as required by the Geotechnical Engineer.

1. Under grassed areas, uses satisfactory excavated or borrow material.
2. Under walks and pavements, use subbase materials, satisfactory excavated or borrow material, or a combination.
3. Under steps, use subbase material.
4. Under building slabs, use drainage fill material.
5. Under piping and conduit and equipment, use subbase materials where required over rock bearing surface and for correction of unauthorized excavation. Shape excavation bottom to fit bottom 90 degrees of cylinder.
6. Backfill trenches with concrete where trench excavations pass within 18 inches of column or wall footings and that are carried below bottom of such footings or that pass. under wall footings. Place concrete to level of bottom of adjacent footing.
    a. Concrete is specified in Section 32 13 13.
    b. Do not backfill trenches until tests and inspections have been made and backfilling is authorized by Geotechnical Engineer. Use care in backfilling to avoid damage or displacement of pipe systems.
7. Provide 4-inch-thick concrete base slab support for piping or conduit less than 2'-6" below surface of roadways. After installation and testing of piping or conduit, provide minimum 4-inch-thick encasement (sides and top) of concrete prior to backfilling or placement of roadway subbase.

B. Backfill excavations as promptly as work permits, but not until completion of the following:

1. Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
2. Inspection, testing, approval, and. recording locations of underground utilities have been performed and recorded.
3. Removal of concrete formwork.
4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.
5. Removal of trash and debris from excavation.
6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

3.9 PLACEMENT AND COMPACTION

A. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow strip, or break up sloped surfaces steeper than I vertical to 4 horizontal so that fill material will bond with existing surface.

1. When existing ground surface has a density less than that specified under "Compaction" for particular area classification, break up ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and percentage of maximum density.

B. Place backfill and fill materials per Geotechnical Engineer's requirements.

C. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

D. Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required . elevations. Prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.

E. Control soil and fill compaction, providing minimum percentage of density specified for each area classification indicated below. Correct improperly compacted areas or lifts as directed by Geotechnical Engineer if soil density tests indicate inadequate compaction.

1. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density, in accordance with ASTM D 1557:

a. Under structures, building slabs and steps, and pavements, compact top 12 inches of subgrade and each layer of backfill or fill material at 95 percent maximum density.

b. Under lawn or unpaved areas, compact top 6 inches of subgrade and each layer of backfill or fill material at 90 percent maximum density.

c. Under walkways, compact top 6 inches of subgrade and each layer of backfill or fill material at 95 percent maximum density.

2. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations.

a. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

b. Stockpile or spread soil material that has been removed because it is too wet to permit compaction. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.

3.10 GRADING

A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated or between such points and existing grades.

B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes and as follows:

1. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10 foot above or below required subgrade elevations.

2. Walks: Shape surface of areas under walks to line, grade, and cross-section, with finish surface not more than 0.10 foot above or below required subgrade elevation.

3. Pavements: Shape surface of areas under pavement to line, grade, and crosssection, with finish surface not more than 1/2 inch above or below required subgrade elevation.

C. Grading Surface of Fill under Building Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 1/2 inch when tested with a 10-foot straightedge.

D. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

3.11 PAVEMENT SUBBASE COURSE

A. General: Subbase course consists of placing subbase material, in layers of specified thickness, over subgrade surface to support a pavement base course.

1. Refer to geotechnical report for sub base.

B. Grade Control: During construction, maintain lines and grades including crown and cross. slope of subbase course.

C. Shoulders: Place shoulders along edges of subbase course to prevent lateral movement. Construct shoulders of acceptable soil materials, placed in such quantity to compact to thickness of each subbase course layer. Compact and roll at least a 12-inch width of shoulder simultaneous with the compaction and rolling of each layer of subbase course.

D. Placing: Place subbase course material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting subbase material during placement operations.

3.12 BUILDING SLAB DRAINAGE COURSE

A. General: Drainage course consists of placement of drainage fill material, in layers of indicated thickness, over subgrade surface to support concrete building slabs.

B. Placing: Place drainage fill material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting material during placement operations.

3.13 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction: Allow testing service to inspect and approve each subgrade and fill layer before further backfill or construction work is performed.

1. Perform field density tests in accordance with ASTM D 1556 (sand cone method) or ASTM D 2167 (rubber balloon method), as applicable or Geotechnical Engineer's report and requirements.

2. Footing Subgrade: For each strata of soil on which footings will be placed, perform at least one test to verify required design bearing capacities. Subsequent verification and approval of each footing. subgrade may be based on a visual comparison of each subgrade with related tested strata when acceptable to Geotechnical Engineer.

3. Paved Areas and Building Slab Subgrade: Perform at least one field density test of subgrade for every 2,000 sq. ft. of paved area or building slab, but in no case fewer than three tests. In each compacted fill layer, perform one field density test for every 2,000 sq.. ft. of overlaying building slab or paved area, but in no case fewer than three tests.

4. Foundation Wall Backfill: Perform at least two field density tests at locations and elevations as directed.

5. If in opinion of Geotechnical Engineer, based on testing service reports and inspection, subgrade or fills that have been placed are below specified density, perform additional compaction and testing until specified density is obtained.

3.14 EROSION CONTROL

A. Provide erosion control methods in accordance with requirements of authorities having jurisdiction. Erosion Control plan on file with the City of Santa Monica Engineering Department.

3.15 MAINTENANCE

A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

B. Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.

C. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

D. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.16 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Removal from the State Property: Remove waste materials, including unacceptable excavated material, trash, and debris, and dispose of it off the State property.

1. Remove excess excavated material, trash, debris, and waste materials and dispose of it off the State property.

END OF SECTION 31 20 00

SECTION 31 22 00

TRENCHING, BACKFILLING AND COMPACTION

PART 1 GENERAL

1.1 SUMMARY

A. The Contractor shall comply with the requirement of this section which includes materials, testing and performance of trench excavation, backfilling and compacting, complete.

B. This project is required to achieve LEED certification. The green building parameters required for this affect all aspects of construction. Materials in this section may contribute to the requirements of credits MRc2 BPDO Environmental Product Declarations, MRc3 BPDS Sourcing of Raw Materials, and MRc4 BPDO Material Ingredients and/or be subject to the requirements of EQc2 Low-Emitting Materials. In addition, wherever possible:

1. Select materials with qualifying Environmental Product Declarations
2. Select materials to maximize use of recycled content.
3. Select materials to maximize use of bio-based products.
4. Select only wood materials which are either Forest Stewardship Council certified or USGBC-approved equivalent.
5. Select materials that use any of the qualifying programs to demonstrate the chemical inventory of the product to at least 0.1%.
6. Select materials that participate in qualified take back or buyback program.
7. Give preference to materials that are both sourced and manufactured within 100 miles of the project site

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 33 30 00 – Sanitary Sewerage Utilities

B. Section 33 40 00 - Storm Drainage Utilities

1.3 SUBMITTALS

A. Submit drawings showing excavation and shoring, bracing, or sloping for worker protection in accordance with the Special Provisions Section if required.

B. Submit a report from a testing laboratory verifying that material conforms to the specified gradations or characteristics for granular material or imported sand.

1.4 MEASUREMENT AND PAYMENT

A. Payment for the work in this section will be included as part of the Contractor's unit price per linear foot for the various types of pipe.

PART 2 MATERIALS

2.1 PAVEMENT ZONES

A. The pavement zone includes the asphaltic concrete and aggregate base pavement or concrete pavement section placed over the trench backfill.

2.2 TRENCH ZONE

A. The trench zone includes the portion of the trench from the top of the pipe zone to the bottom of the street zone in paved areas or to the existing surface in unpaved areas.

2.3 PIPE ZONE

A. The pipe zone shall include the full width of trench from the bottom of the pipe or conduit to a horizontal level 12 inches above the top of the pipe, as specified below. Where multiple pipes or conduits are placed in the same trench, the pipe zone shall extend from the bottom of the lowest pipes to a horizontal level 12 inches above the top of the highest or topmost pipe.

2.4 PIPE BASE

A. The pipe base shall be defined as a layer of material immediately below the bottom of the pipe or conduit and extending over the full trench width in which the pipe is bedded. Thickness of pipe base shall be four inches (4") below the lowest point of the pipe or bell.

2.5 SAND-CEMENT SLURRY BACKFILL

A. Sand-Cement slurry shall consist of one (1) sack of Portland cement per cubic yard of sand and sufficient moisture for workability.

2.6 BACKFILL-PIPE ZONE AND PIPE BASE

A. For ductile iron and PVC pipe the pipe base and pipe zone backfill material shall be imported sand as specified herein.

2.7 IMPORTED OR NATIVE SAND--PIPE ZONE AND PIPE BASE

A. Imported sand shall have a minimum sand equivalent of 30 per State of California, Division of Highways Test "California 217" or ASTM D4219, with 100% passing a 3/8" sieve and not more than 20% passing a 200-mesh sieve.

B. Imported sand used in the pipe zone or for the pipe base shall have the following gradation:

Sieve Size	Percent passing by Weight
3/8 inch	100
No. 4	75 - 100
No. 30	12 - 50
No. 100	5 - 20
No. 200	0 - 15

2.8 SAND-CEMENT SLURRY REFILL MATERIAL FOR FOUNDATION STABILIZATION IN PIPE ZONE

A. Sand-Cement slurry fill in the pipe zone shall not be used unless approved by the State representative.

B. Sand-Cement slurry shall consist of one (1) sack of Portland cement per cubic yard of sand and sufficient moisture for workability. WATER FOR COMPACTION

C. Water used in compaction shall have a maximum chloride concentration of 500 mg/l, a maximum sulfate concentration of 500 mg/l, and shall have a pH of 7.0 to 9.0. Water shall be free of acid, alkali or organic materials injurious to the pipe coatings.

PART 3 EXECUTION

3.1 TESTING FOR COMPACTION

A. The Contractor will test for compaction as described below.

B. Determine the density of soil in place by the sand cone method, ASTM D 1556.

C. Determine the laboratory moisture-density relations of soils per ASTM D 1557.

D. Determine the relative density of cohesionless soils by ASTM D 2049.

E. Sample backfill materials by ASTM D 75.

F. Express "relative compaction" as the ratio, expressed as a percentage; of the in place dry density to the laboratory maximum dry density.

G. Compaction shall be deemed to comply with the specifications when no test falls below the specified relative compaction. The Contractor shall pay all associated costs of any re-testing of work not conforming to the specifications.

3.2 COMPACTION REQUIREMENTS

A. Unless otherwise shown relative compaction in pipe zone shall be 95 percent relative compaction unless shown otherwise

3.3 MATERIAL REPLACEMENT

A. Remove and replace any trenching and backfilling material, which does not meet the specifications, at the Contractor's expense.

3.4 SHEETING, SHORING AND BRACING OF TRENCHES (As Required)

A. General

1. Trenches shall have sheeting, shoring and bracing conforming to CAL/OSHA requirements and General Provisions. Lateral pressures for design of trench sheeting, shoring and bracing shall be based on type of soil exposed in the trench, groundwater conditions, surcharge loads adjacent to the trench and type of shoring that will be used in the trench.

2. The banks of trenches, where required to control trench width and protect adjacent structures, shall be sheeted and braced at no additional expense to the State. Where shoring, sheeting, bracing or steel strutted trench boxes are necessary, they shall be furnished, placed, maintained and, except as shown or specified otherwise, removed. Where damage is liable to result from the removal of the sheeting, then the sheeting will be required to be left in place and cut off if required or directed.
3. The design, planning, installation and removal, if required, of steel strutted trench boxes or sheeting, shoring, lagging, and bracing shall be accomplished in such a manner as to maintain the required excavation or trench section and to maintain the undisturbed state of the soils below and adjacent to the excavation.
4. The use of horizontal strutting below the barrel of the pipe or the use of the pipe as support for trench bracing will not be permitted. Sheet piling and timbers in trench excavations shall be withdrawn in a manner so as to prevent subsequent settlement of the pipe or additional backfill loading which might overload the pipe.
5. Following removal of shoring, bracing or steel strutted trench boxes, the space left due to such removal shall be backfilled immediately and the backfill compacted.

3.5 TRENCH EXCAVATION

A. General

1. Excavation of every description and of whatever substance encountered shall be performed, to the depths, lines and grades indicated or specified. It may be necessary to increase or decrease the quantity of excavation because of unknown factors.

B. Trench Widths

1. Maximum trench width in the pipe zone shall be as shown on the plans. Trench width at the top of the trench will not be limited except where width of excavation would undercut adjacent structures and footings. In such case, width of trench shall be such that there is at least 18 inches between the top edge of the trench and the structure or footing.

C. Grade

1. Excavate the trench to the lines and grades shown with allowance for pipe thickness and for pipe base or special bedding. If the trench is inadvertently excavated below the required grade, refill with imported sand any part of the trench excavated below the grade. Place the refilling material over the full width of trench in compacted layers not exceeding six inches (6") to the established grade with allowance for the pipe base or special bedding.

D. Excavation

1. Unless otherwise indicated, excavation shall be open cut. During excavation, material shall be stockpiled in an orderly manner, a distance back from the edges of the excavations specified by the governing safety agency before being wasted as specified. Caution shall be exercised in operating heavy equipment over pipelines. Leaks or breaks caused by the Contractor's operations shall immediately be repaired in a manner acceptable to the State. The banks of excavated areas shall be controlled as is necessary to prevent movement of soil in areas supporting existing foundations, slabs, pole lines, underground power or telephone cables, trees, pipelines or other structures. If, as a result of the excavation or through fault or neglect of the Contractor, the earth or ground under or around such foundations, slabs, pole lines, underground power or telephone cables, trees, pipelines or other structures, slips or is otherwise disturbed, corrective measures shall be taken as directed at no additional expense to the State.
2. In the event the maximum allowable trench width is exceeded, the Contractor may be required, depending on the depth of trench, to improve the pipe bedding by utilizing concrete or other bedding materials as necessary to assure that the type of pipe installed can withstand the loads imposed by the backfill due to the depth of the trench.
3. The bottom of the trench shall be excavated to the lines and grades shown with proper allowance for pipe thickness, and for foundation stabilization and special bedding when required. Material containing rocks or cobbles larger than 2 inches in maximum dimension shall not be permitted within 6 inches of the pipe. Material of this type shall be removed from the bottom of the trench and replaced with backfill material. Parts of the trench excavated below grade shall be corrected with backfill as specified. The depth of trenches shall be as indicated.

3.6 DEWATERING

A. Provide and maintain means and devices to remove and dispose of all water entering the trench excavation during the time the trench is being prepared for the pipe-laying, during the laying of the pipe, and until the backfill at the pipe zone has been completed. These provisions shall apply during 24 hours per day, seven days a week. Dispose of the water in a manner to prevent damage to adjacent property. Do not drain trench water through the pipeline under construction. Do not allow groundwater to rise around the pipe until jointing compound has set hard or where such groundwater could result in the floatation of the pipe thus disturbing its line and level.

B. Contractor shall notify the State 48 hours prior to commencement of dewatering.

3.7 LOCATION OF EXCAVATED MATERIAL

A. During trench excavation, place the excavated material only within the working area. Do not obstruct any roadways or streets. Conform to federal, state and local regulations governing the safe loading of trenches with excavated material.

3.8 TRENCH BACKFILLING

A. Backfill per the detailed piping specification for the pipe and per the following.

B. Place the specified thickness of pipe base material over the full width of trench. Grade the top of the pipe base ahead of the pipe-laying to provide firm, uniform support along the full length of pipe.

C. After pipe has been bedded, place pipe zone material simultaneously on both sides of the pipe, keeping the level of backfill the same on each side. Carefully place the material around the pipe so that the pipe barrel is completely supported and that no voids or uncompacted areas are left beneath the pipe. Use particular care in placing material on the underside of the pipe to prevent lateral movement during subsequent backfilling.

D. No mechanical compaction of material placed within 12 inches of the outer surface of the pipe will be allowed.

E. Push the backfill material carefully onto the backfill previously placed in the pipe zone. Do not permit free fall of the material until at least two feet (2') of cover is provided over the top of the pipe. Do not drop sharp, heavy pieces of material directly onto the pipe or the tamped material around the pipe.

3.9 BACKFILL COMPACTION

A. Compact per the detailed specification.

B. Compact trench backfill to the specified relative compaction. Compact by using mechanical compaction or hand tamping. Consolidation by jetting or flooding will be permitted at the State discretion. Maximum backfill lifts shall not exceed six inches (6").

3.10 IMPORT OR EXPORT OF BACKFILL MATERIAL

A. Excess excavation soil material shall be removed and disposed of by the Contractor off the project site. Excess soil material shall be disposed of in accordance with local regulations.

B. Contractor shall be responsible to import any required additional backfill material necessary to return all grades to the grade encountered at the beginning of construction or as shown.

END OF SECTION 31 22 00

SECTION 32 01 00

OPERATION AND MAINTENANCE OF EXTERIOR IMPROVEMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. The work includes all materials, labor, services, transportation, and equipment necessary to perform the work as described in this specification section.

1.2 RELATED WORK IN OTHER SECTIONS

A. Site Remediation. Section 02 50 00

B. Irrigation Systems. Section 32 84 00

C. Plants. Section 32 93 00

D. Tree Protection and Pruning. Section 32 01 90

PART 2 - PRODUCTS

Not used

PART 3 - EXECUTION

3.1 MAINTENANCE

A. All work shall be continuously maintained in all areas within the limit of work during the progress of the job, the 90-day maintenance period and until the final acceptance of the work.

B. The ninety (90) day plant maintenance period shall not commence until written notice of approval of all landscape and irrigation installation (see Planting Irrigation Section 32 8400) has been received from the State's Representative. The 90-day plant maintenance period shall not commence in phases.

C. Provide the following during the final ninety (90) calendar day maintenance period:

1. All plants and planted areas shall be kept watered.

2. Weeds, Dallis, Johnson, Kikuyu, Nut and Bermuda grass shall be removed.

3. Grass shall be mowed with a reel type mower equipped with rollers.

4. Lawns shall be edged whenever necessary. Keep the lawn cut to not less than 1 1/2" and not more than 2" in height.

5. Collect grass clippings during mowing operations and remove them from site.

6. The entire project shall be carried out so that a neat and clean condition will be presented at all times to the satisfaction of the State's Representative.

D. General Weeding:

1. Weeding Program: The Contractor shall be responsible for providing a continuous weeding program for all project areas. Weeding shall be done on a weekly basis and shall include any undesirable or misplaced plant.

2. Shrubs: Weeds shall be removed from beds regularly, no less than once a week, chemically or manually. Bermuda grass and other noxious weeds shall not be allowed to become established.

3. Ground Cover: Weeds shall be removed completely, on a regular basis, chemically or manually, no less than once a week. Weeds may be controlled with pre-emergent herbicides, preferably, but also may be controlled with post-emergent herbicides, and/or by hand pulling.

E. Insect, Disease and Pest Control: The Contractor shall regularly inspect all landscaped areas for presence of disease, insect or rodent infestation. The Contractor shall advise the State's representative within four (4) days if disease, insect or rodent infestation is found; he shall identify the disease, insect or rodent and specify control measures to be taken using legally approved materials and methods. Upon written approval of the State's Representative, the Contractor shall implement the approved control measures, exercising extreme caution in the application of all spray material, dusts or other materials utilized. The use of any chemicals for insect and disease control shall be done by a state licensed pest control operator who shall follow all guidelines governing his license. Extreme caution shall be used when spraying insecticides and fungicides. Only spray when there is no wind. State's Representatives approval must be obtained prior to spraying any insecticides or fungicides. Approved control measures shall be continued until the disease, insect or rodent is controlled to the satisfaction of the State's representative. The Contractor shall utilize all safeguards necessary during disease, insect or rodent control operations to ensure safety of the public and the employees of the Contractor.

F. Staking and Guying: Tree stakes, ties and guys shall be checked to prevent bark wounds caused by abrasion and corrected as needed. Ties shall be adjusted to prevent girdling. When trees attain a trunk caliper of approximately 4" consider removing stakes and guys based on the following guidelines. The tree must retain its upright position and this position must be held regardless of moisture content of the

soil. Before any stakes are removed, remove tree ties and allow the tree to remain without support for a period of time to observe structural stability of the tree. Remove tree stakes only when tree has been proven to be structurally stable. Any restaking shall be done with originally specified materials. Guying will, over time, stretch or loosen. Adjust as needed to retain a taut position, until such time when guying is removed. Any tree that is damaged due to improper staking or typing shall be replaced at the Contractor's expense.

G. Plant Replacement: Any tree and shrub that appears to have more than one-quarter (1/4) of its foliage in a declining state shall be brought to the attention of the State's representative immediately. Check plant for over-watering, under-watering, depth of planting, pest infestation, or drainage problems; and repair the problem prior to replacement. Replacement plants shall be of size, condition and variety acceptable to the State's representative. The Contractor shall replace plant material at no cost to the State and subject to acceptance by the State's representative.

1. Plants that show signs of failure to grow at any time during the maintenance period, or those plants so injured or damaged as to render them unsuitable for the purpose intended shall be replaced immediately at the expense of the Contractor.

2. Any trees, shrubs or grass that die or lose form and size as originally specified shall be replaced even though they have taken root and are growing after die-back or loss of form and size.

H. Shrub and Vine Care: All shrubbery shall be checked weekly for any breakage or damage, special watering needs, etc. and treated as necessary. All undesirable conditions shall be eliminated as per accepted landscape maintenance practices. All shrubs shall be maintained in a healthy vigorous condition. Remove all spent flowers, flower spikes and remove all leaves and debris from plant areas daily. Hose off all plant material monthly to remove accumulated dirt and soot. Remove excess soil and/or mulch from crown (root flare) of plant.

1. Pruning: Pruning shall be performed as a continuous ongoing operation not allowing plants to develop stray, undesirable growth, and shall be done under the direction of a certified Arborist. Trimming, pruning, thinning and training are functions to be done at any time as needed to maintain a pleasing appearance. Accomplish pruning by removing woody stems from inside shrubs on an as-needed basis as directed by the Arborist. Excessive pruning or stubbing back will not be permitted. Top shrubs only when necessary for appearance and after interior selective branch pruning has been completed or as directed by the Arborist. Where trees and shrubs occur in close proximity to walks or parked cars, prune to allow movement without interference from branches and foliage.

    a. Shrub Pruners: Shrubs shall be pruned and thinned using hand-held shrub pruners, Hedge shears and clippers shall not be used.

I. Irrigation Systems Care

1. Irrigation Repair and Operation:

   a. Systems Components Damage: Irrigation system components damaged as a result of Contractor's neglect shall be repaired or replaced by the Contractor at no cost to the State. Normal wear and tear of systems, accidental breakage by others, or so-called acts of God, are conditions under which the Contractor is not directly responsible and repairs shall be paid for by the State. The Contractor shall notify the State's Representative the same day of discovery of damage to irrigation system components caused by acts of God that do not result from the performance of the work by the Contractor. Upon receipt of the State Representative's written authorization, the Contractor shall repair said damage as soon as possible and submit a change order related to the cost of said work to the State's Representative. Failure to report any damages will constitute Contractor making repairs at his own expense. Any replacement of irrigation system components under this subparagraph 1 shall be original equipment types. Any substitutions for replacement equipment shall be approved in writing from the State prior to doing work.

   b. Replacement includes: sprinkler system laterals (piping), sprinkler mains (pressure lines), sprinkler control valves, sprinkler controllers, sprinkler heads, sprinkler caps, sprinkler head risers, valve covers, boxes and lids, including electrical pull boxes and lids, valve sleeves, quick couplers, and hose bibs.

   c. Automatic Irrigation System Failure: Irrigation shall be done by the use of automatic sprinkler systems, where available and operable; however, failure of the existing irrigation system to provide full and proper coverage shall not relieve the Contractor of the responsibility to provide adequate irrigation with full and proper coverage to all areas in the work site.

   d. Property Damage: Any damages to property resulting from excessive irrigation water or irrigation water runoff due to the Contractor's negligence shall be charged to the Contractor.

   e. Controller and Valve Boxes: The Contractor shall keep controller and valve boxes clear of solids and debris and maintain the irrigation system including the replacement, readjustment, raise or lower, straighten, and any other operation required for the continued proper operation of the system from the water meter throughout the work site. Immediately after planting, apply water to each tree, shrub and vine by means of a hose in a moderate stream in the planting hole until the material around the roots is completely saturated from the bottom of the hole to the top of the ground.

   f. Following the planting of ground cover, each plant shall be immediately and thoroughly watered by means of a hose with a slow stream of running water.

g. Apply water in sufficient quantities and as often as seasonal conditions require keeping the ground wet, but not soaking, at all times, well below the root systems of the plants and grass.

2. System Monitoring:

a. Contractor Monitoring: The Contractor shall inspect the irrigation system for broken and clogged heads, malfunctioning or leaking valves, or any other condition which hampers the correct operation of the system. Authorization must be obtained from the State's representative before proceeding with work not covered under normal maintenance work. The malfunctioning sprinkler system landscape area shall be irrigated by a portable irrigation method until all authorized repairs have been completed to the satisfaction of the State's representative. Each system shall be checked daily and all necessary adjustments made to heads which throw onto roadways, walks, windows, or out of intended area of coverage. The Contractor shall clean and adjust sprinkler heads as needed for proper coverage. Each system shall be individually operated and observed on a regular basis.

b. Suspension of Irrigation Operation: The Contractor shall turn off irrigation systems during periods of rainfall and times when suspension of irrigation is desirable to conserve water while remaining within guidelines of good horticultural acceptable maintenance practices.

c. System Operation Knowledge: One maintenance person shall have the responsibility of operating and knowing the irrigation systems adjust controllers, observe the effectiveness of the irrigation systems, and make minor adjustments and repairs to systems.

3. Coverage/Application Rate: Generally, watering shall be done at night, between the hours of 12:00 A.M. and 6:00 A.M., unless otherwise approved by the State's representative. The Contractor shall operate systems and irrigation heads as seasonal conditions require. During extremely hot weather, extended holiday periods and during or following breakdown of systems, the Contractor shall provide adequate personnel and materials as required to adequately water all landscaped areas. When breakdowns or malfunctions exist, the Contractor shall water manually by whatever means necessary to maintain all plant material in a healthy condition.

4. Ground Cover Trimming: Grass and ground covers are to be neatly trimmed away from sprinkler heads to ensure proper coverage and operation. Weed or turf killer shall not be used. Trim ground covers away from sprinkler heads by tapering away from head. Holes shall not be cut into ground cover areas. As ground covers grow in height, risers may need to be extended to properly clear top of ground covers.

5. The Contractor shall test the soil and ground cover areas and around trees and shrubs monthly or as necessary with soil probes to determine that the proper amount of water is being applied at all times. This information shall be used to adjust watering times on the controller and supplemental hand or deep watering as necessary.

    a. Soil Probe: The Contractor shall make the soil probe available at all walk-through inspections.

6. Sub-Surface (Drip) Irrigation: Areas irrigated by sub-surface (drip) irrigation will be adequate moisture within the root zone to promote proper plant growth.

7. Maintenance Work not Included:

    a. Backflow Prevention Device: Testing, certification, and service of the backflow prevention shall be done by the Contractor, and it shall be the Contractor's responsibility to notify the State's Representative should a malfunction occur.

J. Grades: Damage to planting areas through any of the following shall be replaced or repaired immediately by refilling with topsoil and leveling:

1. Depressions caused by vehicles, bicycles or foot traffic.

2. Damage caused by gophers and moles.

3. Erosion due to irrigation runoff.

4. Unnatural soil settling.

5. Excessive soil compaction.

K. Walkway Care

1. Sweeping and Vacuuming of Walks: All public walkways shall be swept or vacuumed off once a week. This work shall be coordinated with mowing or other maintenance work in the area. All gutters within the maintenance area shall be kept clean of grass clippings and miscellaneous trash.

2. All walks shall be kept free of dirt, leaves and other debris from the maintenance by or visiting the site. Debris shall be collected on a daily basis. In general, all areas should be policed once daily. All paper, trash, etc., shall be disposed of off-site.

L. The Contractor shall be on site once weekly for a minimum of four (4) hours.

M. The Contractor is to work closely with the State's maintenance division and establish a weekly meeting with the State's maintenance crew.

N. The Contractor shall replace all annual color as necessary during the maintenance period.

O. The Contractor shall remove dead flower buds.

P. The Contractor shall adjust and maintain the low voltage lighting system in fully operational condition. Maintenance of lighting shall run inclusive with landscape and irrigation maintenance period.

Q. The Contractor may be relieved of the maintenance work when the final (90) calendar day plant establishment work has been satisfactorily completed.

R. Extension of Maintenance Period: Continue the maintenance period at no additional cost to the State until previously noted deficiencies have been corrected.

END OF SECTION

SECTION 32 01 90

TREE PROTECTION AND PRUNING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Protect existing plant material specified on the drawings during the duration of the construction period in a healthful state, free from damage or harm as the result of any work performed.

1.2 JOB CONDITIONS

A. Prior to the construction of any nature on the site, Contractor shall call for a site meeting with the State's Representative. The purpose of the meeting shall be to establish the conditions of all existing plant material to be preserved upon receipt of the site by the Contractor. Failure to call for said meeting implies acceptance by the Contractor of plant material to be preserved in its existing condition.

B. An irrigation system and/or quick coupler valve will be fully operational so that plant material can be regularly watered.

C. Coordinate and cooperate with other work to enable the work to proceed as rapidly and efficiently as possible.

1.3 WORK INCLUDED

A. The work of this section includes all labor, materials, equipment, transportation and services necessary to complete the work in this section as shown on the drawings and as specified herein, including but not necessarily limited to, the following:

1. Protection and welfare of all existing plant material within the Contract Limits which is noted to remain, including trimming, cabling, and repair of such plant material as necessary and all labor, materials and equipment necessary.

2. Perform all pruning operations.

3. Submit plant material maintenance plan before commencing landscape work for review by the State's Representative.

1.4 RELATED WORK

A. Irrigation. Section 32 84 00

B. Landscape. Section 32 93 00

C. Landscape Maintenance. Section 32 01 00

1.5 DEFINITIONS

A. “Injury” is defined, without limitation, as any bruising, scarring, tearing, or breaking of roots, branches, or trunk.

B. “Dripline” is defined as the outermost limits of the tree or shrub canopy.

C. “Certified Arborist” is a consulting arborist certified by the International Society of Arboriculture.

1.6 QUALITY ASSURANCE

A. Reference Standards:

1. International Society of Arboriculture (ISA) “Guide for Plant Appraisal” prepared by the Council of Tree and Landscape Appraisers (CTLA).

2. “Cabling, Bracing and Guying Standards for Shade Trees”, as published by the National Arborist Association (NAA), 174 TR 101, Bedford, New Hampshire.

B. Qualification of Workman:

1. Trimming and pruning of trees shall be performed only under the direction of a certified Arborist.

C. Tree Protection Guidelines:

1. Contractor shall follow all guidelines set forth within the City of Los Angeles Tree Ordinance.

1.7 SUBMITTALS

A. Pruning materials

B. Fencing materials.

C. Maintenance plan.

1.8 During the Guarantee to Repair GUARANTEE

A. Period specified in the General Conditions the Contractor shall be liable for damages to all trees covered by the provisions of this Section. Compensation to the State shall be as outlined in section 3.04.

B. Contractor will not be held responsible for damages due to vandalism or freak acts of nature during the guarantee period. Immediately report such conditions to the State’s Representative.

PART 2 - PRODUCTS

2.1 FENCING MATERIALS

A. Fencing-11 gauge galvanized 6' high chain-link fence with galvanized steel posts at 10' o.c. minimum.

2.2 PRUNING MATERIALS

A. Pruning materials shall be in accordance with current horticultural practices.

B. Pruning sterilant shall be Physan 20 Fertilome Type A, or diluted bleach.

PART 3 – EXECUTION

3.1 FENCING

A. Fencing - A continuous 6' high temporary chain-link fence will be erected around trees with a caliper of 4” or larger at the dripline, in order to prevent soil compaction, limb damage, or the accidental introduction of toxic materials into the root zone. Fence can be erected around groups of adjacent trees where possible. Otherwise, fence to be erected around individual trees.

B. The fence will be removed only at the end of construction, as approved by the State’s Representative.

3.2 PLANT MATERIAL PROTECTION

A. Provide protection for all plant materials designated to be retained. Contractor is responsible for replacing damaged plant life with approved equivalent.

B. New and existing plant materials shall not be allowed to deteriorate and shall be maintained in a healthy and vigorous condition during the course of construction and maintenance period.

C. During the course of construction, the Contractor shall take all necessary precautions, as outlined herein, to protect existing plant materials to be preserved from injury and death. Protection shall be given to the roots, trunks, and foliage.

D. The Contractor shall conduct operations continually to completion, unless weather conditions are prohibitive.

E. Provide ample water supply of potable quality and sufficient quantity for all operations required under this Section.

F. Trees subject to the provisions of this Section, which have been injured, shall be repaired immediately by a certified Arborist. Repairs shall include removal of rough edges, sprung bark and severely injured branches as directed by the Arborist.

G. Necessary measures shall be taken to maintain healthy living conditions for existing plant materials to be preserved. Such measures shall include monthly washing of leaves for the removal of dust, regular irrigation, root feeding, etc.

H. Tree protection fencing shall be installed for the protection of existing trees to be preserved. No construction, demolition, or work of any nature will be allowed within the fenced area without prior written approval by the State's Representative.

1. Approval by the State's Representative for work within the fenced area shall not release the Contractor from any of the provisions specified herein for the protection of existing trees to be preserved.

2. During the course of construction of approved work within the fence area, no roots shall be cut without prior written approval by the State's Representative.

I. During construction, the existing site surface drainage patterns shall not be altered within the area of the drip line of existing plant materials.

J. Contractor shall not alter the existing water table within the area of the drip line of existing plant materials.

K. Do not permit the following within the drip line of any existing tree or shrub to be preserved:

1. Storage or parking of automobiles or other vehicles.

2. Stockpiling of building materials, refuse or excavated materials.

3. Skinning or bruising of bark.

4. Use of trees as support posts, power poles, or signposts; anchorage for ropes, guy wires, or power lines; or other similar functions.

5. Dumping of poisonous materials on or around plant materials and roots. Such materials include but are not limited to paint, petroleum products, dirty water, or other deleterious materials.

6. Cutting roots by utility trenching, foundation digging; placement of curbs and trenches, and other miscellaneous excavation without prior written approval by the State's Representative.

7. Damage to the trunk, limbs, or foliage caused by maneuvering vehicles or stacking material or equipment to close to the plant.

8. Compaction of the root area by movement of trucks or grading machines; storage of equipment, gravel, earth fill, or construction supplies; etc.

9. Excessive water or heat from equipment, utility line construction, or burning of trash under or near shrubs or trees.

10. Damage to root system from flooding, erosion, and excessive wetting and drying resulting from watering and other operations.

L. Excavation Around Trees

1. Excavation within the drip lines of trees shall be done only where absolutely necessary, under the direction of a Certified Arborist and with prior approval from the State's Representative.

2. Where trenching for utilities is required within driplines, tunneling under and around roots shall be by hand digging. Main lateral roots and taproots shall not be cut. Smaller roots that interfere with installation of new work may be cut with prior approval from certified Arborist.

3. Where excavation of new construction is required within drip line of trees, hand excavation shall be employed to minimize damage to root system. Roots shall be relocated in backfill areas wherever possible. If large, main lateral roots are encountered, they shall be exposed beyond excavation limits as required to bend and relocate without breaking. If encountered immediately adjacent to location of new construction and relocation is not practical, roots shall be cut approximately 6 inches back from new construction under the direction of a certified Arborist.

4. Exposed roots shall not be allowed to dry out before permanent backfill is placed. Temporary earth cover shall be provided, or roots shall be packed with wet peat moss or four layers of wet, untreated burlap and temporarily supported and protected from damage until permanently relocated and covered with backfill. The cover over the roots shall be wetted to the point of run off daily.

5. Branching structure shall be thinned in accordance with National Arborists Association “Pruning Standards and Principles” to balance loss of root system caused by damage or cutting of root system. Thinning shall not exceed 30 percent of existing branching structure.

3.3 TREE TRIMMING

A. A Certified Arborist shall be engaged to direct removal of branches from trees if necessary to protect the health of the tree or if required to clear for construction.

B. In company with the State’s Representative, University and a certified Arborist, ascertain the limbs and roots which are to be trimmed. Clearly mark them to designate the approved point of cutting.

C. Dead and damaged trees that are determined by the Certified Arborist to be incapable of restoration to normal growth pattern shall be removed.

D. Cut evenly, using proper tools and skilled workmen, to achieve neat severance with the least possible damage to the tree.

E. In the case of root cuts, apply wet burlap or other protection, approved as noted herein, to prevent drying out, and maintain in a wet condition as long as necessary for temporary protection.

3.4 REPAIR COMPENSATION

A. Damage:

1. Damage to existing tree crowns or roots over 1” in diameter shall be immediately reported to the State’s Representative.

2. A Certified Arborist shall direct all repairs to trees. Repairs shall be made promptly after damage occurs to prevent progressive deterioration of damaged trees. Repairs shall be at the Contractor’s expense.

B. Irreparable Damage: Any tree to be protected which is irreparably damaged owing to the Contractor’s negligence or failure to provide adequate protection, shall be compensated for in accordance with the following schedule of values using the “tree caliper” method (greatest trunk diameter, measured 18 inches above the ground):

1. For trees with diameters up to and including 6 inches, compensation shall be the actual cost of replacement with item similar in species, size, and shape, including:

a. Actual cost of item boxed out of the ground.

b. Transportation or delivery of boxed item to site.

c. Planting and staking.

d. Maintenance, including watering, fertilizing, pruning, pest control, and other care to bring replacement to same general condition of original item.

2. For trunks up to:

7”..... $ 1,200
8”..... $ 1,700
9”..... $ 2,200
10”..... $ 2,600
11”..... $ 3,100
12”..... $ 3,600
13”..... $ 4,100
14”..... $ 4,600
15”..... $ 5,000
16”..... $ 5,500
17”..... $ 6,000

18” and over, add for each caliper inch.... $600

3.5 MAINTENANCE

A. Plant material will be maintained throughout the duration of the construction period in a healthy manner. Plant material identified which requires special pruning, insect control, fertilization or other remedial health actions will be treated during this period. Methods and rates of pesticide and fertilizer application will be reviewed by the State’s Representative prior to approval.

B. Watering: Plant materials will be watered on a regular basis, at a rate consistent with their particular requirements. Verification of the proposed watering schedule shall be reviewed by the State’s Representative prior to commencement of the maintenance.

1. The maintenance of the plant materials shall comply with standard horticultural practice for the correct watering, fertilizing, pruning and spraying of the specimen boxed trees.

2. The maintenance and quality of the plant materials shall be subject to monthly checks. The dates of these checks shall be outlined in the State's Representative's field notification relating to the establishment of the plant maintenance period. Additional checks shall be scheduled as determined by the State's Representative.

3. Contractor shall be responsible for performing periodic inspections of existing plant materials to be protected and relocated throughout the construction period, and submit written proposals to the State's Representative for additional maintenance work as may be required to ensure the health and general well-being of the plant material. Contractor shall retain, at the direction of the State's Representative, additional specialists as may be required to perform this work.

C. Contractor shall keep plant material free from weeds and debris at all times.

3.6 FIELD QUALITY CONTROL

A. General: The Contractor guarantees the protection of all plant material included as part of this work, in a healthy manner during the duration of the construction period. Destruction of, or significant damage to, any or all of the plant materials to be protected, as determined by the State's Representative, will result in compensation by the Contractor of 3-36" box trees, installed on the site, for each existing tree damaged.

END OF SECTION

SECTION 32 12 16
ASPHALT PAVING

PART 1 - GENERAL

1.1

A. SUMMARY

1. Work included:

a. Constructing one or more surface courses composed of a mixture of aggregate, filler if required, and asphalt concrete material, placed on a prepared base.

b. Drawings, 3-Dimensional Computer Model Database, Specifications to this Section

1. Select materials with qualifying Environmental Product Declarations.

2. Select materials to maximize use of recycled content.

3. Select materials to maximize use of bio-based products.

4. Select only wood materials which are either Forest Stewardship Council certified or USGBC-approved equivalent.

5. Select materials that use any of the qualifying programs to demonstrate the chemical inventory of the product to at least 0.1%.

6. Select materials that participate in qualified take back or buyback program.

7. Give preference to materials that are both sourced and manufactured within 100 miles of the project site.

B. REFERENCES

1. American Society for Testing and Materials (ASTM):

a. C 117 – Test Method for Material Finer than 75 μM (Number 200) Sieve in Mineral Aggregates by Washing.

b. C 131 – Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

c. C 136 – Method for Sieve Analysis of Fine and Coarse Aggregates.

d. D 977 – Standard Specification for Emulsified Asphalt.

e. D 1559 – Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus.

f. D 3381 – Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction.

g. D 4318 – Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

2. State of California, Department of Transportation (Caltrans), Standard Specifications.

C. SUBMITTALS

1. Job-Mix Formula: Before producing asphalt concrete mixture, submit a job-mix formula for each mixture to the State for approval. Should a change in source of material be proposed, or should a job-mix formula prove unsatisfactory, submit a new job-mix formula for approval.

a. Each job-mix formula submitted shall propose definite single values for:

a. The percentage of aggregate passing each specified sieve, based on dry weight of aggregate. These percentages shall be within the range shown in Part 2 of this section.The percentage of asphalt concrete material to be added, based on the total weight of the mixture, and the percentage of any stabilizing agent such as lime, Portland cement, or antistrip agent.

b. In addition, the job-mix formula shall provide a mixture having a minimum wet retained strength of 125 psi, as determined by AASHTO T165-82, and an index of retained strength of not less then 70 percent.

2. Samples: Asphalt cement, 1-quart minimum sample for each load delivered.

3. Certificates:

a. Certification from supplier that asphalt cement is of correct type and meets requirements of this section. Two copies will be required for each load.

b. Two copies of certified weight ticket from supplier for each load of asphalt cement.

c. Two copies of certified weight tickets for each load of asphalt concrete.

4. Achievement of LEEDNC v4 and 4.1 requires specific forms of documentation as part of the materials submittals to document certain product properties.

D. DELIVERY, STORAGE, AND HANDLING

1. Asphalt Concrete Delivery.

a. Transport the mixture from the mixing plant to the point of use in vehicles having tight bodies previously cleaned of all foreign materials.

b. Treat bodies as necessary to prevent material from sticking to the bodies.

c. Cover each load with canvas or other suitable material of sufficient size and thickness to protect the asphalt mixture from the weather.

E. PROJECT CONDITIONS

PART 2 Apply mixture only during daylight hours; when air temperature is 50 degrees Fahrenheit (F) or higher; when surfaces to be paved are dry and free of frost, snow, or ice; and when precipitation is not imminent. - PRODUCTS

A. AGGREGATE

1. The aggregate shall meet the general and physical requirements of ASTM C131.
2. Coarse aggregate is defined as that portion of a representative sample retained on a No. 8 sieve, whereas fine aggregate is defined as that portion passing the No. 8 sieve.
3. The aggregates for the mixture shall be graded and combined in such proportions that the resulting composite blend meets the requirements of the job-mix formula. The job-mix formula with the allowable tolerances shall be within the master range set forth in the following table.

B.	Sieve Designation	C.	Percent Passing
D.	¾-inch	E.	100
F.	⅜-inch	G.	60 – 85
H.	No. 4	I.	40 – 70
J.	No. 8	K.	28 – 52
L.	No. 30	M.	14 – 30
N.	No. 200	O.	3 – 12

P. ASPHALT CONCRETE MATERIAL

1. Asphalt cement, viscosity grade AR-8000, AASHTO M226-80, Table 1. The grade may be changed one step by the State at no additional expense to the State. The approximate percent of asphalt cement to be added to the mix shall be 5 to 7 percent based on total weight of mixture. The final percentage will be determined from the job-mix formula for each mixture specified. The asphalt cement used on the project shall be of the same grade and from the same supplier as that used and approved in the job-mix formula.
2. Prime/tack coat shall be Type SC-70 liquid asphalt conforming to the requirements of the Caltrans Standard Specifications Section 93 or asphalt emulsion conforming to the requirements of Caltrans Standard Specifications Section 94.
3. Asphalt concrete surfacing shall conform to the requirements of Caltrans Standard Specifications Section 39. Mineral aggregate shall be ½-inch maximum size, Type B.

Q. FILLER

1. If filler is required, the filler material shall meet the requirements of AASHTO M 17-77.

PART 3 - EXECUTION

A. EQUIPMENT

1. Plant, hauling, placing, and rolling equipment shall be adequate to ensure uniformity and continuity of operations and be in good operating condition capable of performing according to manufacturer's specifications. The Contractor may, at his option, use the type plant he desires, provided the equipment meets the following requirements.

2. Requirements for All Plants:

a. Equipment for Preparation of Asphalt Concrete Material: Tanks for the storage of asphalt concrete material shall be equipped to heat and hold the material at the required temperatures. The heating shall be accomplished by steam coils, electricity, or other approved means so that flame will not be in contact with the tank. The circulating system for the asphalt concrete material shall be designed to ensure proper and continuous circulation during the operating period. Provision shall be made for measuring and sampling material in storage tanks.

b. Feeder for Dryer: The plant shall be provided with accurate mechanical means for uniformly feeding the aggregate into the dryer to obtain uniform production and temperature.

c. Dryer: The plant shall include a dryer or dryers that continuously agitate the aggregate during the heating and drying process.

d. Screens: Aggregate gradation control shall be provided either with plant screens or screenless plants in accordance with the following methods:

a. METHOD A: Plant screens shall screen the hot aggregate to the specified sizes and proportions and have normal capacities in excess of the full capacity of the mixer.

b. METHOD B: Screenless plants with cold feed control shall have the cold aggregate separated and stored in separate coarse aggregate and fine aggregate stockpiles.

e. Hot Aggregate Bins: Pugmill plants shall include storage bins of sufficient capacity to supply the mixer when it is operating at full capacity. Bins shall be arranged to ensure separate and adequate storage of appropriate fractions of the hot mineral aggregates. Separate dry storage shall be provided for filler or hydrated lime when used, and the plant shall be equipped to feed such material into the mixer. Each bin shall be provided with overflow pipes, of such size and at such locations as to prevent backing up of material into other compartments or bins. Each compartment shall be provided with its individual outlet gate,

constructed so that when closed there shall be no leakage. The gates shall cut off quickly and completely. Bins shall be so constructed that samples can be readily obtained. Bins shall be equipped with adequate tell-tale devices to indicate the position of the aggregates in the bins at the lower quarter points.

f. Asphalt Concrete Control Unit: Satisfactory means, either by weighing or metering, shall be provided to obtain the proper amount of asphalt concrete material in the mix. Means shall be provided for checking the quantity or rate of flow of asphalt concrete material into the mixer.

g. Thermometric Equipment: An armored thermometer of adequate range shall be fixed in the asphalt concrete feed line at a suitable location near the charging valve at the mixer unit. The plant shall also be equipped with an approved temperature measuring apparatus placed at the discharge chute of the dryer.

h. Emission Control: Dust, smoke, or other contaminants shall be controlled by appropriate devices at the plant site to meet air pollution requirements.

i. Commercial Binders or Fillers: When materials are to be used that require the mixing of commercial binders or fillers with the aggregate, a central mixing plant of the twin-pugmill type will be required. Other methods that ensure a thorough and homogeneous mixture will be permitted on written approval.

3. Requirements for Batching Plants:

a. Weight Box or Hopper: The equipment shall include a means for accurately weighing each size of aggregate in a weigh box or hopper suspended on scales and of ample size to hold a full batch without hand raking or running over. The gate shall close tightly so that material is not allowed to leak into the mixer while a batch is being weighed.

b. Asphalt Concrete Control: The equipment used to measure the asphalt concrete material shall be accurate to plus or minus 0.5 percent. The asphalt concrete material bucket shall be non-tilting type with a loose sheet metal cover. The length of the discharge opening or spray bar shall be not less than ¾ the length of the mixer and it shall discharge directly into the mixer. The asphalt concrete material bucket, its discharge valve or valves, and spray bar shall be adequately hosted. Steam jackets, if used, shall be efficiently drained and all connections shall be so constructed that they will not interfere with the efficient operation of the asphalt concrete scales. The capacity of the asphalt concrete material bucket shall be at least 15 percent in excess of the weight of asphalt concrete material required in any batch. The plant shall have an adequately heeled, quick-acting, nondrip, charging valve located directly over the asphalt concrete material bucket.

4. The indicator dial shall have a capacity of at least 15 percent in excess of the quantity of asphalt concrete material used in a batch. The dial shall be in full view of the mixer operator. The flow of asphalt concrete material shall be controlled so that it will begin when the dry mixing period is over. All of the asphalt concrete material required for one batch shall be discharged not more then 15 seconds after the flow has started. The size and spacing of the spray bar openings shall provide a uniform application of asphalt concrete material the full length of the mixer. The section of the asphalt concrete line between the charging valve and the spray bar shall be provided with a valve and outlet for checking the meter when a metering device is substituted for a asphalt concrete material bucket.

   a. Mixer: The batch mixer shall be an approved type capable of producing a uniform mixture within the job-mix tolerances. If not enclosed, the mixer box shall be equipped with a dust hood to prevent loss of dust.

5. The clearance of blades from all fixed and moving parts shall not exceed 1 inch unless the maximum diameter of the aggregate in the mix exceeds 1¼ inches, in which case the clearance shall not exceed 1½ inches.

6. Hauling Equipment: Trucks used for hauling asphalt concrete mixtures shall have tight, clean, smooth metal beds that have been thinly coated with a minimum amount of paraffin oil, lime solution, or other approved material to prevent the mixture from adhering to the beds. Each truck shall have a cover of canvas or other suitable material of such size as to protect the mixture from the weather.

7. Rollers: Rollers shall be of the steel-wheel, vibratory, pneumatic tire type, or combination, capable of reversing without backlash. Steel-wheel rollers other than vibrating shall be capable of exerting a force of not less than 250 psi of width of the roller. Vibrating steel-wheel rollers shall have a minimum weight of 6 tons.

8. Pneumatic-tired rollers shall have smooth tread tires of equal size that will provide a uniform compaction pressure for the full width of the roller and shall be capable of exerting a ground pressure of at least 80 psi.

B. SAWCUTTING, REMOVAL, AND PREPARATION OF EXISTING PAVEMENT

1. Existing asphalt pavement to be removed shall be cut by a wheel cutter or other device capable of making a neat, reasonably straight and smooth cut without damaging adjacent pavement that is not to be removed.

2. The existing pavement shall be saw cut and trimmed after placement of required base course material and just prior to placement of asphalt concrete for pavement replacement, and the trimmed edges shall be painted with a coating of prime coat immediately prior to constructing the new abutting asphalt pavements.

3. All existing aggregate base material and asphalt concrete removed, and any excess new material shall be hauled away from the project site and legally disposed of by the Contractor.

C. APPLICATION

1. Conditioning of Existing Surface: When the surface of the existing pavement or old base is irregular, it shall be brought to uniform grade and cross section as directed.
2. Paint contact surfaces of curbing, gutters, manholes, and other structures with a thin, uniform coating of asphalt concrete tack/primer coating emulsion before placing the asphalt concrete mixture against them.

D. MIXING

1. Combine aggregates in the mixer in the amount of each fraction of aggregates required to meet the job-mix formula. The asphalt concrete material shall be measured or gauged and introduced into the mixer in the amount specified by the job-mix formula.
2. After the required amounts of aggregate and asphalt concrete material have been introduced into the mixer, the materials shall be mixed until a complete and uniform coating of the particles is secured.
3. The asphalt concrete material and aggregate for pugmill mixtures shall be introduced into the mixer within 35°F of each other. Temperature of pugmill mixtures shall be controlled between 225 and 300°F.
4. Material delivered to the paver shall not be less then 225°F.

E. SPREADING AND FINISHING MIX

1. The mixture shall be laid upon an approved surface, spread and struck off to the grade and elevation established. Use asphalt concrete pavers to distribute the mixture either over the entire width or over such partial width as may be practicable.
2. The longitudinal joint in one layer shall offset that in the layer immediately below by approximately 6 inches.
3. Where paving operations are on the present traveled roadway, and where the thickness of pavement course being placed is greater then 1 inch, the Contractor shall arrange his paving operations so that there will be no exposed longitudinal joint between adjacent travel lanes at the end of a day's run.
4. On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impracticable, the mixture shall be spread, raked, and luted by hand tools. For such areas the mixture shall be dumped, spread, and screeded to give the required compacted thickness.

5. Transport and place asphalt concrete mixture on the roadway in a manner that will minimize segregation. Remove segregated areas behind the paver immediately and replace the segregated material with specification material before the initial rolling has taken place. The removal and replacement of nonspecification material or unacceptable work shall be accomplished at no additional expense to the State.

6. Place asphalt concrete material as continuously as possible. Rollers shall not pass over the unprotected end of a freshly laid mixture unless authorized by the State. Form transverse joints by cutting back on the previous run to expose the full depth of the course. When directed, use a coat of asphalt concrete tack/primer emulsion coating on contact surfaces of all joints just before additional mixture is placed against the previously rolled material.

F. COMPACTING MIX

1. After the asphalt concrete mixture has been spread and struck off, and surface irregularities have been adjusted, thoroughly and uniformly compact mixture by rolling.

2. Roll surface when the mixture is in the proper condition and when the rolling does not cause undue displacement, cracking, or shoving.

3. The number, weight, and type of rollers furnished shall be sufficient to obtain the required compaction while the mixture is in a workable condition.

4. Begin rolling at the sides and proceed longitudinally parallel to the road centerline, each trip overlapping one-half the roller width, gradually progressing to the crown of the road. When paving in echelon or abutting a previously placed lens, roll the longitudinal joint first, then follow regular rolling procedure. On super elevated curves, begin rolling at the low side and progress to the high side by overlapping of longitudinal trips parallel to the centerline.

5. Continue rolling until all roller marks are eliminated and the minimum density specified has been obtained.

6. Any displacement occurring as a result of the reversing of the direction of a roller, or from other causes, shall be corrected at once by the use of rakes and addition of fresh mixture when required. Care shall be exercised in rolling not to displace the line and grade of the edges of the asphalt concrete mixture.

7. To prevent adhesion of the mixture to the rollers, keep wheels properly moistened with water or water mixed with very small quantities of detergent or other approved material. Excess liquid will not be permitted.

8. Along forms, curbs, headers, walls, and other places not accessible to the rollers, thoroughly compact mixture with herd tampers or with mechanical tampers.

9. Remove mixture that becomes loose and broken, mixed with dirt, or is in any way defective, and replace with fresh hot mixture; compact to conform with the surrounding area.

G. ACCEPTANCE REQUIREMENTS

1. Surface Tolerance: The variation between any two contacts with the surface shall not exceed 1 inch vertical in a 10-foot length. Correct all humps or depressions exceeding the specified tolerance by removing defective work and replacing it with new material at no additional expense to the State.

2. Density: Acceptable density of the in-place asphalt concrete pavement shall be 95 percent of the optimum values as determined from the job-mix formula. Field sampling and density determinations shall be made in accordance with California Test 308, Method A, or an acceptable nuclear procedure.

3. A uniform compacted thickness shall be obtained for each course equal to or greater than the design thickness shown. Individual tests shall not vary by more than plus or minus ¼ inch.

4. Mix Tolerances: The following tolerances for the job-mix formula will be allowed per single test:

H.	Sieve Designation	I.	Percent Passing
J.	No. 8 and larger sieves	K.	+ 8
L.	Smaller than No. 8 to larger than No. 200 sieve	M.	+ 6
N.	No. 200 sieve	O.	+ 3
P.	Asphalt content, weight percent total mix	Q.	+ 0.5

R. FIELD QUALITY CONTROL

1. Placement

   a. Place the mixture on the roads, pavements, or walks at a temperature not less than 225°F.

2. Tests

   a. The type and size of the samples shall be suitable to determine conformance with stability, density, thickness, and other specified requirements. Use an approved power saw or core drill for cutting samples. Furnish all tools, labor, and materials for cutting samples, testing, and replacing the pavement where samples were removed. Take a minimum 1 sample per 200 tons of asphalt concrete placed.

3. Acceptance Criteria

a. General: Acceptance will be based on the following characteristics of the bituminous mixture and completed pavement as well as the implementation of the Contractor's Quality Control plan and test results:

a. Stability
b. Flow
c. Air Voids
d. Mat Density
e. Joint Density
f. Thickness
g. Smoothness
h. Grade
i. Aggregate Gradation

END OF SECTION 32 12 16

SECTION 32 13 13

PORTLAND CEMENT PAVING

PART 1 - GENERAL

1.1 WORK RELATED

A. Provide all equipment and materials and do all work necessary to construct the Portland cement concrete paving work, complete, as indicated and as specified. Portland cement concrete paving shall include but not be limited to: Roadway pavement, handicap ramps, and curbs.

B. Related Work

1. Trenching, Backfilling and compacting - Section 31 22 00

1.2 QUALITY ASSURANCE

A. Unless otherwise specified, work and materials for construction of the Portland cement concrete paving shall conform to ACI 316R.

B. Work, materials, and color of the handicap ramp paving shall conform to applicable sections of Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities and CBC.

C. Paving work, base course etc., shall be done only after excavation and construction work which might injure them have been completed. Damage caused during construction shall be repaired before acceptance.

D. Existing paving area shall, if damaged or removed during the course of this project, be repaired or replaced under this section of the specification. Workmanship and materials for such repair and replacement, except as otherwise noted, shall match as closely as possible those employed in existing work.

E. Pavement, base, or sub-base shall not be placed on a muddy subgrade.

F. Provide one 4' X 4' mock-up panel of each type of proposed concrete paving, including finishes.

1.3 SUMMARY

1. Select materials with qualifying Environmental Product Declarations.

2. Select materials to maximize use of recycled content.

3. Select materials to maximize use of bio-based products.

4. Select only wood materials which are either Forest Stewardship Council certified or USGBC-approved equivalent.

5. Select materials that use any of the qualifying programs to demonstrate the chemical inventory of the product to at least 0.1%.

6. Select materials that participate in qualified take back or buyback program.

7. Give preference to materials that are both sourced and manufactured within 100 miles of the project site

1.4 SUBMITTALS

A. Submittals for review during construction phase:

1. Catalog cuts of all concrete colors and lists of all proposed concrete mix designs.

2. Description of Methods and Sequence of Placement. For each type of specially-finished concrete provide description of methods and sequence of placement.

3. Submit manufacturer's product data for the following:

   a. Form release agent.
   b. Concrete coloring additive.
   c. Prefabricated control joint.
   d. Performed joint filler.
   e. Sealants.
   f. Slip joint.
   g. 2’ x 2’ sample for color selection.

A. Achievement of LEED-NC v4 and 4.1 requires specific forms of documentation as part of the materials submittals to document certain product properties.

PART 2 – PRODUCTS

2.1 AGGREGATE BASE COURSE

A. Material for aggregate base course shall be per soil report or as instructed by the State.

2.2 STEEL REINFORCEMENT

A. Steel reinforcing bars shall conform to ASTM A 615.

1. Bars employed as reinforcement shall be deformed type.

2. Bars employed as dowels shall be hot-rolled plain rounds.

3. Reinforcing bars shall be Grade 60.

B. Welded wire fabric reinforcement shall conform to the applicable requirements of ASTM A185. Fabric reinforcement shall be furnished in flat sheets. Fabric reinforcement in rolls will not be permitted.

2.3 PORTLAND CEMENT CONCRETE

A. Portland cement concrete for pavements and slabs shall be air-entrained type with a maximum water-cement ratio of .50 conforming to ACI 316R. Minimum compressive strengths at 28 days shall be as follows: Flexural strength with third point loading - 650 psi; compress strength 3000 psi.

1. Concrete shall be air-entrained type, conforming to ASTM C 94. Air content by volume shall be 6% ± 1%, and shall be tested in accordance with ASTM C 231.

2. Concrete slump shall be no less than 2 in. nor did greater that 4 in., determine in accordance with ASTM C 143.

3. Cement shall be Portland cement, conforming to ASTM C 150, Type II.

4. Fine and coarse aggregates shall conform to ASTM C 33.

5. Concrete shall contain a water reducing agent to minimize cement and water content of the concrete mix at the specified slump. Water reducing agent shall conform to ASTM C 494.

6. No calcium chloride or admixtures containing calcium chloride shall be added to the concrete. No admixtures other than those specified shall be used in the concrete without the specific written permission of the State.

2.4 COLOR ADMIXTURE

A. Color admixture shall be suitable for flatwork concrete and shall meet or exceed the requirements set by Portland Cement Association (PCA) and ATSM C 494.

B. Color admixture shall be of a type and quality which will not adversely affect workability, setting, or strength of concrete. Color pigments shall consist of chemically inert, non-fading, alkali-fast mineral oxides, finely ground and specially

prepared for the use in both cement and mortar. Admixture shall not contain calcium chloride.

C. Color admixture shall be manufactured by Davis Colors, L.M. Scofield Company Company, QC Construction Products, or equal.

1. Co-1, "Eastern Tan" as manufactured by Davis Colors.

2. Co-2, "Pewter" as manufactured by Davis Colors.

3. Co-3, "Cobblestone" as manufactured by Davis Colors.

D. Mix design shall conform to manufacturer's recommendations, and directions of the State to achieve proposed color. Strictly monitor additive / cement ratio throughout job to ensure uniform color.

E. Sealer: Environmentally safe, stain repelling, penetrating clear sealer by L.M. Scofield "Repello" or QC Construction "SEM-SEAL", or equal.

2.6 CURING AND SEALING MATERIALS FOR EXPOSED AGGREGATE AND NATURAL COLOR SANDBLASTED.

A. All exposed aggregate concrete and natural color sandblasted designated in the plans or specifications shall be cured with new, non-staining, curing paper and sealed with penetrating clear sealer, Manufactured by L.M. Scofield Company , QC Construction Products or equal. The concrete shall be at least one month old, dry, clean, and free of dust, paint plaster, oils and waxes, curing compounds, and other marks and discoloration. Two coats of penetrating clear sealer shall be applied in accordance with manufacturer's instructions.

2.7 CURING MATERIAL FOR UNCOLORED CONCRETE

A. Curing shall be by moist curing or by use of curing compound.

B. Curing paper shall be non-staining, fiber reinforced laminated kraft bituminous product conforming to ASTM C 171. Four mil polyethylene sheeting may be substituted for curing paper.

C. Curing compound shall be a resin-base, white pigmented compound conforming to ASTM C 309, Type 2.

2.8 EXPANSION JOINTS

A. Expansion joints shall be located 20 ft. o.c., maximum.

B. Expansion joint filler shall be performed, non bituminous type joint filler conforming to ASTM D 1752, Type II,

1. Pre-molded filler shall be one piece for the full depth and width of the joint leaving a sealant recess.

2. Use of multiple pieces of lesser dimensions to make up required depth and width of joint will not be permitted.

3. Joint filler shall be 1/2 in. thick.

C. Expansion joint shall receive joint backer rod and shall be sealed with joint sealant.

2.9 CONTROL JOINTS

A. Saw Cut Joints indicated shall be sawn by using a diamond blade concrete power saw. Joint shall be made after concrete is finished and when the surface is stiff enough to support the weight of workmen without damage to the slab. Saw shall cut into slab, but in no case less than 25% of slab depth. Cuts shall be full depth for entire area indicated; no radical transitions.

B. Score lines shall be tooled into the concrete slab, with troweled edges, or every 10 ft. o.c. maximum. Joint shall be made after concrete is finished and when the surface is stiff enough to support the weight of workmen without damage to the slab, but before slab has achieved its final set.

2.10 CONSTRUCTION JOINTS

A. Transverse construction joints shall be placed whenever placing of concrete is suspended for more than 30 minutes.

1. Butt joint with dowels or thickened edge joint shall be used if construction joint occurs at location of control joint.

2. Keyed joints with tie bars shall be used if the joint occurs at any other location.

B. Expansion joints shall be spaced at 20 o.c. maximum.

2.11 GROUT

A. Grout shall be mixed in the proportions of one part Portland cement to two parts sand, by volume. Only sufficient water shall be used to enable grout to barely hold its shape when squeezed into a ball in the hand. Sand for grout shall be "Fine Aggregate", conforming to ASTM C 33.

B. Non-shrink grout shall be pre-mixed non-shrinking, high strength grout. Compressive strength in 28 days shall be 5,000 psi minimum, but in no case less than the specified strength of the adjacent concrete. Manufacturer shall provide evidence that the material meets the requirements of the COE CRD-C 621 (558). Grout permanently exposed to view shall be non-oxidizing; metallic grout may be used in other locations.

1. Non-shrink grout shall be one of the following or equal:

Manufacturer	Product
Gifford-Hill Co.	Supreme
Master Builders Co.	Embeco
U.S. Grout Corporation	Five Star Grout

2.12 SEALANT

A. Sealant for sealing of control joints and expansion joints in concrete band and expansion joints of concrete walks shall be a three component polyurethane based

sealant conforming to ASTM C 920 and to Fed. Spec. TT-S-00227, Class A, with a Shore A hardness of 30 + 5, or better.

1. Color of sealant shall be selected by the State from the manufacturer's full color range.

2. Primer shall be that recommended by the sealant manufacturer for the use intended.

3. Joint backing where required shall be as recommended by the sealant manufacturer.

2.13 BOND BREAKER

A. Bond breaker shall be round closed-cell polyethylene by DFC, Sonneborn or equal.

2.14 SANDBLASTING MATERIAL

A. Material for sandblasting shall be 16/20 mesh sand.

2.15 TOP SURFACE RETARDER

A. All concrete flatwork with exposed-aggregate shall be exposed using a top surface retarder, manufactured by L.M. Scofied Company, QC Construction Products, or equal. It shall be applied and the aggregate exposed in accordance with manufacturer's application instructions. For supplemental sealing: The exposed aggregate concrete shall be cured with new, non-staining, curing paper. After the concrete is at least one month old, two coats of penetrating clear sealer shall be applied in accordance with manufacturer's instructions to surfaces that are dry, clean, and free of dust, paint, plaster, oils and waxes, and other marks and discolorations.

PART 3 – EXECUTION

3.1 PREPARATION OF SUBGRADE

A. Areas to be paved will be compacted and brought to subgrade elevation per soils report before work of this section is performed. Final fine grading, filling, and compaction of areas to receive paving, as required to form a firm, uniform, accurate, and unyielding subgrade at required elevations and to required lines, shall be done under this Section.

B. Existing subgrade material which will not readily compact as required shall be removed and replaced with satisfactory materials. Additional materials needed to bring subgrade to required line and grade and to replace unsuitable material removed shall be material conforming to this Section.

C. Subgrade of areas to be paved shall be re-compacted per Section 31 22 00.

D. Excavation required in pavement subgrade shall be completed before fine grading and final compaction of subgrade are performed. Where excavation must be performed in complete subgrade, sub-base, base, or pavement, subsequent backfill and compaction shall be performed per soils report.

E. Areas being graded or compacted shall be kept shaped and drained during construction. Ruts greater than or equal to 2 in. deep in subgrade, shall be graded out, reshaped as required, and re-compacted before placing pavement.

F. Materials shall not be stored or stockpiled on subgrade.

G. Disposal of debris and other material excavated under this section, and material unsuitable for or in excess of requirements for completing work of this section shall be disposed of off-site.

H. Prepared subgrade will be inspected by geotechnical engineer. Subgrade shall be approved before installation of gravel base course. Disturbance to subgrade caused by inspection procedures shall be repaired under this section of the specification.

3.2 AGGREGATE BASE COURSE

A. Aggregate base course for paving and the spreading, grading, and compaction methods employed shall conform to standard requirements for usual base course of this type for first class road work, and the following:

1. Standard Specifications for Public Works Construction Section 200-2.

B. Aggregate material shall be applied in lifts less than or equal to 6 in. thick, compacted measure. Each lift shall be separately compacted to specified density, using a 6 ton static roller, or an approved equivalent.

1. Material shall be placed adjacent to wall, manhole, catch basin, and other structures only after they have been set to required grade and level.

2. Rolling shall begin at sides and progress to center of crowned areas, and shall begin on low side and progress toward high side of sloped areas. Rolling shall continue until material does not creep or wave ahead of roller wheels.

3. Surface irregularities which exceed 1/2 in. as measured by means of a 10 ft. long straightedge, shall be replaced and properly re-compacted.

C. Base course shall be compacted at optimum moisture content to not less than 95% of maximum density as determined by ASTM D 1557.

D. Subgrade and base course shall be kept clean and uncontaminated. Less select materials shall not be permitted to become mixed with gravel. Materials spilled outside pavement lines shall be removed and area repaired.

E. Portions of subgrade or of construction above which become contaminated, softened, or dislodged by passing of traffic, or otherwise injured, shall be cleaned, replaced, or otherwise repaired to conform to the requirements of this specification before proceeding with next operation.

3.3 STEEL REINFORCEMENT

A. Before being placed in position, reinforcing for reinforced concrete shall be thoroughly cleaned of loose mill and rust scale, dirt, ice and other foreign material which may reduce the bond between the concrete and reinforcing. Where there is

delay in placing concrete after reinforcement is in place, bars shall be re inspected and cleaned when necessary.

B. Any bar showing cracks after bending shall be discarded.

C. Reinforcing shall extend within 2 in. of form work and expansion joints. Reinforcing shall continue through control joints. Adjacent sheets of fabric reinforcing shall lap 6 in.

D. After forms have been coated with form release agent, but before concrete is placed, reinforcing steel anchors shall be securely wired in the exact position called for, and shall be maintained in that position until concrete is placed and compacted.

3.4 PORTLAND CEMENT CONCRETE PAVING

A. Paving mix, equipment, methods of mixing and placing, and precautions to be observed as to weather, condition of base etc., shall meet the requirements of ACI 316R. Pavement shall be constructed in accordance with the Contract Documents.

B. The State shall be notified on concrete placement sufficiently in advance of start of operation to allow his representative to complete preliminary review of the work, including subgrade, forms, and reinforcing steel, if used.

C. Normal concrete placement procedures shall be followed. Concrete shall arrive at the job site so that no additional water will be required to produce the desired slump. When conditions develop that required addition of water to produce the desired slump, permission of the State must be obtained. The concrete shall be transported from the mixer to its place of deposit by a method that will prevent segregation or loss of material.

D. Work shall not be performed during rainy weather or when temperature is less than 40° F.

E. Adjacent work, etc. shall be thoroughly protected from stain and damage during entire operation. Damaged and stained areas shall be replaced or repaired to equal their original conditions.

F. Existing concrete, earth, and other water-permeable material against which new concrete is to be placed shall thoroughly damp when concrete is placed. There shall be no free water on surface.

G. Concrete which has set or partially set before placing shall not be employed. Re tempering of concrete will not be permitted.

H. Concrete shall be thoroughly spaded and tamped to secure a solid and homogeneous mass, thoroughly worked around reinforcement and into corners of forms.

I. When joining fresh concrete to concrete which has attained full set, latter shall be cleaned of foreign matter, and mortar scum and laitance shall be removed by chipping and washing. Clean, roughened base surface shall be saturated with water, but shall have no free water on surface. A coat of 1:1 cement-sand grout,

approximately 1/8 in. thick, shall be well scrubbed into thoroughly dampened concrete base. New concrete shall be placed immediately, before grout has dried or set.

3.5 FINISHING

A. Concrete flatwork surfaces shall be screeded off and finished true to line and grade, and free of hollows and bumps. Surface shall be dense, smooth, and at exact level and slope required.

1. Finished concrete surface for concrete walks and pads and concrete band shall be wood-floated and steel troweled to a smooth surface. Surface shall not deviate more than 1/8 in. in 10 ft.

B. Broom finish - The direction of grooves in the concrete surface shall be perpendicular to length of concrete band, slab, or pad. After concrete has set sufficiently to prevent coarse aggregate from being torn from surface, but before it has completely set, brooms shall be drawn across it to produce a patter of small parallel grooves. Broomed surface shall be uniform, with no smooth, unduly rough or porous pots, or other irregularities. Course aggregate shall not be dislodged by brooming operation.

C. Sandblast finish shall be consistent finish throughout and match approved mock-up.

D. Immediately following finish operations, arises at edges and both sides of expansion joints shall be rounded to 1/4 in. radius. Control joints to be tooled shall be scored into slab surface with coring tool. Adjacent edges of control joint shall at same time be finished to 1/4 in. radius.

E. Where finishing is performed before end of curing period, concrete shall not be permitted to dry out, and shall be kept continuously moist from time of placing until end of curing period, or until curing membrane is applied.

3.6 CURING

A. It is essential that concrete be kept continuously damp from time of placement until end of specified curing period. It is equally essential that water not be added to surface during floating and troweling operations, and not earlier than 24 hours concrete placement. Between finishing operations surface shall be protected from rapid drying by a covering of waterproofing paper. Surface shall be damp when the covering is placed over it and shall be kept damp by means of a fog spray of water, applied as often as necessary to prevent drying, but not sooner than 24 hours after placing concrete. None of the water so applied shall be troweled or floated into surface.

B. Concrete surfaces shall be cured by completely covering with curing paper or application of a curing compound.

1. Concrete cured using waterproof paper shall be completely covered with paper with seams lapped and sealed with tape. Concrete surface shall not be allowed to become moistened between 24 and 36 hours after placing concrete. During curing period surface shall be checked frequently and sprayed with water as often as necessary to prevent drying, but not earlier than 24 hours after placing concrete.

2. If concrete is cured with a curing compound, compound shall be applied at a rate of 200 sq. ft. per gallon, in two applications perpendicular to each other.

3.7 CURING COLORED CONCRETE

A. Colored concrete shall not under any circumstances, be cured using water fog misting or ponding, burlap, plastic sheeting, or other wet covering.

B. Curing material and method shall be in strict conformance with manufacturer's guidelines and recommendations.

C. Only if additional protection is absolutely required, the surface should remain uncovered for at least 4 days, after which time new and unwrinkled non-staining reinforced waterproof kraft curing paper may be used.

3.8 EXPANSION JOINTS

A. Expansion joints shall be as located on the Contract Documents. Expansion joints shall be formed in the concrete to required width to accommodate preformed joint filler. Joint filler shall extend the full depth of the slab. Joint filler shall extend the full length of the expansion joint.

3.9 SEALING OF JOINTS

A. Expansion joints in concrete banding and expansion joints in concrete walkways shall be sealed with joint sealant in accordance with the precautions specified in the appendix of ATSM C 962.

3.10 PROTECTION OF CONCRETE SURFACES

A. Concrete surfaces shall be protected form traffic or damage until surfaces have hardened sufficiently. If necessary 1/2 in. thick plywood sheets shall be used to protect the exposed surface.

END OF SECTION 32 13 13

SECTION 32 16 13
CONCRETE CURBS AND GUTTER

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Provide the construction of concrete curbs and combination curb and gutter when not integral with the pavement slab, as shown and as specified, complete.

1.2 QUALITY ASSURANCE

B. Material Testing:

1. The following tests will be performed by the State-furnished testing agency.
    a. Concrete and concrete materials tests conforming to the requirements of Section 32 13 13.

C. Test Reports: The State testing agency will report all results of the tests to the State who will approve or disapprove Contractor's work.

1.3 SUMMARY

D.

1. Select materials with qualifying Environmental Product Declarations.
2. Select materials to maximize use of recycled content.
3. Select materials to maximize use of bio-based products.
4. Select only wood materials which are either Forest Stewardship Council certified or USGBC-approved equivalent.
5. Select materials that use any of the qualifying programs to demonstrate the chemical inventory of the product to at least 0.1%.
6. Select materials that participate in qualified take back or buyback program.
7. Give preference to materials that are both sourced and manufactured within 100 miles of the project site

1.4 SUBMITTALS

E. Miscellaneous Materials: Furnish mill tests or manufacturer's certification of compliance with the specifications for materials when requested by the State. Use no membrane curing compounds until they have been approved by the State.

F. Types of forms for approval.

G. Proposed curing compound.

H. Achievement of LEED-NC v4 and 4.1 requires specific forms of documentation as part of the materials submittals to document certain product properties.

1.5 JOB CONDITIONS

I. Placing Temperature:

1. Warm Weather. Concrete placement will be subject to approval by the State when weather conditions or limitations of facilities reported by Contractor would prevent correct finishing and curing of the concrete in accordance with the requirements of these Specifications.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Concrete is specified in Section 32 05 23, Cement and Concrete for exterior improvements, and shall be Class N-6.0 air-entrained. Minimum compressive strength at 28 days shall be 2500 psi.

B. Expansion Joint Filler: Preformed non-extruding bituminous-treated fiberboard conforming to ASTM D 1751.

C. Joint Sealer: Hot poured type consisting of a resilient and adhesive plastic. The material shall be in accordance with ASTM D 1190.

D. Curing Materials:

1. Burlap. Conform to AASHTO M-182. Burlap shall be free from holes, dirt, clay or any other substance that would have a deleterious effect on concrete. Burlap shall absorb water readily when dipped or sprayed and shall weigh not less than 7 ounces per square yard when clean and dry.

2. Waterproof Paper. Conform to ASTM C 171.]

3. Membrane curing compound shall be water soluble emulsion type linseed oil base compound and conform to the requirements for Type 2 compound as specified in ASTM C 309, except that requirements for the sag test and the drying time shall not apply.

E. Forms: Form coating is specified in Section 03 11 00, Concrete Formwork

1. Forms shall be of wood or steel, straight, and shall be fastened to prevent springing during depositing and consolidating the concrete.

2. The outside forms shall have a height equal to the full depth of the curb.

3. The width of outside forms for gutters shall equal the full thickness of the gutter.

4. For straight runs, forms of wood shall be surfaced plank, 2-inch nominal thickness, straight and free from warp, twist, loose knots, splits, or other defects. Wood forms shall have a nominal length of 10 feet, staked to prevent distortion of the form.

5. Steel forms shall be channel-formed sections with a flat top surface and with welded braces at each end and at not less than two (2) intermediate points. Form ends shall be interlocked and self-aligning.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Concrete:

1. General. Use metal forms unless otherwise specifically authorized by the State, except that on curves having a radius of 150 feet or less, wood forms may be used. All forms shall be approved by the State.
   a. Form Setting. The subgrade under the forms shall be compact and cut true to grade, so that the forms will be firmly in contact with it for their entire length. Join each form section tightly by locked joints, free from play or movement in any direction. Check conformity to the alignment and grade elevation shown and make necessary corrections prior to placing the concrete.
   b. Coating. Oil forms each time they are used.
   c. Removal. Keep forms in place at least 12 hours after concrete has been placed against them or for a longer period if requested by the State. Do not use crowbars or other heavy tools against green concrete in removing the forms. Clean forms completely before re-oiling and reuse.
2. Finishing. Test the subgrade for elevation and density in advance of placing concrete. Correct any discrepancies in accordance with the requirements for subgrade preparation.
   a. Tamp and space the concrete so as to produce a dense concrete in which the mortar has been worked to the surface. Strike off the concrete to the required cross section and smooth the upper face of the gutter slab and the front face and top of the curb with a wood float. Use an edging tool on all exposed corners. When completed, the surface of the curb and gutter shall be straight and true, and shall conform to the shape and dimensions shown and shall have a first-class float finish of sandy or gritty texture as shown.
3. Joints.
   a. General. Provide contraction and expansion joints in all curb and gutters. Place and finish joints per Section 303-5.4 of the Standard Specifications for Public Works Construction and as approved by the State. All joints shall be perpendicular to the finished grade.
   b. Contraction Joint. Place contraction joints so that monolithic sections shall be in 8 foot sections. Separate each section by a 1/8 inch thick steel template. Remove templates as soon as practicable after the concrete has been struck off, and set to preserve the shape of the joint.
   c. Expansion Joint. Form expansion joints by a preformed filler material cut and shaped to the cross section of the curb and gutter. Provide expansion joints at the ends of all return radii. Expansion joints shall be provided 1/2 inch in width at intervals not exceeding 48 feet.

d. Sealing. Fill the joints with sealing material, specified in Paragraph 2.1 C above, as shown and as approved by the State. Joints shall be cleaned, dried and poured as soon after the end of the curing period as weather conditions permit. Perform the work in a neat workmanlike manner without spilling and remove all excess material.

4. Patching. After removal of forms, fill all damaged and honeycombed areas with mortar, one part cement to two parts sand. No patching is allowed on the surface.

5. Curing.

a. General. Cover and protect all concrete from moisture evaporation, rapid temperature change and from rain, flowing water, and mechanical injury during a period of at least 72 hours immediately following the finishing. The use of a covering material which contains, or becomes contaminated with sugar in any form, tannic acid, or any other substance considered detrimental to Portland cement, will not be permitted. The initial curing medium shall be applied so as to prevent checking, cracking, and the appearance of dry spots in the surface of the concrete. Protect the sides of concrete slabs exposed by the removal of forms immediately to provide continuance of curing and prevent injury of the curb and gutter edges and the underlying subgrade. When it is expected during the progress of the work, and before all concrete has attained final set, that the temperature may fall below 35ºF, supply straw, hay or other material approved by the State to cover the concrete and to protect its surface and edges against freezing until it is at least ten (10) days old.

b. Mat Curing. Mats of burlap, cotton, or other fibrous material having similar water absorptive properties shall be wet when applied and kept continuously wet and in intimate contact with the covered surface, for the duration of the curing period. Mats shall be uniform in thickness, shall weigh not less than 20 ounces per square yard when dry, and shall be capable of absorbing at least one and one-half times their weight of water. If burlap is used, it shall be used in two or more, not single, layers. All mats shall be approved by the State.

c. Membrane Curing Compound. No compound shall be used until it has been approved by the State.

1) Application. Agitate curing compounds continuously during use, and spray uniformly, in a single coat, by spraying equipment, on all concrete surfaces, at a rate recommended by the manufacturer and based on moisture retention tests. Application will be made immediately following the final finishing operation.

2) Protection of Treated Surfaces. Keep concrete surfaces to which membrane compounds have been applied free from all foot and vehicular traffic and all other sources of abrasion for a minimum period of 14 days.

3) Protection. Protect the curb and gutter against all damage prior to final acceptance of the work. Exclude the traffic from the pavement by erecting and maintaining barricades and signs until the concrete is at

least fourteen (14) days old, or for a longer period if requested by the State.

3.2 FIELD QUALITY CONTROL

B. Workmanship: Construct all curbs at the location and to the lines and levels shown.

END OF SECTION 32 16 13

SECTION 32 17 23
PAVEMENT MARKINGS

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Pavement Marking
B. Precast Concrete Bumpers

1.2 RELATED WORK

A.. Section 32 12 16 -Asphalt Paving
B. Section 32 13 13 - Portland Cement Paving.

1.3 SUMMARY

1. Select materials with qualifying Environmental Product Declarations.

2. Select materials to maximize use of recycled content.

3. Select materials to maximize use of bio-based products.

4. Select only wood materials which are either Forest Stewardship Council certified or USGBC-approved equivalent.

5. Select materials that use any of the qualifying programs to demonstrate the chemical inventory of the product to at least 0.1%.

6. Select materials that participate in qualified take back or buyback program.

7. Give preference to materials that are both sourced and manufactured within 100 miles of the project site.

1.4 SUBMITTALS

A. Procedure: Division 1.
B. Shop drawings: Scaled plan drawings of pavement marking layouts for approval prior to pavement marking application.
C. Product Data: Manufacturer’s detailed technical materials and application data, including technical bulletins, guides, and manuals for bumpers and pavement marking paint

D. Achievement of LEED-NC v4 and 4.1 requires specific forms of documentation as part of the materials submittals to document certain product properties.

1.5 REFERENCE STANDARDS

A. "Greenbook" SSPWC: Standard Specifications for Public Works Construction, latest edition.

1.6 PROJECT CONDITIONS

A. Environmental requirements:
   1. Pavement marking paint: Do not apply when ambient or surface temperatures are less than 50°F.
   2. Allow 48 hour curing time for asphalt prior to application of paint markings.

B. Protection: Protect completed application/installation from damage of subsequent construction activities.

C. Sequencing/scheduling:
   1. Coordinate and sequence the application/installation of work of this Section with adjacent/integral materials, and work specified in other Sections.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. As specifically listed under Materials or as listed in the State of California Department of Transportation Qualified Products List. Colors as indicated.
   1. Morton International, Inc., Traffic Markings, Los Angeles, CA, (213) 225-4154.
   2. Pittsburgh Paints, PPG Architectural Finishes, Pittsburgh, PA, (412) 434-3131.
   3. The Sherwin-Williams Company, Los Angeles, Ca, (800)321-8194.
   4. 3M Traffic Control Materials Division, St. Paul, MN.

2.2 MATERIALS

A. Conform to SSPWC Section 210-1.6, and/or as specified herein.

2.3 BUMPERS

A. Precast concrete bumpers: Minimum 3000 psi precast concrete with chamfered edges, and openings for anchoring pins. Provide with smooth finish, free from pits and rock pockets.
   1. Cement: ASTM C150, Type I or II.
   2. Aggregates: ASTM C33.
   3. Reinforcing steel: ASTM A615, Grade 40. Two No. 3 bars minimum, full length or bumper, spaced one each side of anchoring pin openings.
   4. Anchoring pins: Hot-dip galvanized standard weight steel pipe, solid rod, or reinforcing bar, 314 in. diameter, length as required for slabs on grade.
   5. Epoxy, as recommended by manufacturer, for concrete slabs.
   6. Calking compound: As specified in Section 07 92 00.

7. Bumper length: 4 ft. and as shown.

PART 3 – EXECUTION

3.1 PAINT MARKINGS APPLICATION

A. Apply marking paint in accord with SPPWC Section 310-5.6 and in locations shown

B. Machine apply paint at the minimum rate as recommended by manufacturer, but not less than the following:

1. 15 mils wet film thickness per coat.
2. 6 mils dry film thickness per coat.

C. Apply traffic line markings 4 in. wide, unless otherwise indicated

D. Apply accessibility symbols and marking as shown or required by CBC 11B-502.3.3 for Accessible parking spaces.

E. Apply multiple coats as required for complete opacity, but not less than two coats. Apply second or final coat immediately prior to completion and acceptance of project.

F. Apply red curb paint to fire lanes and stencil “No parking fire lane” stencil.

3.2 PRECAST CONCRETE BUMPERS

A. Insert anchoring pins full depth of cored hole and recess 1/2 in. below top surface of precast concrete bumper. Fill with calking flush to top of bumper.

B. Bumpers may be adhered to concrete surfaces with epoxy, in lieu of pins, as recommended by bumper supplier.

END OF SECTION 32 17 23

SECTION 32 84 00

PLANTING IRRIGATION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials and equipment required to complete the irrigation sprinkler work indicated on the drawings and specified herein.

1.2 APPLICABLE STANDARDS

A. ASTM - American Society for Testing and Materials

B. ANSI - American National Standards Institute

C. PVC - Polyvinyl Chloride

D. NSF - National Sanitation Foundation

E. AWG - American Wire Gauge

1.3 EXAMINATION OF DRAWINGS AND SITE:

A. Drawings: Drawings are diagrammatic. Avoid conflicts between irrigation systems, planting, architectural features, and utilities. Install plumbing in planting areas wherever possible.

B. Fittings: Drawings do not indicate all offsets, fittings, sleeves, etc. which may be required by structural and finished conditions. Provide fittings required to meet these conditions.

C. Field Conditions: Provide written notification to State’s Representative of field conditions such as obstructions, grade differences or discrepancies in dimensions. Start of irrigation work shall indicate acceptance of field conditions encountered and acceptance of responsibility for revisions necessary because of field conditions.

D. Grading: Verify that grading has been completed before starting irrigation work.

E. Utilities: When working near existing utilities excavate in such a manner as to prevent damage to said utilities. Repair damage to utilities caused by irrigation work as approved and at Contractor's expense. Check existing utility drawings for locations.

1.4 SITE REVIEWS:

A. Construction Reviews: Provide at least 4 working days advance notification to confirm availability of personnel for site observation of the following reviews:

1. Pressure supply line installation and testing.

2. System layout and materials review.

3. Coverage tests: Prior to landscape planting.

4. Punchlist / Final review. Contractor shall confirm with State's representative that the irrigation system is fully operational. The Irrigation Controller shall be connected to all valves and communicating properly with all valve stations prior to Punchlist / Final review.

1.5 SUBMITTALS

A. List of Materials: Submit for approval a complete list of materials with manufacturers' names and numbers and descriptive literature marked for each item, including the following:

Mainline and Lateral Pipe	Driplines
Pipe Sleeving	Compression Couplings
Backflow Preventer	Galvanized Tie Down Stakes
Backflow Enclosure	Irrigation Controller
Pressure Reducing Valve	Irrigation Controller Enclosure
Wye Strainer	Rain Sensor
Master Valve	Wires
Flow Meter	Flow Sensor Cable
Quick Coupler	Wire Connectors
Check / Ball Valve	Valve Boxes, caps and sleeves
Remote Control Valve	Type of pipe solvent
Sprinkler Head	PVC primer
Nozzles / Bubbler Nozzle	Detectable irrigation tape
Flush Cap	Hose Bib
Air Relief Valve	ID Tags
Pipe fittings	Drip system operation indicator kit

B. Test Data: Submit written, dated certification that PVC pipe and fittings have passed the following tests:

1. Acetone Test: Immersion in 72.4 degrees F, 90% pure, anhydrous acetone for 20 minutes with no evidence of flaking or delamination on the inner or outer walls of the pipe. Softening or swelling shall not constitute failure.

2. Flattening: Flatten sample between parallel plates of a press to 40% of the pipe outside diameter with no evidence of cracking, splitting or breaking.

C. Controller Chart

1. Approval: Secure approval of chart prior to final review of irrigation system.

2. System Chart: Submit chart. Reduce blackline print of approved record drawing to 7" x 91/2" to fit on controller door.

3. Valve Identification: Identify area of coverage of each remote-control valve with a distinctly different pastel color marked over entire area of coverage.

4. Sealing: Seal approved chart hermetically between two layers of 20 mil-thick plastic sheet.

D. Operating and Maintenance Manual

1. Manuals: Provide six (6) manuals detailing operation and maintenance requirements for irrigation system ten (10) days prior to completion of work, with sufficient detail to permit maintenance personnel to understand, operate and maintain the equipment.

2. Content

a. Index sheet, with irrigation installer's name, address, telephone number and name of contact person.

b. Equipment list with the following information for each item installed:

1) Manufacturer's name.

2) Make and model numbers.

3) Name and address of local manufacturer's representative.

c. Spare parts list.

d. Detailed operating and maintenance instructions for equipment.

E. Record Drawings: Provide record drawings of the irrigation system.

PART 2 - PRODUCTS

2.1 PLASTIC PIPE AND FITTINGS

A. Polyvinyl Chloride (PVC) Pipe: ASTM D1784 or ASTM D2241 solvent weld type, virgin PVC compound, 2000 psi hydrostatic design stress rate, schedule 40, marked with manufacturer's name, size, class rating, date extruded, and NSF seal of approval.

B. Fittings: Schedule 40, injection molded, ASTM D1784 PVC, with injection molded thread and side-gated tees and ells.

C. Threaded Nipples and Risers: Schedule 80 PVC, with molded threads.

2.2 JOINTS CEMENT AND JOINT PRIMER

A. 100% active solvent, blue.

2.3 ELECTRICAL WIRING

A. Low Voltage Conductors: Direct burial, type UF, No. 14 AWG wire, for connections between controller and remote-control valves. Use different color wire for each control valve.

B. Splice Connectors: Rainbird, Pen-Tite or equal.

C. Neutral (Common) Wires: White.

2.4 VALVES:

A. Hose Bibbs: As noted on drawings.

B. Check Valves

1. Swing check valves up to 2" on non-pressure lines: Bronze or plastic, 100 psi SWP.

2. Anti drain Valve: Plastic, with soft composition disc and stainless-steel internal parts; spring tension adjustable from 4 psi to 15 psi.

C. Remote Control Valves: Spring loaded, packless diaphragm activated, normally closed type with bleeder valve.

1. Valve solenoid: 24 a.c., 4.5 watt maximum 500 milliamp maximum surge, corrosion proof stainless steel construction, epoxy encapsulated as a single integral unit.

2.5 DRIP IRRIGATION

As noted on drawings.

2.6 SPRINKLERS:

As noted on drawings.

2.7 VALVE BOXES:

As noted on drawings.

2.8 OPERATING AND MAINTENANCE TOOLS:

A. Wrenches: Two, for disassembly and adjustment of each type of sprinkler head supplied.

B. Hose Bibb Key

C. Valve box keys: Three.

D. Soil probe: 36" long, 1" diameter, heavy duty stainless steel, with integral handle. Oakfield Model B, or equal (no known equal).

2.9 AUTOMATIC CONTROLLER:

As noted on drawings.

2.10 BACKFLOW PREVENTION ASSEMBLY:

As noted on drawings

PART 3 - EXECUTION

A. MATERIALS HANDLING: Load, unload, handle and store material to avoid damage. Transport so the lengths of pipe lie flat. Do not install dented or damaged pipes.

B. WATER SERVICE CHANGEOVER: Make cold taps to existing line as indicated on the drawings.

3.2 TRENCHING AND BACKFILLING:

A. General: Perform trenching and backfilling as specified in Section 02210. Maintain bottom of trenches flat to permit piping to be supported on an even grade continuously for full run.

B. Coverage Above Pipe: Provide the following depth of cover:

1. Pressure supply lines 2 1/2" and smaller: 18".

2. Non-pressure lines: 12".

3. Control wire: 18".

C. Line Clearances: Provide 4" clearance between irrigation lines and 6" clearance between lines of other trades. Do not install parallel lines directly over any other line.

D. Backfilling: Fill trenches with clean, fine, granular material free of stones. Compact to a dry density equal to adjacent undisturbed soil. Restore to adjacent grade, free of dips, depressions, humps, or other irregularities.

3.3 INSTALLATION:

A. Plastic Pipe and Fittings: Install in accordance with manufacturer's printed instructions.

B. Plastic Pipe and Threaded Fittings: Assemble by applying Teflon tape to male threads only.

C. Connections

1. Adapters: Use schedule 40, PVC, threaded male adapter for connection to threaded joints.

2. Change of depth: Use 45-degree fittings at changes in depth of pipe.

3. Steel to PVC Connections: Work steel connections first. Use non-hardening pipe dope on threaded steel to PVC joints. Apply light wrench pressure.

4. PVC Nipple: Use 4" minimum length.

5. Open ends of pipe: Tape during installation to prevent entry of foreign matter into the system.

6. Quick Coupling Valves: Locate valves within 12" of hardscape.

7. Remote Control Valves: Locate in shrub area outside spray of valve system, whenever possible.

8. Sprinkler Heads: Locate approximately as indicated on drawings to provide best coverage with no throw onto buildings and minimum overthrow onto paving. Do not exceed maximum or minimum spacing indicated by manufacturer.

9. Valve Boxes: Stencil identification number on each remote-control valve box in 2" high letters and numbers, with epoxy-resin-based paint, colors as selected by State's Representative. Do not stencil boxes until the identification system has been approved.

10. Low Voltage Wiring

11. Place wiring in the same trench and routing as the pressure supply lines unless otherwise approved. Install wiring prior to main line.

12. Tape wires together, except in sleeves under paving, and tape bunch to side of main line at 12 feet on center maximum. Provide a 12" expansion loop at every 100 feet and at each connection and directional change. Provide a continuous wire between controller and remote-control valves.

13. Make connections at valves. Do not splice the wires except within an approved box.

14. Encase wires passing under paving in a Schedule 40 PVC sleeve.

3.4 FLUSHING:

A. Main Lines: Flush underground mains and lead-in connections to sprinkler system thoroughly before connecting to control valves. Flush mains using a flush out assembly at lowest elevation.

B. Lateral Pipes: After all sprinkler pipes and risers are in place and connected and prior to installation of sprinkler heads, thoroughly flush all lines with a full head of water. Do not install heads until lines have been flushed and approved.

3.5 SYSTEM ADJUSTMENT:

A. Adjust valve flow controls for correct operation. Adjust sprinkler heads for alignment or change nozzles for coverage and minimum overthrow. Make adjustments prior to any planting.

3.6 COVERAGE TESTS:

A. Provide notification of readiness to perform coverage tests. Perform coverage tests after sprinkler system is completed, but prior to any planting. Test system to assure that all planting areas are watered completely and uniformly. Make necessary adjustments, including realignment of heads, to provide required coverage.

3.7 PRESSURE TESTS:

A. Provide notification of readiness to perform pressure tests. Test pressure supply lines under 150 psi hydrostatic pressure for a period of 2 hours. Do not backfill over any line more than necessary for testing until line has been inspected, tested and approved. Center load only. Leave pipe connections uncovered. Install remote control valves, quick couplers and other valve assemblies after testing have been approved.

3.8 ACCEPTANCE:

A. Sprinkler Heads: Clean and adjust heads at end of landscape maintenance period. Refer to Section 328400.

B. Training: Make arrangements to train the State's maintenance personnel in the correct operations of the irrigation system and equipment.

3.9 CLEAN UP:

A. Upon completion of the work, restore ground surfaces to required elevations and remove excess materials, debris and equipment from the site.

3.10 MAINTENANCE:

90 Days.

END OF SECTION

SECTION 32 93 00

LANDSCAPE PLANTING

PART 1 - GENERAL

1.1 SUMMARY:

The work includes all services, labor, materials, transportation and equipment necessary to perform the work indicated on the Drawings and as specified.

1.2 SUBMITTALS:

A. Contractor shall submit list of soil amendments, fertilizers, plant materials, topsoil, with quantities of each, along with the source of the supplier and results of (2) phases of agronomy tests taken both prior to amending soil and after soil has been amended per 1.9. Planting recommendations may be revised based on soil tests.

B. Plants shall be subject to observation and preliminary acceptance by State's representative at place of growth or upon delivery to job site. Such observation shall not impair the right of observation and rejection during progress of the work. Tagging of plant material is for conformance w/ design intent only, and does not constitute the landscape architect approval of plant materials in regards to their health. The health and vigor of plant material is solely the responsibility of the contractor.

C. Submit written reports by certified arborists for all trees to be planted on site, that such trees meet the criteria of arboricultural health, as established by the International Society of Arboriculture (ISA). Arboricultural reports shall be provided at cost of Landscape Contractor.

D. Submit documentation to the State's representative within 75 calendar days of award of contract to the General Contractor that all plant material is available. The contractor shall be responsible for procuring all the material listed on the planting legends.

1.3 GUARANTEES AND REPLACEMENTS:

A. Plant Materials: Shrubs and vines shall be guaranteed to remain healthy and vigorously growing for one year. Groundcovers shall be guaranteed to remain healthy and vigorously growing for one year.

B. Trees: All trees that have been supplied and installed under this Contract shall be guaranteed to live in a healthy condition for a period of one (1) year from date of final acceptance of project.

C. Plant Replacement: Plants found to be dead or not in a vigorous condition, or if root balls have been damaged, within the Installation, Maintenance and Guarantee Periods, shall be replaced within fourteen (7) days from date of discovery. Contractor shall include, at his expense, a timely written diagnosis of plant health by a certified Arborist, should a dispute arise. Arborist's report shall indicate reason for lack of vigor, potential remedies, if any, and estimate of time required to regain vigor and specified size.

D. Plant Replacement: Plants used for replacement shall be same kind or approved option by the Landscape Architect and size as specified and shall be furnished, planted and fertilized as originally specified. Cost of all repair work to existing improvements damaged during replacements shall be borne by the Contractor.

1.4 SITE OBSERVATION:

A. Site observations herein specified shall be made by the State's Representative. The Contractor shall provide a minimum of three (3) working days notice before Observation is required.

B. Site observation will be required for the following parts of the work:

1. Pre-Job Meeting: Explain State Representative's role to Contractor.

2. Incorporation of soil conditioning and fertilizing into the soil, after approval of first soil report.

3. Application of pre-emergent herbicide.

4. Soil preparation for approval to plant, after approval of second soils report.

5. Upon the completion of grading prior to planting.

6. Irrigation coverage test

7. Confirmation of corrected finish grades.

8. Approval of samples of plant materials.

9. Approval of tree & shrub locations for planting, prior to planting holes being excavated.

10. Plant installation: Check size of planting holes and backfill mix.

11. Observation after completion of planting, and all other indicated or specified work. Written approval to commence maintenance period by client representative is required and shall establish beginning of the maintenance period.

12. Maintenance observation after thirty (30) days to coincide with fertilizer application.

13. Final Observation at the completion of the ninety (90) day Maintenance Period. This observation shall establish the beginning date for the one (1) year guarantee of all trees.

C. Upon completion of the Final Observation and the work of this section, the Contractor will be notified in writing: (1) whether the work is acceptable; (2) of any requirements necessary for completion and acceptance.

D. Contractor shall be on the site at the time of each observation. Contractor shall speak English.

E. No site visits shall be made unless all items in previous observation reports are either completed or remedied, unless State has waived in writing such compliance. Landscape Contractor shall be responsible for reimbursement to the Client for State's time incurred in making untimely site visits at State's current billing rates.

F. Construction observation visits shall be made in proper sequence of the installation of the work. No visits will be made until all soil submittals have been made and approved. Out of sequence construction visits shall make the Landscape Contractor responsible for reimbursement of the State at current billing rates.

1.5 MAINTENANCE:

A. The Maintenance Period begins on the first day after all landscape work on this project is complete, checked, accepted and written approval from the State's Representative is given to begin the Maintenance Period and shall continue thereafter for no less than ninety (90) continuous calendar days.

B. The Contractor shall continuously maintain all involved areas of the Contract during the progress of the work and during the Maintenance Period until the Final Acceptance of the work.

C. Regular planting maintenance operations shall begin immediately after each plant is planted. Plants shall be kept in a healthy, growing condition and in a visually pleasing appearance by watering, pruning, mowing, rolling, trimming, edging, fertilizing, re-staking, pest and disease controlling, spraying, weeding, cleaning up and any other necessary operation of maintenance. Landscape areas shall be kept free of weeds, noxious grass and all other undesired vegetative growth and debris. All plants found to be dead or in an impaired condition shall be replaced within seven (7) days. Maintenance operations shall also include:

1. Filling and replanting of any low areas which may cause standing water.

2. Adjusting of sprinkler head height and watering pattern.

3. Filling and re-compaction of eroded areas.

4. Weekly removal of trash, litter, clippings and foreign debris.

D. The Contract completion date of the Contract Maintenance Period shall be extended when, in the opinion of the State's Representative, improper maintenance and/or possible poor or unhealthy condition of planted material is evident at the termination of the scheduled Maintenance Period. The Contractor shall be responsible for additional maintenance of the work at no change in price until all of the work is completed and acceptable.

E. When in the opinion of the State's Representative, improper maintenance, possible poor or unhealthy condition of plant materials, or unestablished lawns are evident or when maintenance work is not being performed, the Contractor shall be responsible for additional maintenance of the work at no charge to the State until Final Completion is delivered.

F. The Contractor shall provide protection of all planting areas against traffic or other damage by erecting fencing or temporary twine immediately after planting is completed. Warning signs and barricades shall be placed in various high traffic areas. Damaged areas shall be repaired immediately by the Contractor.

G. Watering by hand will be required when soil moisture is below optimum level for best plant growth or when ordered by the State's Representative. Hand watering may be required when high or hot wind conditions exist, or to promote vigorous root growth.

H. Plants shall be inspected by the Contractor at least twice per week and needed maintenance shall be performed promptly.

I. At conclusion of maintenance period an observation shall be made by the State's Representative, to determine the acceptability of work, including maintenance. The Contractor will be notified by the State's Representative of all deficiencies revealed by the observation before acceptance. State must accept all maintained areas, in writing, prior to end of maintenance period.

1.6 SEQUENCING AND SCHEDULING:

Coordinate the work of this Section with installation of underground irrigation system utilities, piping and watering heads.

1.7 LAYOUT OF WORK:

The Contractor shall employ, at his own expense, a registered Civil Engineer or licensed Land Surveyor to lay out the work of the project, to establish all reference points set for construction and the certification of finish grades with Civil Engineer drawings.

1.8 GENERAL REQUIREMENTS:

A. The term "Planting Area" shall mean all areas to be planted with trees, shrubs, groundcovers, seed and sod.

B. Actual planting shall be performed during those periods when weather and soil conditions are suitable in accordance with locally accepted horticultural practice. California Natives are to be planted in the fall.

C. All rock, gravel and other growth or debris accumulated during construction of the project shall be removed from the site. Soil areas used for construction clean-up, washing, debris, stockpiling.

D. Conservation of Topsoil: Contractor shall identify and protect areas of arable topsoil to stockpile during construction for re-use during landscape construction activities. Top soil shall be defined as top 6" of undisturbed soil only, in accordance with these specifications.

1. Maintain the topsoil stockpile tree from debris, trash, and contamination in a manner in which will not obstruct the natural flow of drainage.

2. Keep the sampled or tested stockpiled topsoil separate from other topsoil.

3. Keep the stockpiled topsoil damp to prevent dust and drying out.

4. Procure approval of State or Landscape Architect for topsoil material and storage conditions at time of the stockpile.

E. Prior to excavation for planting or placing of plant materials, locate all underground utility lines still in use and take proper precautions to avoid damage to such improvements. In the event of a conflict between such lines and plant locations, notify the State's Representative who shall arrange for the relocation of one or the other. The Contractor assumes all responsibility for making any and all repairs for damages from work as herein specified.

F. Grading, planting and soil preparation work shall be performed only during the period when beneficial and optimum results may be obtained. If the moisture content of the soil should reach such a level that working it would destroy soil structure, spreading grading operations shall be suspended until the moisture content is increased or reduced to acceptable levels and the desired results are likely to be obtained.

G. All scaled dimensions are approximate. Before proceeding with any work, carefully check and verify all dimensions and immediately inform the State's Representative of any discrepancy between the drawings and/or specifications and actual conditions.

H. Because of variances in field conditions, quantities for plant material shown on the plans may need to be adjusted in the field. The Contractor shall provide, at a minimum, the quantity stated on the plans for all planting areas Notify the State's Representative of discrepancies between quantities and symbols shown prior to ordering.

I. Adequately stake, barricade and protect all irrigation equipment, manholes, utility lines and other existing property during all phases of the soil amending and grading operation.

J. Tree Selection:

1. One photograph of each tree variety and size, called out on Drawings, shall be delivered to the State's Representative for approval prior to tagging.

2. The Contractor shall immediately remove from the site any trees not approved after the

State's Representative has seen them.

3. The Contractor, at his option and expense, can retain the services of the State's Representative to review trees 15 gallon and larger tagged at the nursery and/or at its place of growth, or submit color photographs of trees for approval.

K. Shrub and Tree Samples: Typical samples, three each of all varieties and sizes (5 gallon and under - shrubs, 15 gallon and under - trees) of all plant materials shall be submitted for inspection approval at the site a minimum of fifteen (15) working days prior to planting operations. Approved samples shall remain on the site and shall be maintained by the Contractor as standards of comparison for plant materials to be furnished. Samples will be incorporated into the work.

L. Rejection and Substitution: All plants not conforming to the requirements herein specified shall be considered defective and such plants, whether in place or not, shall be marked as rejected and be immediately removed from the site of the work and replaced with acceptable plant materials. The plant materials shall meet all applicable inspections required by law. All plants shall be of the species, variety size, age, flower color and condition as specified herein and/or as indicated on the Drawings. Plants with buried root flares, girdled roots, poor branch attachment, evidence of poor pruning, significant trunk scars, or with pest or diseases are unacceptable. Under no condition will there be any substitution of plant species, variety or reduced sizes for those listed on the accompanying Drawings, except with the written consent of the State's Representative.

M. All utilities (water and electricity) used during the installation of the landscaping and irrigation systems for this project shall be paid for by the State. During the ninety (90) day Maintenance Period, the State shall be responsible for the payment of the utilities.

1.9 INVOICING OF PLANT MATERIAL

A. After installation of plant materials but prior to the pre-maintenance inspection, the State's Representative, with the heretofore specified signed copies of the required certificates, trip slips and invoices for the plant materials and related items, shall invoice such material comparing the total area and/or the amounts specified. If the minimum amounts have not been furnished, the contractor shall install additional materials to fulfill the minimum requirements specified.

B. Upon delivery of materials and/or completion of all soil conditioning and grading, but prior to initiating planting operations, the State's Inspector on site with the heretofore specified signed copies of required certificates, trip slips and invoices for soil preparation materials, shall require State's Inspector on site to compare the total quantities of each material furnished against the total area required to each operation. If the minimum rates of application have not been met, the Contractor will be required to distribute additional quantities of these materials to fulfill the minimum application requirements specified.

1.10 SOIL PREPARATION AND SOIL PREPARATION CONFORMANCE TEST

A. Contractor shall provide, within (30) days of award of contract, (3) soil tests per acre, from approved locations, of existing soil (calculated as area of property including building and parking footprints). Such soil tests shall be submitted to an approved laboratory source for analysis and recommendations for amendments to be used. Planting and amendment recommendations may be revised based on soil test results. Such soil tests shall be provided at cost of Landscape Contractor.

B. A sample of the soil amendments shall be delivered to the State's Representative within thirty (45) days after recording of the Contract for submittal to a testing laboratory at cost of Landscape Contractor.

C. After approved soil amendments have been thoroughly mixed into the site and prior to planting, three (3) samples of the mixed soil will be taken at approved locations by the Contractor and submitted to an approved soil laboratory for comparison to a control mix. Cost of the above testing by the soils laboratory shall be borne by the Contractor. Soil amendment may be modified based on test results at sole cost of Landscape Contractor.

D. Soil amendments shall be added to the areas where native plants are to be installed.

1.11 NURSERY STANDARDS

A. Trees shall be selected from qualified tree farms which conform to the professional standards of the California Association of Nurseries, meet all standards for arboricultural health, and which have certified arborists on staff.

B. Landscape Contractor pretag all trees from reputable tree nurseries. Pretagged trees shall have appropriate form and specifications. The nursery's certified arborist shall provide written confirmation to the States authorized representative that the trees meet arboricultural standards. Written confirmation shall include Arborist's Certification number and name. If nursery does not have a Certified Arborist on staff, the Landscape Contractor shall contract with an independent Certified Arborist to review all trees at the tree nurseries and provide confirmation of the above, at Landscape Contractor's sole expense.

C. No trees will be accepted without written confirmation of the tree's health, including but not limited to the following: Trees shall have exposed root flares, shall be pest free, free of trunk scars, have excellent branch attachment, and shall be free of girdled roots.

D. Contractor shall submit photographs of all pretagged trees to OAR and Landscape Architect, along with written confirmation by certified arborist, for review and approval. Landscape Architect may elect, at Landscape Architect's discretion, to make trip to tree nursery to review trees 36" box size or over. In the event that the trees show evidence of arboricultural flaws, including those listed above, the landscape State reserves the right to reject the trees and require the Landscape contractor to select trees from other nurseries.

PART 2 - PRODUCTS

2.1 SUSTAINABLE CONSTRUCTION REQUIREMENTS

A. Select products with recycled content to achieve overall Project recycled content requirement.
   1. Fertilizer.
   2. Weed control fabric.
   3. Root control barrier.

B. Steel Recycled Content: 30 percent total recycled content, minimum.

C. Aluminum Recycled Content: // 80 // 50 // percent total recycled content, minimum.

D. Biobased Content:
   1. Organic Mulch: 100 percent.
   2. Peat: 100 percent.

2.2 MATERIALS

A. Topsoil: Fertile, agriculturally acceptable, clean and on-site topsoil from within the top 6" of undisturbed site, with imported topsoil accepted by the Client Representative. Supply topsoil for all plants to bring finished grades to 2 inches below tops of curbs, sidewalks and driveways. Topsoil shall not be used for planting operations while in a muddy condition.

B. In the top 30" of on-site soil, no subsoil, soil from construction excavation operations, soil from beneath previously paved areas, or soil from other sites shall be used in any planting area. Should any question about the quality of the topsoil arise the contractor shall provide soil test to determine suitability of topsoil before installation.

C. Imported Topsoil: Fertile, agricultural sandy loam, typical for locality, capable of sustaining vigorous plant growth, taken from drained site, free of subsoil, clay, rocks, impurities, plants, weeds and roots; minimum pH value of 5.4 and maximum 7.0. Salinity shall not exceed 6 (SAR).

D. Structural Soil: To be specified.

E. Native soil mix shall be composed of approved amended soil mixed at a ratio of 1 part amended soil to 5 parts soil.

F. Container Planting: To be specified.

G. Soil Amendment and Fertilizer: Soil Conditioner shall contain a special blend of organic fractions to supply several degrees of breakdown rate, a portion of inorganic amendment that resists further breakdown, a long-lasting form of iron, pH of 5.5 to 6.0, salinity of 1.75, organic matter (dry weight basis) more than 90%, non-ionic wetting agent and total nitrogen content of 0.5%. (Loamex, Organo Life, Forest Humus or equal).

H. Gypsum: Gypsum shall be commercially processed and packaged gypsum (CaSo4, 2H2O) with minimum 80% grade containing 14% minimum combined sulfur.

I. Iron Sulfate: Ferric sulfate or ferrous sulfate in pellet or granular form containing not less than 18.5% iron expressed as metallic iron. Registered as an agricultural mineral with the State Department of Agriculture in compliance with Article 2, "Fertilizing Materials", and Section 1030 of the Agriculture Code.

J. Soil Sulphur: 99% of approved quality by State's Representative.

K. Pre-Plant Fertilizer: (10-10-10) shall be a combination of natural organic and inorganic granular fertilizers, free flowing, and shall contain the following minimum available percentage by weight of plant food:

Nitrogen	10.0% minimum
Phosphoric Acid	10.0% minimum
Potash	10.0% minimum

L. Post-Plant Fertilizer: (7-9-4) shall be a long-lasting, organic and controlled release plastic-coated, uniform in composition, free flowing and shall contain the following minimum available percentages by weight of plant food:

Nitrogen	7% minimum
Phosphoric Acid	9% minimum
Potash	4% minimum

M. Planting Tablets: Planting tablets shall be Agriform (20-10-5) or equal (no known equal) as reviewed by the State's Representative.

N. Planting soil mix ratio materials and amounts specified here are anticipated. This amendment is for bidding purposes and shall be superseded by recommendation of soil test/analysis report. Thoroughly blended mixture of topsoil and soil amendments at the following ratio:

Soil amendment per approved soils test	1 Part
Accepted Topsoil	2 Parts
Iron Sulphate	2 Lbs. Per Cu. Yd. of Mix
Gypsum	10 Lbs. Per Cu. Yd. of Mix
Pre-plant Fertilizer	4 Lbs. Per Cu. Yd. of Mix

Container Planting Backfill – To be specified.

2.3 STAKING MATERIALS:

A. Tree Staking: Stakes shall be of lodge pole pine. These shall be straight shafts, shaved and cut clean and bare of branches and stubs, of uniform thickness with a minimum diameter of 2 inches, free of loose knots, splits or bends. Stakes shall be no less than ten feet in length, treated with copper napthenate.

B. Tree ties shall be flexible, non-deteriorating, self-fastening, black vinyl tree ties of sizes required to adequately support trees.

2.4 GUYING MATERIALS:

A. Guy wires shall be of pliable, zinc-coated steel of No. 12 gauge.

B. Anchors (deadman) for holding guy wires shall be of 4 inches x 4 inches solid lumber, 1-foot-6 inches in length. [Note: For high wind planting areas including on structure planting, use Duckbill earth anchors. Select model #: Duckbill anchor model #s 40DTK, 68DTK, 88TDK vary per tree trunk caliper: up to 3”, 6”, or 11”. Similarly, model #s for root ball anchor: 40RBK, 68 RBK, 88RBK, vary per tree trunk caliper. Root ball kits are used where guying tree trunk is not possible including near sidewalks.]

C. Hose for covering wire shall be of 2-ply reinforced rubber, used or new, garden hose type of at least 1/2 inches in diameter.

D. Flags, to be attached to guys, shall be of surgical tubing, 1/8 inch diameter and 4 feet long, of uniform thickness.

E. Tree ties shall be Bordon Cinch-Tie or equal (no known equal).

2.5 PLANT MATERIALS:

A. Nomenclature: The scientific and common names of plants herein specified conform with the approved names given in "A Checklist of Woody Ornamental Plants of California", published by the State of California, College of Agriculture, Manual 32 (1963). See list of plant material on Drawings.

B. All material provided shall be well branched and proportioned, with respect to width-height relationship.

C. Labeling: Materials shall be clearly labeled as to species and variety. All patented plants (cultivar) shall be delivered with a proper plant patent attached.

D. Quality and size of all plants shall be of No. 1, of Pinto Tag stock. They shall be vigorous, of normal growth, free from disease, insects, insect eggs and meet or exceed the measurements specified. Pinto Tags must be submitted to the State’s Representative. Tree trunks shall be sturdy and well "hardened off", self-supporting. Plants shall have well-developed branch systems, vigorous and fibrous root systems not root or container bound.

E. Container stock (1 gal., 5 gal., 15 gal. boxes) shall have grown in containers for at least six (6) months, but not over two (2) years. No container plants that have cracked or broken balls of earth, when taken from the container, shall be planted, except upon special approval. No trees with damaged roots or broken balls shall be planted.

F. Pruning shall not be done, prior to delivery, except by written approval by the State's Representative.

G. Inspection of plant materials shall be a responsibility of the Contractor and where necessary the Contractor shall have secured permits or certificates prior to delivery of plants to site.

H. Protection: Plants shall be handled, stored and maintained to prevent drying out, wind burn, wilting or root or stem damage. Evidence of these conditions will be grounds for plant replacement.

I. Plants shall be subject to inspection and approval or rejection at the project site at any time before or during the progress of work for size, variety, condition, latent defects and injuries. Rejected plants shall be removed from the project site immediately.

J. Substitutions will not be permitted except that if proof is submitted that any plant specified is not obtainable, a proposal will be considered for use of the nearest equivalent size or variety and cost. All substitutions subject to State Representative's written approval.

K. Quantities shall be furnished as needed to complete work as shown on Drawings.

L. The State's Representative reserves the right to inspect root condition of any species, particularly those grown from seed, and if found defective, to reject the plants represented by the defective sample.

M. Identify plant species or varieties correctly on legible, weather-proof labels attached securely to the job site. There shall be a minimum of one labeled plant for each five plants in a lot.

N. Groundcover plants shall be healthy, vigorous rooted cuttings grown in flats until transplanting.

O. Hydroseed/Stolon Material: Not used

P. Pre-emergence herbicide shall be Surflan, Treflan, Dymid or equal.

Q. Weed contact spray shall be Phytar 560, Broadside, Round-Up or equal.

2.6 BARK MULCH:

All shrub and groundcover areas shall be covered with fine-size nitrolized fir bark, 2 inches minimum deep, as designated on plans. Fir bark shall be screened bark. Mulch shall contain no Eucalyptus.

2.7 JUTE MATTING:

Install on all sloped areas 3:1 or greater as per manufacturer's instructions. Jute matting shall be of hemp material which is, heavy jute mesh of a uniform plain open weave of unbleached single jute yarn averaging 130 pounds per spindle of 14,400 yards. The yarn shall be of loosely twisted construction having an average twist of not less than 1.6 turns per inch and shall not vary in thickness of more than 1/2 its normal diameter. The jute mesh shall be furnished in approximately 90 pound roll strips.

2.8 CONCRETE MOWCURBS:

A. Mowcurbs shall be Class A concrete with No. 3 rebar as noted on plans and details to separate lawn from groundcover.

2.9 TREE STAND PIPES:

Tree stand pipes shall be 4 inches rigid, perforated PVC pipe wrapped with filter fabric and placed upright in augured hole surrounded with gravel; one per tree. Keep stand pipe free of gravel to facilitate monitoring of water level at bottom of pit and cover with black plastic.

2.10 SOD LAWN:

See Landscape plans.

2.11 FILTER FABRIC:

Filter fabric at drain pipe shall be non-woven polypropelene with a weight of 4.5 ounces per square yard, grab strength of 120 pounds, tensile elongation of 55%, burst strength of 210 PSI, tear strength of 50 pounds and puncture strength of 70 pounds.

2.12 ROOT BARRIERS:

Biological root control device as manufactured by Biobarrier: 1-800-352-6776, or equal (no known equal). Width shall be 19.5 inches.

2.13 TREE GRATES: As per plan.

2.14 DECOMPOSED GRANITE:

Provide 3" min. of material of 1/4" minus fines, light brown to gold in color. Decomposed granite shall conform to R-value test of 73 min., and sand equivalent test of 30 min.

PART 3 - EXECUTION

3.1 PREPARATION

A. Beginning of installation indicates Contractor's acceptance of existing conditions.

B. Clearing and Grubbing: Prior to tillage operations, vegetation growth shall be grubbed, raked and cleared from the site. The ground surface shall be cleared of material which might hinder grading, tillage, planting and maintenance operations and be disposed of off the site.

3.2 SOIL CONDITIONING, FERTILIZING AND ROTOTILLING:

A. Grade shall ensure positive drainage of site, directing surface drainage toward curbs, gutters, swales and drains; away from building foundations, free of irregularities and depressions. Provide a minimum of 2% slope over planted areas and 1% slope over hardscape. Provide a minimum of 2% slope away from all building foundations.

B. Finish grade below adjacent paving, curbs, or headers shall be 2-inches in shrub or ground cover areas.

C. After rough grading, prior to adding soil amendments, the Contractor shall provide analysis of imported and existing soil obtained from three (3) soil samples each from locations as approved by State's Representative. The samples shall be analyzed by an approved testing laboratory and amendments applied as outlined in the soils report. The contract prices shall be adjusted to reflect any differences between the amendments as specified in the agronomy test.

D. After the areas have been graded, all planting areas shall be conditioned and amended in accordance with soil test analysis recommendations. Soil conditioning and amendment materials shall be evenly spread over all planting areas and shall be thoroughly scarified to an average depth of 6 inches by rototilling a minimum of 2 alternating passes: (The following quantities and rates are for bid purposes only.)

Soil Conditioner	4 Cu. Yd.	Per 1,000 Sq. Ft.
Soil Sulphur	20 Lbs.	Per 1,000 Sq. Ft.
Iron Sulphate	20 Lbs.	Per 1,000 Sq. Ft.
Gypsum	100 Lbs.	Per 1,000 Sq. Ft.
Pre-Plant Fertilizer	20 Lbs.	Per 1,000 Sq. Ft.

E. Contractor shall procure new soil analysis from approved soil testing laboratory, from (3) location per 1 acre on site to be approved by client representative. Contractor shall reapply amendments and conditioners, or leaching, or any other action as recommended by soil test laboratory's recommendations.

F. Fertilizer (pre-plant) shall be incorporated into the top 6 inches of finish grade. Fertilizer shall be applied after leaching operation.

*Caution: Iron Sulphate will stain concrete, granite and other paved surfaces. Avoid contact between these surfaces and any soil mix containing iron sulphate. After iron sulphate application, broom all surfaces free of material before any water application, including impending rains.

G. Soil Preparation Procedure for all Landscaped Areas:

1. After landscape areas have been graded, compacted and sloped to drain as shown and specified, Contractor shall accept the areas for landscape soil preparation.

2. Areas that have not been graded and will be planted shall be thoroughly irrigated for a minimum of two weeks or until weeds germinate and vigorous weed growth is evident. Apply contact herbicide per manufacturers specifications. Repeat process if required by State's Representative until weed kill is achieved.

3. All areas shall be deep ripped to a depth of 12 inches and all rocks 1 inch or larger, construction debris, soil from previously paved areas shall be removed from the top 8 inches of soil. The thoroughness of rock removal shall be approved by the State's Representative prior to incorporation of amendments. Accepted topsoil shall be imported to equal volume of rock removed. (See Topsoil Specification).

4. Incorporate Agricultural Gypsum and soil sulphur to a depth of 8-12 inches.

5. Deep Water Leaching: Due to the type of soil in the site, it is mandatory that soils be leached and that the soil be re-tested for suitability prior to incorporating nutritional amendments. All areas shall be leached two times to a depth of 8 inches each time. Soil test must be approved by an approved, reputable soil laboratory and meet the following requirements prior to planting:

   ECe - maximum 3.1
   pH - maximum 7.50 - minimum 6.00

6. Soil testing labs: Agri Service Soil and Plant Lab, 2142-B Industrial Court, Vista, CA 92083, (619)727-5451; Soil and Plant Laboratory, 421 South Lyon Street, Santa Ana, CA 92107; Wilbur Ellis, 7982 Irvine Boulevard, East Irvine, CA 92650,(800) 792-5983 or (714) 551-0363, or equal.

7. Reapplication of soil amendment, conditioning and leaching or other actions shall be required by the Contractor if tests so recommend. Expense of test, reapplication of soil amendment and leaching operation shall be borne by the Contractor.

8. Add nutritional amendments to a depth of 6 inches. The thoroughness and completeness of the rototilling and incorporation of the soil conditioners/amendments shall be as approved by the State's Representative. Slopes 2:1 and steeper, or as per the Drawings, omit soil conditioner application of tilling.

9. Deep water leaching shall be done prior to the application of the commercial fertilizer 1-10-10.

10. Grades: Planting areas which have been soil conditioned and/or graded shall be maintained in a true and even condition prior to planting. Contractor shall include repairs to previously graded areas, if disruption of these areas should occur prior to end of Maintenance Period.

11. Settling of Soil: When grading, deep ripping, topsoiling, addition of soil conditioning and tilling have been accomplished, areas shall be compacted and settled by heavy irrigation to a minimum depth of 12 inches without causing erosion or sloughing of soils. Soil tests will be required after leaching to assure conformance to soil test results.

12. Final Grading of Planting Areas: Planting areas shall be free of rocks larger than 1 inch with no more than 5% by volume of rocks smaller than 1 inch. All depressions, voids, erosion, settled trenches and excavations shall be filled with approved topsoil or amended soil and/or removed by the Contractor leaving a smooth, even finish grade. Final grade shall be as shown and specified, and in conformance the following directives:

    a. Drainage away from buildings shall be maintained.

    b. Molding and rounding of grades shall be provided at all changes in slope. Blend slopes into level areas.

    c. Grades shall be 2 inches below adjacent paved areas and sidewalks and flush with valve boxes, mowing strips, clean-outs, drains, manholes, etc., and shall have a minimum slope of 1% to drains.

    d. Maintain grades within a tolerance of +/- 0.1 foot of grades shown on the Civil Engineering plans. Open lawn areas may be within +/- 0.5 foot of grades shown on Civil plans.

    e. No planting shall be installed until approval has been given by the State's Representative.

    f. Contractor shall install accepted topsoil to bring finish grades to 2" below tops of curbs sidewalks and driveways, sloped in accordance with grading and drainage specifications.

13. Care shall be taken that the rate of application of water does not cause erosion or sloughing of soils.

14. All depressions, voids, erosion scars and settled trenches generated by the deep watering shall be filled with approved topsoil or amended soil and brought to finish grade.

3.3 FINISH GRADING:

A. Finish grades shall be indicated on Civil drawings.

B. Finish grades shall be measured as the final water compacted and settled surface grades and shall be within +/- 0.1 foot of the spot elevations and grade lines indicated.

C. Finish grades shall be measured at the top surface of surface materials.

D. Molding and rounding of the grades shall be provided at all changes in slope.

E. All undulations and irregularities in the planting surfaces resulting from tillage, rototilling and all other operations shall be leveled and floated out before planting operations are initiated.

F. The Contractor shall take every precaution to protect and avoid damage to sprinkler heads, irrigation lines and other underground utilities during his grading and conditioning operations.

G. Final finish grades shall insure positive drainage of the site with all surface drainage away from buildings, walls and toward roadways, drains and catch basins.

H. Final grades shall be acceptable to the State's Representative before planting operations will be allowed to begin.

I. Planting surfaces shall be graded with no less than two (2) percent surface slope for positive drainage.

J. Areas shown on plans as turf areas to receive soil preparation and conditioning (amend and fine grade soil) shall have all stones removed from the surface of the lawn bed.

3.4 PLANTING:

A. The layout of locations for plants and outlines of groundcover to be planted shall be approved on the site by the State's Representative prior to their planting. All such locations shall be checked for possible interference with existing underground piping prior to excavation of holes. If underground construction or utility lines are encountered in the excavation of planting areas, other locations for the planting may be selected by the State's Representative. Damage to existing utilities shall be the responsibility of the Contractor.

B. Planting Trees and Shrubs:

1. All excavated holes shall have vertical sides with roughened surfaces and shall be of the minimum sizes indicated on drawings. Holes shall be, in all cases, large enough to permit handling and planting without injury or breakage of root balls or roots. Center of planting pit shall not exceed depth of soil on container, measured from exposed root flare of plant to bottom of container.

2. Excavation shall include the stripping and staking of all acceptable soil encountered within the areas to be excavated for plant pits and planting beds. Protect all areas that are to be trucked over and upon which soil is to be temporarily stacked pending its reuse for the filling of holes, pits and beds.

3. Remove nursery stakes and ties from all container stock. Maintain side growth on all trees.

4. Loosen roots and soil at edges of root ball of plant being installed and mix with native soil.

5. Excess soil generated from the planting holes shall be spread on the site as approved by the State's Representative.

6. All used cans shall be removed to the storage area or from the site daily.

7. The plants shall be planted at approved locations with the heretofore specified soil planting backfill & amended soils.

8. The plants shall be placed in the planting pits on the backfill material which has been hand-tamped and water settled to the root ball base levels prior to the placement of the plants. After setting the plants, the remaining backfill material shall be carefully tamped and settled around each root ball to fill all voids.

9. Each tree and shrub shall be placed in the center of the hole and shall be set plumb and held rigidly in position until the planting back fill has been tamped from around each root ball.

10. All plants shall be set at such a level, that after settling, the root flare shall be set as specified on the contract documents.

11. Planting tablets shall be placed in each planting hole at the following rates:

    One (1)-5 gram tablet per liner and flat size plant.
    One (1)-21 gram tablet per gallon container.
    Three (3)-21 gram tablets per 5 gallon container.
    Four (4)-21 gram tablets per 15 gallon container.
    One (1)-21 gram tablet per each 4 inch of box size.

12. No plant will be accepted if the root ball is broken or cracked, either before, during or after the process of installation.

13. All plants shall be thoroughly watered into the full depth of each planting hole immediately after planting, and shall be watered by hand as required to promote establishment.

14. All trees, 15 gallon and larger, shall be staked with two wood stakes, driven into the ground. The stakes shall be driven in plumb and secure. Special care shall be taken that the driving in of the stakes does not damage the tree root ball. Tree ties shall be fastened to each tree and stake by looping figure eights with the inside diameter of the tie at two or three times the diameter of the tree and by tacking the back of the tie to the stake (See Detailed Drawings).

15. The staking method shall be accomplished in such a manner as to insure the proper and healthy growth and the safety of the plants, property and public.

16. Plants shall not be placed within 12 inches of sprinkler heads.

17. Shrubs shown in plant areas shall be under planted with groundcover shown by adjacent symbol to within 12 inches of main plant stem.

18. The Contractor shall be responsible for all surfaces and subsurface drainage required which may affect his guarantee of the trees, shrubs and vines.

19. Pruning after planting shall be required on all trees and shrubs when necessary to provide the specified or approved standard shapes, form and/or sizes characteristic to each plant. Pruning may include thinning, topping and/or cutting and shall be as approved by the State's Representative. Cuts over 3/4 inch in diameter shall be painted with an approved tree sealant.

20. All trees shall be spotted in place prior to digging of the hole.

21. Install vines as per plans and details.

22. Palm trees [confirm from tree schedule if palm trees are specified.] shall be a minimum of 18' BT (trunk height from base of heart leaf or fronds) unless otherwise specified in the drawings. Remove only dead fronds that will likely fall off during transport and installation. Skin palm trunks at the nursery prior to delivery and planting.

C. Groundcovers:

1. Groundcovers shall be planted in the areas indicated on the Drawings. The groundcover plants shall be rooted cuttings grown in flats and shall remain in those flats until transplanting.

2. All groundcover plants shall be planted with soil around roots in staggered rows, evenly spaced at the intervals called out on the Drawings.

3. The groundcover plants shall be planted sufficiently deep to cover all roots and shall be immediately watered after planting until the entire area is soaked to the full depth of all holes.

4. The groundcover planting areas shall be hand-smoothed after planting to provide an even, smooth final finish grade. All groundcover areas to receive 2 inches layer fir bark mulch.

3.5 CONCRETE MOWCURB:

A. Concrete mow curbs shall be installed per plan and details.

3.6 STANDPIPES AT TREES:

Install PVC standpipe at all trees. Wrap standpipes with filter fabric and cap standpipe with plastic drain grate, spot glue to pipe to reduce vandalism.

3.7 FREE ZONE:

Contractor shall install a planting and irrigation "Free Zone" at the base of all buildings to minimize water contact with the building.

3.8 HERBICIDE APPLICATION:

Pre-emergence herbicide shall be applied to groundcover areas only and in accordance with manufacturer's specifications. Do not apply in lawn or hydroseed areas. State's Representative shall be notified and present at the time of application.

3.9 BARK MULCH:

Install 2 inches layer in all shrub and groundcover areas. Do not install on slope areas 3:1 or greater.

3.10 JUTE MATTING:

Install on all sloped areas 3:1 or greater as per manufacturer's instructions.

3.11 ROOT BARRIER:

Install root barriers for all trees located within six (6) feet of paving. Install root barrier along the edge of paving for a distance of ten (10) feet in each direction from the tree for a total of twenty (20) feet per tree. Where trees are closer than twenty feet apart, a single continuous piece of root barrier shall be used. Overlap root barrier a minimum of twelve (12) inches at splices. Root barriers shall be installed at a minimum depth of (30) inches. Top of root barriers shall be set at 2" below adjacent paved surfaces.

3.12 CLEAN UP:

As project progresses, Contractor shall maintain all areas in a neat manner and remove unsightly debris as necessary. After completion of project, Contractor shall remove all debris and containers used in accomplishing work. The Contractor shall sweep and clean all sidewalks, asphalt and concrete areas adjacent to plantings.

3.13 TREE PROTECTION:

A. Identification: Trees to be saved are noted on plans.

B. Grading and Backfill: Do not place fill within 4' from trunk of any trees noted to remain without prior written approval from the State's Authorized Representative.

C. Storage and Traffic: Keep traffic and storage 15' away from protected trees.

D. Protection: Refer to Section 01 5639

E. Roots: Refer to Section 01 5639

F. Tree Damage: Damage is defined under Section 01 5639.

G. Repair: Provide a tree surgeon to repair damage, including shaping wounds, removing damaged limbs and sealing wounds and cuts.

H. Replacement: Remove and replace trees with life-threatening damage with tree of equal size and quality.

3.14 TREE GRATES:

A. Per manufacturer’s specifications.

3.15 CONTAINERS:

A. Containers to be installed as per plan and details.

END OF SECTION

SECTION 32 94 13

LANDSCAPE EDGING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Aluminum edging.

B. Steel edging.

1.2 RELATED SECTIONS

A. Section 03 30 00 - Basic Site Materials and Methods: Installation and requirements for sitework.

B. Section 32 84 00 – Landscape Irrigation: Installation and requirements for underground lines.

C. Section 32 93 00 – Landscape Planting: Installation and requirements for plant materials.

1.3 SUBMITTALS

A. Submit Manufacturer’s data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Product characteristics, including materials and finishes.
3. Storage and handling requirements and recommendations.
4. Installation methods.
5. Maintenance methods.

B. Selection Samples: For each finish product specified, two 4 inch (101 mm) long samples representing manufacturer's full range of available colors.

C. Verification Samples: For each finished product specified, two 4 inch (101 mm) long samples representing actual product and color.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store products in accordance with manufacturer's requirements.

B. Store products in manufacturer's unopened packaging with labels intact until ready for installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Sureloc Aluminum/Steel Edging, which is located at: 494 E. 64th St.; Holland, MI 49423; Toll Free Tel: 800-787-3562; Tel: 616-392-3209; Fax: 616-392-5134; Email: info@surelocedging.com; Web: www.surelocedging.com

B. Substitutions: Not permitted.

2.2 ALUMINUM EDGING

A. Landscape Edging: Extruded aluminum alloy 6063; hardness: T-6; 3/16 inch (5 mm) thick. Interlocking system with stake punch-outs; sections shall lock together without offset or overlap. Stakes not less than 12 inches (304 mm) long, secured 1/2 inch (13 mm) below top of edging and locked into place. Sure-loc SureEdge, as manufactured by Sure-loc Edging Corporation, Holland, MI.
   1. Height: 4 inches (101 mm).
      a. Length: 8 feet (2438 mm).
      b. Length: 16 feet (4877 mm).
      c. Length: Manufacturer's standard length for prolonged straight runs.
      d. Finish: Mill finish.
      e. Finish: Black anodized.
   2. Height: 5-1/2 inches (140 mm).
      a. Length: 8 feet (2438 mm).
      b. Length: 16 feet (4877 mm).
      c. Length: Manufacturer's standard length for prolonged straight runs.
      d. Finish: Mill finish.
      e. Finish: Black anodized.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify location of underground lines, irrigation hoses and other cables.

3.2 EDGING INSTALLATION

A. Install in accordance with manufacturer's instructions, including staking requirements.

B. Aluminum Edging: Install edging with radius edge and ridges pointing up, with stake pockets on inside of planting bed.

C. Steel Edging: Install edging with stake pockets on inside of planting bed.

D. Back fill both sides of edging. Compact back fill so that top of edging is not more than 1/2 inch (13 mm) above finish grade.

3.3 PAVER RESTRAINT INSTALLATION

A. Install in accordance with manufacturer's instructions, including staking requirements.

B. Prepare and compact base course as required by paver manufacturer. Base course

shall extend not less than 6 inches (150 mm) beyond edging.

1. Standard Installation: Install paver restraint so that horizontal flange is under paver and vertical flange is secure against paver side.
2. Reverse Installation: Install paver restraint so that horizontal flange is under grade, facing away from paver, and vertical flange is securely against paver side.

C. Back fill up to grade. Compact back fill so that paver restraints are hidden from view.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Repair or replace damaged products before Beneficial Occupancy.

END OF SECTION

SECTION 33 10 00

WATER UTILITIES

PART 1 – GENERAL

1.1 SUMMARY

A. Work Included: Furnish all materials, labor and equipment required to construct water system complete in place and ready for use.

B.

1. Select materials with qualifying Environmental Product Declarations.
2. Select materials to maximize use of recycled content.
3. Select materials to maximize use of bio-based products.
4. Select only wood materials which are either Forest Stewardship Council certified or USGBC-approved equivalent.
5. Select materials that use any of the qualifying programs to demonstrate the chemical inventory of the product to at least 0.1%.
6. Select materials that participate in qualified take back or buyback program.
7. Give preference to materials that are both sourced and manufactured within 100 miles of the project site.

1.2 REFERENCES

A. Codes:
1. California Plumbing Code, 2022 Edition

1.3 SUBMITTALS

A. Product data for fire water system including fire hydrant, FDC, piping, PIV, and backflow preventer.

B. Product data for domestic water system including piping and backflow preventer

C. Achievement of LEED-NC v4 and 4.1 requires specific forms of documentation as part of the materials submittals to document certain product properties. Review the LEED Requirements. Provide submittals as required in all relevant materials in this section

PART 2- PRODUCTS

2.1 MATERIALS

A. All materials shall conform to the approved Material List and Standard Details of local water District

B Ductile iron pipe (DIP): Pipe shall meet service and casting allowances specified in AWWA C-150 with 8 mil AWWA/ANSI C105/A21.5 Polyethylene encasement wrap, printed with the words “WARNING CORROSION PROTECTION - REPAIR ANY DAMAGE”.

C. Polyvinyl Chloride pipe (PVC): Pipe shall meet requirements of AWWA C900. Piping shall be plain end or gasket bell end, pressure class 305 (DR14). Manufacturer: JM Eagle, Blue Brute, or approved equal.

1. Mechanical Fittings: Mega lug, Tyler, Sigma, or approved equal.

a. Fittings are to use stainless steel bolts.

b. The fitting and bolt shall be wrapped in 10 mil poly and taped to pipe to provide corrosion resistance.

c. Bolts and nuts shall have no oxide applied.

d. Bell and spigot ends shall be restrained.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All work shall be done in accordance with the city standards.

1. The Contractor shall be responsible for precisely laying out the various exterior utility lines shown as provided elsewhere in these Specifications. The locations shown of the various existing utility lines which the new lines are to cross over or under or connect to were determined on the basis of the best information available; however, no assurance can be provided that the actual locations will be precisely as shown.

2. In performing all work, the Contractor shall exercise due care and caution necessary to avoid any damage to and impairment in the use of any existing utility lines. Any damage inflicted on existing lines resulting from the negligence of the Contractor's operations shall be immediately

repaired and restored as directed by the State at the Contractor's expense.

3. The installation, testing, disinfection and acceptance of water lines shall be governed by the Local Agency standard specifications for water improvements.

END OF SECTION 33 10 00

SECTION 33 30 00
SANITARY SEWERAGE UTILITIES

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes sanitary sewerage system piping and appurtenances from a point 5 feet outside the building to the point of disposal.

B. Related Sections: The following sections contain requirements that relate to this section:

1. Division 31 "Earth Moving" for excavation and backfill required for sanitary sewerage system piping and structures.
2. Division 22 "Facility Sanitary Sewerage" for building sanitary drains.

C.

1. Select materials with qualifying Environmental Product Declarations.
2. Select materials to maximize use of recycled content.
3. Select materials to maximize use of bio-based products.
4. Select only wood materials which are either Forest Stewardship Council certified or USGBC-approved equivalent.
5. Select materials that use any of the qualifying programs to demonstrate the chemical inventory of the product to at least 0.1%.
6. Select materials that participate in qualified take back or buyback program.
7. Give preference to materials that are both sourced and manufactured within 100 miles of the project site

1.2 SUBMITTALS

A. Product data for drainage piping specialties.

B. Shop drawings for precast concrete sanitary manholes, including frames and covers.

C. Shop drawings for cast-in-place concrete or field-erected masonry sanitary manholes, including frames and covers.

D. Coordination drawings showing pipe sizes and manholes, locations, and elevations. Include details of underground structures and connections. Show other piping in the same trench and clearances from sanitary sewerage system piping. Indicate interface and spatial relationship between piping and proximate structures.

E. Achievement of LEED-NC v4 and 4.1 requires specific forms of documentation as part of the materials submittals to document certain product properties.

1.3 QUALITY ASSURANCE

A. Standards:
   1. City of Oxnard Standards, and Specifications.
   2. American Public Works Association (APWA) Standard Plans for Public Works Construction.

B. Codes:
   1. California Plumbing Code, 2022 Edition.

C. Environmental Compliance: Comply with applicable portions of local environmental agency regulations pertaining to sanitary sewerage systems.

D. Utility Compliance: Comply with local utility regulations and standards pertaining to sanitary sewerage systems.

1.4 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations. Verify that storm sewerage system and sanitary sewerage system piping may be installed in compliance with original design and referenced standards.

1.5 SEQUENCING AND SCHEDULING

A. Coordinate connection to public sewer with utility company.

B. Coordinate with interior building sanitary drainage piping.

C. Coordinate with other utility work.

PART 2 – PRODUCTS

2.1 PIPE AND FITTINGS

A. General: Provide pipe and pipe fitting materials in accordance with the approved materials list for the City of Oxnard.

2.2 CLEANOUTS

A. General: To be in accordance with the City of Oxnard supplemental engineering Standards.

2.3 IDENTIFICATION

A. Metallic-Lined Plastic Underground Warning Tapes: Polyethylene plastic tape with. metallic core, 6 inches wide by 4 mils thick, solid green in color with continuously printed caption in black letters "CAUTION - SEWER LINE BURIED BELOW."

PART 3 – EXECUTION

3.1 PREPARATION OF FOUNDATION FOR BURIED SANITARY SEWERAGE SYSTEMS

A. Grade trench bottom to provide a smooth, firm, stable, and rock-free foundation, throughout the length of the pipe.
B. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid, and backfill with clean sand or pea gravel to indicated level.
C. Shape bottom of trench to fit bottom of pipe. Fill unevenness with tamped sand backfill. Dig bell holes at each pipe joint to relieve the bells of all loads and to ensure continuous bearing of the pipe barrel on the foundation.

3.2 INSTALLATION, GENERAL

A. General Locations and Arrangements: Drawings (plans and details) indicate the general location and arrangement of the underground sanitary sewerage system piping. Location and arrangement of piping layout take into account many design considerations. Install the piping as indicated, to the extent practical.

B. Install piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings in accordance with manufacturer's recommendations for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.

C. Use manholes for changes in direction, except where a fitting is indicated. Use fittings for branch connections, except where direct tap into existing sewer is indicated.

D. Use proper size increasers, reducers, and couplings, where different size or material of pipes and fittings are connected. Reduction of the size of piping in the direction of flow is prohibited.

E. Install piping pitched down in direction of flow, at minimum slope of 2 percent, except where indicated otherwise.
F. Extend sanitary sewerage system piping to connect to building sanitary drains, of sizes and in locations indicated.
G. Install 1-inch-thick extruded polystyrene over underground building drain piping not under building. Width of insulation shall extend minimum of 12 inches beyond each side of pipe. Install directly over and center on pipe center line.
H. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed, by tunneling, jacking, or a combination of both.

3.3 MANHOLES

A. General: Install manholes complete with accessories as indicated. Form continuous concrete or split pipe section channels and benches between inlets and outlet. Set tops of frames and covers flush with finish surface where manholes occur in pavements. Elsewhere, set tops 3 inches above finish surface, unless otherwise indicated.

3.4 CLEANOUTS

A. Install cleanouts and extension from sewer pipe to cleanout at grade as indicated

3.5 TAP CONNECTIONS

A. Make connections to existing piping and underground structures so that finished work will conform as nearly as practicable to the requirements specified for new work.

B. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris, concrete, or other extraneous material that may accumulate.

3.6 INSTALLATION OF IDENTIFICATION

A. Install continuous plastic underground warning tape during back-filling of trench for underground water service piping. Locate 6 to 8 inches below finished grade, directly over piping.

3.7 FIELD QUALITY CONTROL

A. Testing: Perform testing of completed piping in accordance with local authorities having jurisdiction.

B. Cleaning: Clear interior of piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed.

1. In large, accessible piping, brushes and brooms may be used for cleaning.
2. Place plugs in ends of uncompleted pipe at end of day or whenever work stops.
3. Flush piping between manholes, if required by local authority, to remove collected debris.

C. Interior Inspection: Inspect piping to determine whether line displacement or other damage has occurred.

1. Make inspections after pipe between manholes and manhole locations has been installed and approximately 2 feet of backfill is in place, and again at completion of project.
2. If inspection indicates poor alignment, debris, displaced pipe, infiltration or other defects correct such defects, and re-inspect.

END OF SECTION 33 30 00

SECTION 33 40 00

STORM DRAINAGE UTILITIES

PART 1 – GENERAL

1.1 SCOPE: WORK INCLUDES BUT IS NOT NECESSARILY LIMITED TO THE FOLLOWING:

A. Examine all other sections for work related to those sections which are required to be included as work of this section.

B. Piping, stub outs, catch basins inlets, manhole structure and connection to existing system or temporary outlets into public right of way.

C. Clean out construction.

D. Storm drain piping to within 5' of building.

E. Combined sewer overflow.

1.2 RELATED WORK IN OTHER SECTIONS:

A. Excavating, backfilling and compacting for utilities - refer to Section 31 22 00.

B. Sanitary sewer construction - refer to Section 33 30 00.

1.3 SUMMARY

1. Select materials with qualifying Environmental Product Declarations.
2. Select materials to maximize use of recycled content.
3. Select materials to maximize use of bio-based products.
4. Select only wood materials which are either Forest Stewardship Council certified or USGBC-approved equivalent.
5. Select materials that use any of the qualifying programs to demonstrate the chemical inventory of the product to at least 0.1%.
6. Select materials that participate in qualified take back or buyback program.
7. Give preference to materials that are both sourced and manufactured within 100 miles of the project site

1.4 SUBMITTALS

A. Achievement of LEED-NC v4 and 4.1 requires specific forms of documentation as part of the materials submittals to document certain product properties.

PART 2 - PRODUCTS AND EXECUTION

2.1 MATERIALS AND EXECUTIONS:

A. Materials, Installation and Workmanship: Conform to the applicable sections of "Standard Specifications for Public Works Construction, "latest Edition and all errata and addenda thereto except where noted otherwise in this Section. Where two or more identical articles or pieces of equipment are required, provide products of the same manufacture.

B. Pipe, Branches, Manholes and Structures: As noted and shown.
C. On-site pipe shall be poly vinyl chloride, SDR 35-conforming to ASTM-D3034
D. Bedding: Defined as material supporting, surrounding the pipes as detailed.
E. Reinforcement: ASTM A-615 intermediate grade bars with ASTM A-305 Deformations.
F. Forms: Plywood or tongue and grove lumber for exposed faces.

2.2 WORK PROCEDURES:

A. Obtain and pay for all permits in connection with this work.
B. Trench Backfill: Compact as specified in Section 31 20 00.
C. Trenching and bedding for Pipes: As detailed and as specified in Section 31 22 00.
D. Provide shop drawings for each installation. Construct per manufacture's recommendations.
E. At the close of work each day, or whenever work ceases for any reason, the end of the pipe must be securely closed.

END OF SECTION 33 40 00

ANDERSEN ENVIRONMENTAL
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LIMITED ASBESTOS ASSESSMENT REPORT

PERFORMED AT

California Department of Motor Vehicles – Oxnard Field Office
4050 S. Saviers Road
Oxnard, CA 93033

Project No.: 1011-1043

PREPARED FOR

California Department of Motor Vehicles
Herbert Earl, Jr.
2415 First Avenue
M/S A-156
Sacramento, CA 95818

December 27, 2010

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EXECUTIVE SUMMARY

Herbert Earl, Jr. of The California Department of Motor Vehicles (referred to hereunder as the client) retained Andersen Environmental (AE) to perform an assessment and sampling of suspect asbestos containing materials (ACM) that are to be disturbed during renovation activities of the flooring throughout, in the bathrooms and in the areas with hash marks on the floor plan in appendix 1, of the above referenced property (referred to hereunder as subject property). The purpose of this assessment was to conduct bulk sampling in order to determine the presence or absence of ACM in the defined areas at the subject property. This report is a record of activities, observations, analytical results and recommendations performed to date.

Findings

The following materials were found to contain asbestos and are considered ACM:

- Tan/beige floor tile w/green/grey marks (Throughout)
- Mastic for the tan/beige floor tile w/green/grey marks (Throughout)

All of the above materials were found to be in good condition at the time of the assessment.

All other materials sampled in this assessment tested negative for asbestos.

Recommendations

All materials found to contain asbestos and/or presumed to contain asbestos should be removed and disposed of by a licensed and Cal/OSHA registered asbestos abatement contractor prior to any disturbance of the material.

It is highly recommended that abatement monitoring be performed by the asbestos consultant (AE) if asbestos abatement is to be performed while non-abatement persons (employees, tenants, other building occupants, or general public) are present in adjacent areas. Abatement monitoring included the collection of air samples in adjacent areas to demonstrate that asbestos fibers are not migrating out of the regulated areas. In addition to air sampling, the monitoring includes oversight of the abatement contractor to ensure that the work is being conducted in compliance with all applicable regulations and in accordance with the scope of work and abatement specifications. Such abatement monitoring serves to limit the legal liabilities of the building owner.

METHODOLOGY

All samples were collected using a clean knife, chisel or the appropriate tools. The sample location was first moistened with water in order to limit dust release. Each sample was extracted carefully so as not to disturb adjacent materials while still penetrating through all layers of the material sampled. Each sample was sealed in the appropriate sized plastic zip lock bag and the bag then labeled with a unique identification number. The sample number, description and location was then recorded on a log and plotted on a floor plan of the structure or area. Sampling tools were cleaned after collecting each sample. Any excess dust or debris from the sample location was cleaned using a moistened cloth. Whenever possible, samples were collected from previously damaged portions of the material in order to minimize damage to the material.

A total of thirty (30) samples were submitted to LA Testing in South Pasadena, California. LA Testing is accredited under the NIST/NVLAP program for asbestos in bulk material by polarized light microscopy and the State of California for asbestos analysis. NIST/NVLAP lab code 200232-0.

The analyses of the samples in this report were performed using polarized light microscopy using the EPA method 600/R-93/116. The phase abundances provided are visually estimated and expressed as percent area. Total percentage of sample constituents may total greater than 100 due to trace amounts. The limit of detection for this analytical method is less than one percent. In multilayer samples, unless otherwise specified, the asbestos concentration is reported for the layer where asbestos is found. These results lie within the statistical limits of variability calculated for standard reference samples routinely analyzed in the laboratory. On a per sample basis, the accuracy and precision of the results depend on the type of sample and its asbestos content.

DEFINITIONS

Asbestos – includes Chrysotile (CH), Amosite (AM), Crocidolite (CR), Tremolite (TR), Anthophyllite (AN), Actinolite (AC) and any of these minerals that have been chemically treated and/or altered.

Asbestos Containing Material (ACM) – any material containing greater than one percent (>1%) asbestos. These materials are subject to all federal, state and local asbestos regulation.

Asbestos Containing Construction Material (ACCM) – any manufactured construction material containing greater than one tenth of one percent (>0.1%) asbestos (as defined by California's Department of Occupational Safety and Health). These materials are subject to all Cal-OSHA standards.

Bulk sample – a chunk of material which is sent to a laboratory to be tested for asbestos.

Damaged – a material that exhibits less than ten percent (10%) distributed damage or twenty five percent (25%) localized damage.

Demolition – wrecking or taking out of any load-supporting structural member and any related removing or stripping of asbestos material.

Disturbance – activities that disrupt the matrix of ACM, crumble or pulverize ACM or generate visible debris from ACM.

EPA – Environmental Protection Agency

Friable – a friable material is any material that can be crushed, crumbled or pulverized by hand pressure when dry.

Good condition – a material with no visible damage or deterioration, or exhibiting only very limited damage or deterioration.

High – Potential for contact – service workers work in the vicinity of the material more than once per week or the material is in a public area and accessible to building occupants.

High – Influence of vibration – loud motors or engines present, intrusive noises or easily sensed vibrations.

High – (air) Erosion potential – high velocity air movement such as in a fan room or elevator shaft.

Homogeneous area – an area of material that is uniform in color and texture.

Linear Feet – (LF) the length of a given material. Usually used to define a quantity of pipe insulation.

Low – Potential for contact – service workers work in the vicinity of the material less than once per month or the material is visible but not within reach of building occupants.

Low – Influence of vibration – no loud motors, engines, intrusive noises or sensed vibrations.

Low – (air) Erosion potential – no noticeable movement of air.

Moderate – Potential for contact – service workers work in the vicinity of the material once per month to once per week or the materials are in a room or office and accessible to the occupants.

Moderate – Influence of vibration – motors or engines present but not obtrusive or occasional loud sounds.

Moderate – (air) Erosion potential – noticeable movement of air such as an airshaft or ventilator air stream.

Non-friable – a non-friable material cannot be crushed, crumbled or pulverized by hand pressure.

OSHA – Occupational Safety and Health Administration

Polarized Light Microscopy (PLM) – the analysis used to determine the asbestos content of a material.

Presumed Asbestos Containing Material (PACM) – a material that is not analyzed but is presumed to contain asbestos, such as transite.

Procedure 5 – an approved alternative combination of techniques and/or engineering controls. Written approval from the Air Quality Management District (AQMD) must be obtained prior to the use of procedure 5 ACM removal activities. These procedures are usually implemented in instances where more than 100 square feet of friable asbestos material has been disturbed and emergency clean up activities are recommended.

Significantly damaged – a material exhibiting over ten percent (10%) distributed damage or twenty five percent (25%) localized damage.

Square feet – (SF) Used to quantify building materials.

PROJECT DETAIL

Introduction

Herbert Earl, Jr. of Department of Motor Vehicles (referred to hereunder as the client) retained Andersen Environmental Consulting (AE) to perform an assessment and sampling of suspect asbestos containing materials (ACM) that are to be disturbed during renovation activities of the flooring throughout, in the bathrooms and in the areas with hash marks on the floor plan in appendix 1, of the above referenced property (referred to hereunder as subject property). The assessment was performed on December 2, 2010, by Adam Nelson, a California Certified Asbestos Consultant (Cert. No. 09-4482).

Scope of Work

The purpose of this assessment was to conduct bulk sampling in order to determine the presence or absence of ACM in the defined areas at the subject property. The scope of this assessment included reviewing any provided building records and/or previous investigation records, visually identifying homogeneous areas and functional spaces, collecting bulk samples of suspect ACM, interpreting the laboratory results and producing a written report of our findings and recommendations.

The sampling was performed in accordance with requirements of the following regulations:

- Asbestos Hazard Emergency Response Act (AHERA); 40 CFR 763 Subpart E
- Asbestos School Hazard Abatement Reauthorization Act (ASHARA); Section 206 of the Toxic Substance Control Act
- National Emissions Standards for Hazardous Air Pollutants (NESHAPS); 40 CFR 61 Subpart M.

This report is a record of activities, observations, analytical results and recommendations performed to date.

Site Description

The subject property is a Department of Motor Vehicles building built on a concrete slab foundation. In general, the construction materials consist of drywall walls; drywall, 1'x 1' tiled and 2'x 4' tiled ceilings; carpeted, ceramic and vinyl tiled floors.

Findings

The following materials were found to contain asbestos and are considered ACM:

- Tan/beige floor tile w/green/grey marks (Throughout)
- Tan/beige floor tile w/green/grey marks mastic (Throughout)

All of the above materials were found to be in good condition at the time of the assessment.

All other materials sampled in this assessment tested negative for asbestos.

Recommendations

All materials found to contain asbestos and/or presumed to contain asbestos should be removed and disposed of by a licensed and Cal/OSHA registered asbestos abatement contractor prior to any disturbance of the material.

It is highly recommended that abatement monitoring be performed by the asbestos consultant (AE) if asbestos abatement is to be performed while non-abatement persons (employees, tenants, other building occupants, or general public) are present in adjacent areas. Abatement monitoring included the collection of air samples in adjacent areas to demonstrate that asbestos fibers are not migrating out of the regulated areas. In addition to air sampling, the monitoring includes oversight of the abatement contractor to ensure that the work is being conducted in compliance with all applicable regulations and in accordance with the scope of work and abatement specifications. Such abatement monitoring serves to limit the legal liabilities of the building owner.

LIMITATIONS

AE is committed to providing quality consulting services. However, asbestos survey work is not an exact science. The possibility of field and general conditions, beyond AE's control, that affect our work or that present a concern for the safety of our employees, our consultants, building occupants and the public at the site, and insurance constraints, requires that we qualify the services we provide with the following limitations:

The findings of this survey, opinions rendered, recommendations and conclusions provided in this survey report are only valid for a period of up to one year from the date of this survey report.

Reasonable effort is made by AE personnel to locate and sample all suspect materials. However, for any facility the existence of unique or concealed asbestos-containing materials and debris is a possibility. In addition, sampling and laboratory analysis constraints typically hinder the investigation. AE does not warrant, guarantee or profess to have the ability to locate or identify all asbestos-containing materials in a facility.

Confined spaces, and areas determined by AE's personnel as unsafe to access, are excluded from the scope of work.

AE does not employ professional cost estimators. Statements of probable construction cost or cost estimates prepared by AE represent AE's professional opinion of probable costs based upon current industry information. Actual costs may fluctuate due to several variables including, but not limited to, the time the work is performed, phasing, labor availability, quantity of work performed, product availability, specification requirements, and unforeseeable changes in the economy and asbestos regulations.

AE is not, and has no responsibility as, a generator, operator, treater, storer, transporter or disposer of hazardous materials or waste found or identified as a result of Andersen' work.

AE does not guarantee or warrant that the facility or workplace is safe, nor does AE's involvement in this property relieve the Client, building owner/operator or tenant of any continuing responsibility of providing a safe facility or workplace.

This report was based on those conditions observed on the day(s) the field evaluation was accomplished. In the event that changes in the nature of the property have occurred, or additional relevant information about the property is subsequently discovered, the findings and recommendations contained in this report may not be valid unless these changes and additional relevant information are reviewed and the conclusion of this report is modified and verified in writing.

In as such that no destructive investigation has been performed during the survey, the report may not reveal concealed asbestos-containing materials. Subsequently, additional investigation including construction documents review and/or destructive investigation is recommended as a precaution to prevent accidental exposure when construction or demolition is planned for this facility.

SIGNATURES

Please do not hesitate to contact us should there be any questions or if additional services are necessary.

Prepared by:



Adam Nelson
DOSH Certified Asbestos Consultant No. 09-4482

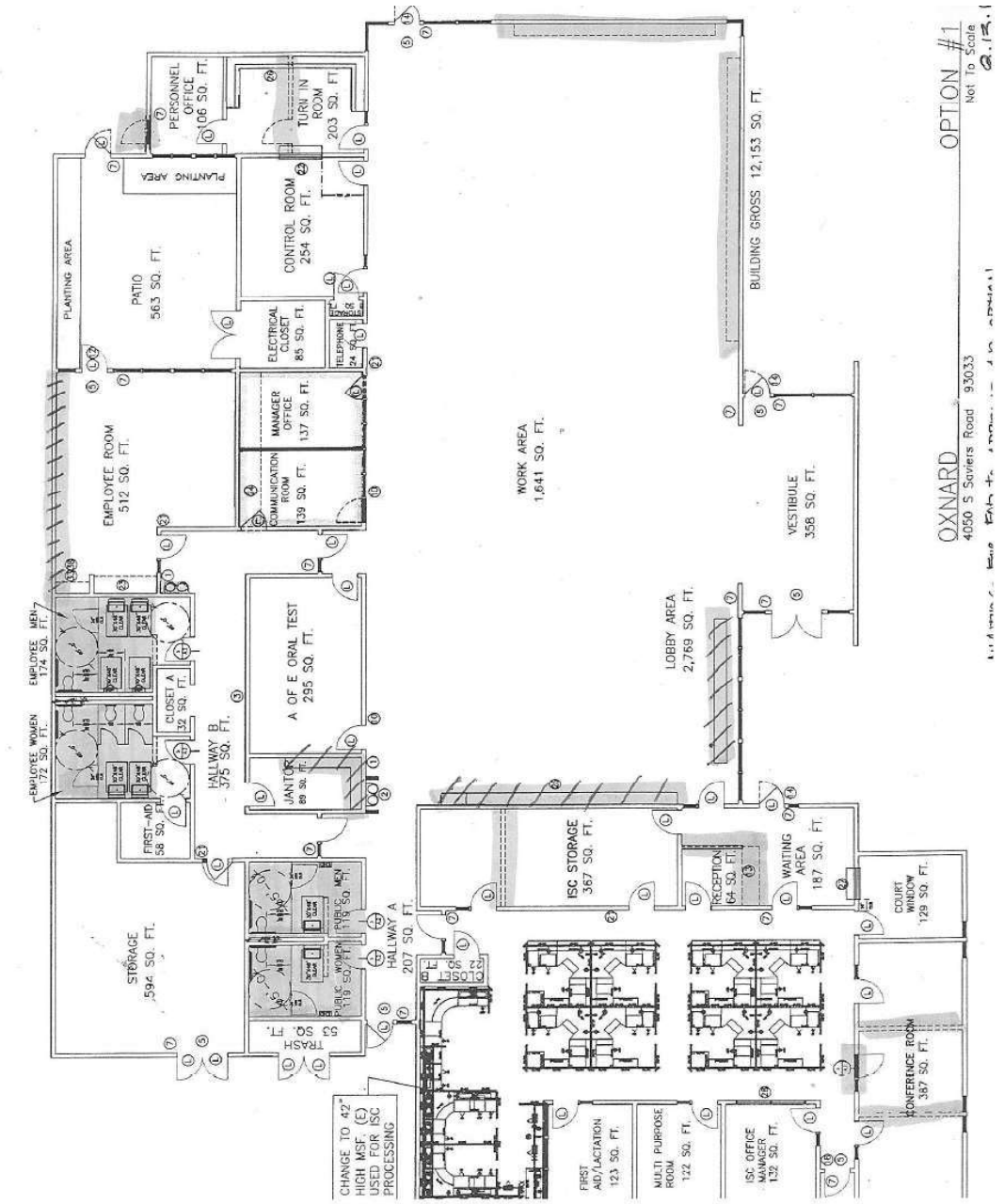
Reviewed by:



Michael Pinkerton
DOSH Certified Asbestos Consultant No. 07-4170

APPENDICES

Appendix I - FLOOR PLAN



Appendix I FLOOR PLAN	Source: DMV

Appendix II - SITE PHOTOGRAPHS



Tan/beige floor tiles



Tan/beige floor tiles

Appendix III - BULK SAMPLE TABLE

Sample Number	Material	Location	Asbestos Content	Quantity	Friability	Damage Rating
1011-1043-01	Brown cove base	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-01	Brown cove base mastic	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-02	Brown cove base	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-02	Brown cove base mastic	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-03	Brown cove base	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-03	Brown cove base mastic	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-04	1'x 1' ceiling tile	Throughout the above mentioned areas of renovation	None	---	Friable	GC
1011-1043-05	1'x 1' ceiling tile	Throughout the above mentioned areas of renovation	None	---	Friable	GC
1011-1043-06	1'x 1' ceiling tile	Throughout the above mentioned areas of renovation	None	---	Friable	GC
1011-1043-07	1'x 1' ceiling tile mastic	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-08	1'x 1' ceiling tile mastic	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-09	1'x 1' ceiling tile mastic	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-10	Blue cove base	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-10	Blue cove base mastic	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-11	Blue cove base	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-11	Blue cove base mastic	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-12	Blue cove base	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-12	Blue cove base mastic	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-13	Drywall	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-14	Drywall	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-15	Drywall	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-16	Drywall joint compound	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC

Sample Number	Material	Location	Asbestos Content	Quantity	Friability	Damage Rating
1011-1043-17	Drywall joint compound	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-18	Drywall joint compound	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-19	Tan/beige floor tile w/green/grey marks	Throughout the above mentioned areas of renovation	**3% CH**	2,000SF	Non-friable	GC
1011-1043-19	Tan/beige floor tile w/green/grey marks mastic	Throughout the above mentioned areas of renovation	**5% CH**	2,000SF	Non-friable	GC
1011-1043-20	Tan/beige floor tile w/green/grey marks	Throughout the above mentioned areas of renovation	**3% CH**	2,000SF	Non-friable	GC
1011-1043-20	Tan/beige floor tile w/green/grey marks mastic	Throughout the above mentioned areas of renovation	**5% CH**	2,000SF	Non-friable	GC
1011-1043-21	Tan/beige floor tile w/green/grey marks	Throughout the above mentioned areas of renovation	**3% CH**	2,000SF	Non-friable	GC
1011-1043-21	Tan/beige floor tile w/green/grey marks mastic	Throughout the above mentioned areas of renovation	**8% CH**	2,000SF	Non-friable	GC
1011-1043-22	White floor tile w/grey marks	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-22	White floor tile w/grey marks mastic	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-23	White floor tile w/grey marks	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-23	White floor tile w/grey marks mastic	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-24	White floor tile w/grey marks	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-24	White floor tile w/grey marks mastic	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-25	Black cove base	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-25	Black cove base mastic	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-26	Black cove base	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-26	Black cove base mastic	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-27	Black cove base	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-27	Black cove base mastic	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-27	Drywall	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-28	Grey cove base	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-28	Grey cove base mastic	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC

Sample Number	Material	Location	Asbestos Content	Quantity	Friability	Damage Rating
1011-1043-29	Grey cove base	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-29	Grey cove base mastic	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-30	Grey cove base	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC
1011-1043-30	Grey cove base mastic	Throughout the above mentioned areas of renovation	None	---	Non-friable	GC

Appendix IV - LABORATORY ANALYSIS RESULTS

LA Testing
520 Mission Street, South Pasadena, CA 91030
Phone: (323) 254-9960 Fax: (323) 254-9982 Email: pasadenalab@latesting.com

Attn: **Adam Nelson**
Andersen Environmental
9937 Jefferson Blvd.
Suite 200
Culver City, CA 90232

Fax: Phone: (310) 854-6300
Project: **1011-1043 DMV-Oxnard**

Customer ID: 32ANDE85
Customer PO:
Received: 12/06/10 9:00 AM
LA Testing Order: 321017194

LA Testing Proj: LAWA World Airport
Analysis Date: 12/9/2010

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
1011-1043-01-Cove Base *321017194-0001*	Brown covebase + masitc	Brown Non-Fibrous Heterogeneous		100% Non-fibrous (other)	**None Detected**
1011-1043-01-Mastic-Comp *321017194-0001A*	Brown covebase + masitc	Brown/Tan/Cream Non-Fibrous Heterogeneous		100% Non-fibrous (other)	**None Detected**
1011-1043-02-Cove Base *321017194-0002*	Brown covebase + masitc	Brown Non-Fibrous Heterogeneous		100% Non-fibrous (other)	**None Detected**
1011-1043-02-Mastic-Comp *321017194-0002A*	Brown covebase + masitc	Brown/Tan/Cream Non-Fibrous Heterogeneous		100% Non-fibrous (other)	**None Detected**
1011-1043-03-Cove Base *321017194-0003*	Brown covebase + masitc	Brown Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
1011-1043-03-Mastic-Comp *321017194-0003A*	Brown covebase + masitc	Brown/White Non-Fibrous Heterogeneous		100% Non-fibrous (other)	**None Detected**

Initial report from 12/09/2010 09:48:28

Analyst(s)

Kieu-anh Pham Duong (17)
Roger Casillas (32)

or other approved signatory

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			Non-Asbestos			Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**		**% Non-Fibrous**	**% Type**
1011-1043-04 *321017194-0004*	Ceiling tile (1'x1')	Gray/White Fibrous Heterogeneous	40% 20%	Cellulose Min. Wool	30% Non-fibrous (other) 10% Perlite	**None Detected**
1011-1043-05 *321017194-0005*	Ceiling tile (1'x1')	Gray/White Fibrous Heterogeneous	40% 20%	Cellulose Min. Wool	30% Non-fibrous (other) 10% Perlite	**None Detected**
1011-1043-06 *321017194-0006*	Ceiling tile (1'x1')	White/Beige Fibrous Heterogeneous	50% 30%	Cellulose Glass	10% Non-fibrous (other) 10% Perlite	**None Detected**
1011-1043-07 *321017194-0007*	Ceiling tile (1'x1') mastic	Brown Non-Fibrous Heterogeneous			100% Non-fibrous (other)	**None Detected**
1011-1043-08 *321017194-0008*	Ceiling tile (1'x1') mastic	Brown Non-Fibrous Heterogeneous			100% Non-fibrous (other)	**None Detected**
1011-1043-09 *321017194-0009*	Ceiling tile (1'x1') mastic	Brown Non-Fibrous Homogeneous			100% Non-fibrous (other)	**None Detected**
1011-1043-10-Cove Base *321017194-0010*	Blue covebase + mastic	Purple Non-Fibrous Heterogeneous			100% Non-fibrous (other)	**None Detected**

Initial report from 12/09/2010 09:48:28

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Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
1011-1043-10-Mastic-Comp *321017194-0010A*	Blue covebase + mastic	Brown/Cream Non-Fibrous Heterogeneous		100% Non-fibrous (other)	**None Detected**
1011-1043-11-Cove Base *321017194-0011*	Blue covebase + mastic	Purple Non-Fibrous Heterogeneous		100% Non-fibrous (other)	**None Detected**
1011-1043-11-Mastic-Comp *321017194-0011A*	Blue covebase + mastic	Brown/Cream Non-Fibrous Heterogeneous		100% Non-fibrous (other)	**None Detected**
1011-1043-12-Cove Base *321017194-0012*	Blue covebase + mastic	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
1011-1043-12-Mastic-Comp *321017194-0012A*	Blue covebase + mastic	Brown/Cream Non-Fibrous Heterogeneous		100% Non-fibrous (other)	**None Detected**
1011-1043-13 *321017194-0013*	Drywall	Brown/White Non-Fibrous Heterogeneous	10% Cellulose	90% Non-fibrous (other)	**None Detected**

Initial report from 12/09/2010 09:48:28

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			Non-Asbestos			Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**		**% Non-Fibrous**	**% Type**
1011-1043-14 *321017194-0014*	Drywall	Brown/White Non-Fibrous Heterogeneous	10%	Cellulose	90% Non-fibrous (other)	**None Detected**
1011-1043-15 *321017194-0015*	Drywall	Brown/White Fibrous Heterogeneous	20%	Cellulose	80% Non-fibrous (other)	**None Detected**
1011-1043-16 *321017194-0016*	Drywall joint compound	Beige Non-Fibrous Heterogeneous			100% Non-fibrous (other)	**None Detected**
1011-1043-17 *321017194-0017*	Drywall joint compound	Beige Non-Fibrous Heterogeneous			100% Non-fibrous (other)	**None Detected**
1011-1043-18 *321017194-0018*	Drywall joint compound	Brown/Beige Fibrous Heterogeneous	10%	Cellulose	90% Non-fibrous (other)	**None Detected**
1011-1043-19-Floor Tile *321017194-0019*	Tan/beige floor tiles w/green/grey mark + mastic	Tan/Beige Non-Fibrous Heterogeneous			97% Non-fibrous (other)	**3% Chrysotile**

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			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
1011-1043-19-Mastic *321017194-0019A*	Tan/beige floor tiles w/green/grey mark + mastic	Black Non-Fibrous Heterogeneous		95% Non-fibrous (other)	**5% Chrysotile**
1011-1043-20-Floor Tile *321017194-0020*	Tan/beige floor tiles w/green/grey mark + mastic	Tan/Beige Non-Fibrous Heterogeneous		97% Non-fibrous (other)	**3% Chrysotile**
1011-1043-20-Mastic *321017194-0020A*	Tan/beige floor tiles w/green/grey mark + mastic	Black Non-Fibrous Heterogeneous		95% Non-fibrous (other)	**5% Chrysotile**
1011-1043-21-Floor Tile *321017194-0021*	Tan/beige floor tiles w/green/grey mark + mastic	Beige Non-Fibrous Homogeneous		97% Non-fibrous (other)	**3% Chrysotile**
1011-1043-21-Mastic *321017194-0021A*	Tan/beige floor tiles w/green/grey mark + mastic	Black Non-Fibrous Homogeneous		92% Non-fibrous (other)	**8% Chrysotile**
1011-1043-22-Floor Tile *321017194-0022*	White floor tiles w/grey mastar + mastic	Gray/White Non-Fibrous Heterogeneous		100% Non-fibrous (other)	**None Detected**

Initial report from 12/09/2010 09:48:28

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LA Testing Order: 321017194

LA Testing Proj: LAWA World Airport
Analysis Date: 12/9/2010

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
1011-1043-22-Mastic *321017194-0022A*	White floor tiles w/grey mastar + mastic	Yellow Non-Fibrous Heterogeneous		100% Non-fibrous (other)	**None Detected**
1011-1043-23-Floor Tile *321017194-0023*	White floor tiles w/grey mastar + mastic	Gray/White Non-Fibrous Heterogeneous		100% Non-fibrous (other)	**None Detected**
1011-1043-23-Mastic *321017194-0023A*	White floor tiles w/grey mastar + mastic	Yellow Non-Fibrous Heterogeneous		100% Non-fibrous (other)	**None Detected**
1011-1043-24-Floor Tile *321017194-0024*	White floor tiles w/grey mastar + mastic	Grayish Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
1011-1043-24-Mastic *321017194-0024A*	White floor tiles w/grey mastar + mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
1011-1043-25-Cove Base *321017194-0025*	Black covebase + mastic	Black Non-Fibrous Heterogeneous		100% Non-fibrous (other)	**None Detected**

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			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
1011-1043-25-Mastic-Comp *321017194-0025A*	Black covebase + mastic	Brown/Cream Non-Fibrous Heterogeneous		100% Non-fibrous (other)	**None Detected**
1011-1043-26-Cove Base *321017194-0026*	Black covebase + mastic	Black Non-Fibrous Heterogeneous		100% Non-fibrous (other)	**None Detected**
1011-1043-26-Mastic-Comp *321017194-0026A*	Black covebase + mastic	Brown/Cream Non-Fibrous Heterogeneous		100% Non-fibrous (other)	**None Detected**
1011-1043-27-Cove Base *321017194-0027*	Black covebase + mastic	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
1011-1043-27-Mastic-Comp *321017194-0027A*	Black covebase + mastic	Brown/White Non-Fibrous Heterogeneous		100% Non-fibrous (other)	**None Detected**
1011-1043-27-Drywall *321017194-0027B*	Black covebase + mastic	Brown/White Fibrous Heterogeneous	20% Cellulose	80% Non-fibrous (other)	**None Detected**

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LA Testing
520 Mission Street, South Pasadena, CA 91030
Phone: (323) 254-9960 Fax: (323) 254-9982 Email: pasadenalab@latesting.com

Attn: **Adam Nelson**
Andersen Environmental
9937 Jefferson Blvd.
Suite 200
Culver City, CA 90232

Fax: Phone: (310) 854-6300
Project: **1011-1043 DMV-Oxnard**

Customer ID: 32ANDE85
Customer PO:
Received: 12/06/10 9:00 AM
LA Testing Order: 321017194

LA Testing Proj: LAWA World Airport
Analysis Date: 12/9/2010

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
1011-1043-28-Cove Base *321017194-0028*	Grey covebase + mastic	Gray Non-Fibrous Heterogeneous		100% Non-fibrous (other)	**None Detected**
1011-1043-28-Mastic-Comp *321017194-0028A*	Grey covebase + mastic	Brown/Cream Non-Fibrous Heterogeneous		100% Non-fibrous (other)	**None Detected**
1011-1043-29-Cove Base *321017194-0029*	Grey covebase + mastic	Gray Non-Fibrous Heterogeneous		100% Non-fibrous (other)	**None Detected**
1011-1043-29-Mastic *321017194-0029A*	Grey covebase + mastic	Cream Non-Fibrous Heterogeneous		100% Non-fibrous (other)	**None Detected**
1011-1043-30-Cove Base *321017194-0030*	Grey covebase + mastic	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
1011-1043-30-Mastic-Comp *321017194-0030A*	Grey covebase + mastic	Brown/White Non-Fibrous Heterogeneous		100% Non-fibrous (other)	**None Detected**

Initial report from 12/09/2010 09:48:28

Analyst(s)

Kieu-anh Pham Duong (17)
Roger Casillas (32)

or other approved signatory

Due to magnification limitations inherent in PLM, asbestos fibers in dimensions below the resolution capability of PLM may not be detected. Samples reported as <1% or none detected may require additional testing by TEM to confirm asbestos quantities. The above test report relates only to the items tested and may not be reproduced in any form without the express written approval of LA Testing. LA Testing's liability is limited to the cost of analysis. LA Testingbears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. The test results contained within this report meet the requirements of NELAC unless otherwise noted. Samples received in good condition unless otherwise noted. Samples received in good condition unless otherwise noted.
Samples analyzed by LA Testing 520 Mission Street, South Pasadena CA NVLAP Lab Code 200232-0, CA ELAP 2283

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Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos			Asbestos	
Sample	**Description**	**Appearance**	**%**	**Fibrous**	**% Non-Fibrous**	**%**	**Type**
Multiple layers composited (analyzed as one) at client request.							

Initial report from 12/09/2010 09:48:28

Analyst(s)

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Samples analyzed by LA Testing 520 Mission Street, South Pasadena CA NVLAP Lab Code 200232-0, CA ELAP 2283

THIS IS THE LAST PAGE OF THE REPORT.

321017194

Laboratory Chain of Custody

Turn Around Time - (Circle) *Please select based on laboratory being used	Weekend/Holiday 3hr 6hr 12hr 24hr 48hr (72hr)
Sample Type (Circle Those That Apply)	Air Swab (Bulk) Tape

AE Project No.:	Project Name	Sampling By	# of Samples	Date(s) Taken	Page No.:		Total Pages
1011 - 1043	DMV - Oxnard	Adam Nelson	30	12/2/10	1	Of	4

Sample No.:	Sample Location & Comments	Start Flow Rate / End Flow Rate	Total Time	Total Volume/Area	Type of Analysis / Sample Serial Number
1011 - 1043 -01	Brown cove base + mastic				Serial No.: PLM
-02	↓				Serial No.:
-03	↓				Serial No.:
-04	Ceiling tile (1'x1')				Serial No.:
-05	↓				Serial No.:
-06	↓				Serial No.:
-07	Ceiling tile (1'x1') mastic				Serial No.:
-08	↓				Serial No.:
-09	↓				Serial No.:

Relinquished By (Print & Sign)(Date & Time)	Received By (Print & Sign) (Date & Time)
Adam Nelson 12/3/10 1:00pm	[illegible] (EMSL) 12/6/10 9am
Relinquished By (Print & Sign) (Date & Time)	Received By (Print & Sign) (Date & Time)

Andersen Environmental Consulting
9937 Jefferson Blvd, Suite 200 Culver City, CA 90232, Ph (310) 854-6300, Fax (310) 854-0199

321017194

321017194

Laboratory Chain of Custody

Turn Around Time - (Circle) *Please select based on laboratory being used	Weekend/Holiday 3hr 6hr 12hr 24hr 48hr (72hr)
Sample Type (Circle Those That Apply)	Air Swab (Bulk) Tape

AE Project No.:	Project Name	Sampling By	# of Samples	Date(s) Taken	Page No.:		Total Pages
1011-1043	DMV - Oxnard	Adam Nelson	30	12/2/10	2	Of	4

Sample No.:	Sample Location & Comments	Start Flow Rate / End Flow Rate	Total Time	Total Volume/Area	Type of Analysis / Sample Serial Number
1011-1043 -10	Blue cove base + mastic				Serial No.: PLM
-11	↓				Serial No.:
-12	↓				Serial No.:
-13	Drywall				Serial No.:
-14	↓				Serial No.:
-15	↓				Serial No.:
-16	Drywall Joint compound				Serial No.:
-17	↓				Serial No.:
-18	↓				Serial No.: ↓

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Adam Nelson 12/3/10 1:00pm	
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Laboratory Chain of Custody

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Turn Around Time - (Circle) *Please select based on laboratory being used: Weekend/Holiday — 3hr 6hr 12hr 24hr 48hr (72hr)

Sample Type (Circle Those That Apply): Air Swab (Bulk) Tape

AE Project No.:	Project Name	Sampling By	# of Samples	Date(s) Taken	Page No.:		Total Pages
1011-1043	DMV-Oxnard	Adam Nilsen	30	12/2/10	3	Of	4

Sample No.:	Sample Location & Comments	Start Flow Rate / End Flow Rate	Total Time	Total Volume/Area	Type of Analysis / Sample Serial Number
1011-1043 -19	Tan/Beige floor tiles w/ green/grey mark & mastic				Serial No.: PLM
-20	↓				Serial No.:
-21	↓				Serial No.:
-22	White floor tiles w/ grey marker & mastic				Serial No.:
-23	↓				Serial No.:
-24	↓				Serial No.:
-25	Black cove base + mastic				Serial No.:
-26	↓				Serial No.:
-27	↓				Serial No.: ↓

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Adam Nilsen 12/3/10 1:00pm	
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Laboratory Chain of Custody

Turn Around Time - (Circle) *Please select based on laboratory being used	Weekend/Holiday 3hr 6hr 12hr 24hr 48hr (72hr)
Sample Type (Circle Those That Apply)	Air Swab (Bulk) Tape

AE Project No.:	Project Name	Sampling By	# of Samples	Date(s) Taken	Page No.:		Total Pages
1011-1043	DMV-Oxnard	Adam Nilsen	30	12/2/10	4	Of	4

Sample No.:	Sample Location & Comments	Start Flow Rate / End Flow Rate	Total Time	Total Volume/Area	Type of Analysis / Sample Serial Number
1011-1043 -28	Eng cover back + mastic				Serial No.: PLM
-29	↓				Serial No.:
-30	↓				Serial No.:
					Serial No.:
					Serial No.:
					Serial No.:
					Serial No.:
					Serial No.:
					Serial No.:

Relinquished By (Print & Sign)(Date & Time)	Received By (Print & Sign) (Date & Time)
Adam Nilsen 12/3/10 1:00	
Relinquished By (Print & Sign) (Date & Time)	Received By (Print & Sign) (Date & Time)

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321017194

HEALTH AND SAFETY • ENGINEERING • ENVIRONMENTAL

Project Number: 1022519

Re: Limited Hazardous Materials Survey Report
DMV – Oxnard Field Office
4050 S. Saviers Road
Oxnard, CA 93033
(WO #: 10893)

CSC Local Office: Clark Seif Clark, Inc.
PO Box 4299
Chatsworth, CA
Office: 818-727-2553
Fax: 818-727-2556

Client: Department of Motor Vehicles
Attn: Mr. Herbert Earl
2415 First Avenue, M/S A-156
Sacramento, CA 95818

Date Report Issued: March 28, 2012

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LIMITATIONS **5**

INTRODUCTION

Mr. Herbert Earl Jr. of the Department of Motor Vehicles (Client) retained Clark Seif Clark, Inc. (CSC) to perform a limited asbestos survey at DMV Field Office property located at 4030 Saviers Road in Oxnard, California. The survey was conducted on March 23, 2012 by Mr. Christian Goerrissen, CDPH-I/A #13462.

CSC's report is for the exclusive use of Client and applies only to the building referenced above or portion thereof. No one other than those contracted by the Client may utilize, reference, or otherwise rely on this report without prior written consent from CSC.

PURPOSE AND SCOPE

The purpose and scope of this survey was to perform non-destructive testing for lead-based paint, which may present an exposure risk during planned renovation work of the employee and public restrooms, work area partition wall and DSO Work Area at the subject property.

SURVEY AND ANALYTICAL METHODOLOGIES

Lead-Based Paint Method

A portable NITON-XL 309, XRF LBP Spectrum Analyzer manufactured by NITON Corporation was used to test for LBP. The XRF analyzer was equipped with a 14 mCi, cadmium 109, and sealed radioactive source. The XRF analyzer was calibrated pursuant to the manufacturer's specifications and the readings were regularly verified against predetermined lead samples produced by the National Institute of Standards and Testing (NIST). The calibration data is attached.

CSC referenced all building components as existing on either side "A", "B", "C", or "D" of the property; refer to the attached drawings for reference. For the property's interior, CSC reports designated side A, B, C, and D as follows:

1. Side A is the west wall, or the side holding the main entry door to the building.
2. Side B is the north wall.
3. Side C is the east wall.
4. Side D is the south wall.

This survey of building components was for the purpose of determining whether lead-based or lead-containing building materials paint are present. XRF readings were taken to survey for lead levels and provides results that are generally representative of typical conditions but are not inclusive of all painted/coated surfaces present at the subject property. This survey is considered a surface-by-surface inspection as described in the U.S. Department of Housing and Urban Development (HUD) *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing* pursuant to Title X of the Housing and Community Development Act of 1992. This data can be helpful in evaluating the lead-related environmental risks in general, but cannot be used to calculate worker exposures, are not a substitute for employee exposure monitoring, and are not sufficient for waste stream profiling.

Lead-Based Paint (LBP)

According to Chapter 7: Lead-Based Paint Inspection "Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing," U.S. Department of Housing and Urban Development, 1997 Revision,

> "Lead-based paint means paint or other surface coatings that contain lead equal to or greater than 1.0 mg/cm^2 or 0.5 percent by weight (equivalent units are: 5,000 µg/g, 5,000 mg/kg, or 5,000 ppm by weight). Surface coatings include paint shellac, varnish, or any other coating, including wallpaper which covers painted surfaces."

Similarly, according to Title 17 California Code of Regulations, Division 1, Chapter 8 "Accreditation, Certification, and Work Practices For Lead-Based Paint and Lead Hazards,"

> "Lead-based paint' means paint or other surface coatings that contain an amount of lead equal to, or in excess of one milligram per square centimeter (1.0 mg/cm^2) or half of one percent (0.5%) by weight."

Conclusions made in this report regarding the presence or absence of lead-based paint (LBP) is based on these equivalent definitions.

Lead-Containing Material (LCM)

California's Division of Occupational Safety and Health, better known as Cal/OSHA, refers to a lead-containing material as a material containing *any* amount of lead. Conclusions made in this report regarding the presence or absence of lead-containing material (LCM) is based on this definition.

LEAD-BASED PAINT SURVEY

Lead-Based Paint Survey

A non-destructive, visual inspection was conducted to determine the presence of surface coatings and building materials suspected of containing LBP or LCM. A representative number of surfaces of suspect components were tested for lead using an XRF analyzer.

Lead-Based Paint Survey Results

The XRF measurements taken from the interior representative components revealed lead in concentrations greater than 1.0 mg/ cm^2. (See attachments for a complete listing of the field reports and measurements.)

CONCLUSIONS AND RECOMMENDATIONS

Lead-based Paint Conclusions and Recommendations

The survey indicates the presence of lead containing materials in the tan ceramic wall tile in the men's and women's employee restrooms, in the men's urinals and on the walls of the public men's and women's restrooms. The walls in the public restrooms are covered with plastic paneling; it is suspected that there is ceramic tile behind the wall paneling that is lead containing.

Contractor must perform all work in compliance with the most recent edition of all applicable federal, state, and local regulations, standards, and codes governing abatement, transport, and disposal of lead-containing of lead-contaminated materials.

Cal/OSHA requires a lead-work pre-job notification if the quantities of lead-containing materials to be disturbed exceeds 100 square feet or 100 linear feet OR if the tasks include torch cutting or welding exceeding 1 hour in any shift OR if the percentage of lead in the material to be disturbed exceeds 0.5% by weight (5,000 ppm) or 1.0 mg/cm^2. The information and form required for notification can be found in 8 CCR 1532.1. OSHA states that these rules apply to "any detectable concentration of lead" without a specified detection limit or analytical method. Due to the Consumer Product Safety Commission currently allowing paint to contain up to 600 parts per million (ppm) or 0.06 wt% of lead, the variation of lead content due to aging and weathering, and the variation of detection limits associated with analysis of bulk materials such as paint chips or surface content analysis using XRF, it is recommended that all painted or coated surfaces be treated as potentially containing lead.

Finally, regardless of the amount of lead found in a material:

OSHA does not consider any method that relies solely on the analysis of bulk materials or surface content of lead (or other toxic material) to be acceptable for safely predicting employee exposure to airborne contaminants. Without air monitoring results or without the benefit of historical or objective data (including air sampling which clearly demonstrates that the employee cannot be exposed above the action level during any process, operation, or activity) the analysis of bulk or surface samples cannot be used to determine employee airborne exposure.

– OSHA Standard Interpretation dated May 8, 2000 [corrected June 2, 2005]

LIMITATIONS

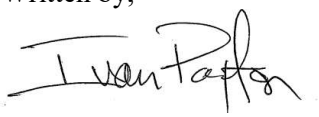
CSC prepared this limited hazardous materials survey under contract with the Client. No warranties, expressed or implied, are made by CSC or its employees as to the use of any information, apparatus, product, or process disclosed in this report. Though reasonable efforts have been made to assure correctness, if a Contractor is employed, he should bring any discrepancies to the immediate attention of CSC.

We have employed state-of-the-art practices to perform this analysis of risk and identification, but this evaluation is severely limited in scope to areas accessible to a visual inspection or through reasonable means of the areas evaluated. No demolition or product review was performed in attempts to reveal material compositions. Our services consist of professional opinions and recommendations made in accordance with generally accepted engineering principles and practices and are designed to provide an analytical tool to assist the Client. CSC or those representing CSC bear no responsibility for the actual condition of the structure or safety of a site pertaining to asbestos, lead, and/or UWR material regardless of the actions taken by the Client.

CSC appreciated having the opportunity to perform this survey. Should you have any questions regarding this report or require assistance in the design, specification, management, and/or air monitoring for your hazardous materials abatement project, please do not hesitate to contact us at (949) 453-8177.

Respectfully Submitted,
CSC - Clark Seif Clark, Inc.

Written by,



Ivan Paxton, CAC, CDPH-I/A
CDPH-I/A #9201

Reviewed by,



Christian Goerrissen, CAC, CDPH-I/A
CDPH-I/A #13462

Attachments: - XRF Data Report (March 22, 2012)
- CDPH 8552 Form
- Floor Plans

CSC Project No. 1022519
Oxnard DMV Field Office
4050 S. Saviers Road, Oxnard, CA 93033

HEALTH & SAFETY • ENGINEERING • ENVIRONMENTAL

XRF LEAD-BASED PAINT AND LEAD-CONTAINING MATERIALS INSPECTION REPORT

							Results			
Reading No	Room	Side	Component	Substrate	Condition	Color	Results	PbC	PbC Error	Units
1	SHUTTER CALIBRATION							2.53	0	cps
2	NITON CALIBRATION - SRM 2573					RED	Positive	1.1	0.1	mg / cm ^2
3	NITON CALIBRATION - SRM 2573					RED	Positive	1	0.1	mg / cm ^2
4	NITON CALIBRATION - SRM 2573					RED	Positive	1.1	0.1	mg / cm ^2
5	MENS EMPLOYEE RR		FLOOR	TERRAZZO	INTACT	BEIGE	Negative	0	0.02	mg / cm ^2
6	MENS EMPLOYEE RR		CEILING	PLASTER	INTACT	MAUVE	Negative	0.01	0.02	mg / cm ^2
7	MENS EMPLOYEE RR	A	WALL	PLASTIC	INTACT	BEIGE	Negative	0	0.02	mg / cm ^2
8	MENS EMPLOYEE RR	C	WALL	PLASTIC	INTACT	BEIGE	Negative	0	0.02	mg / cm ^2
9	**MENS EMPLOYEE RR**	**B**	**WALL**	**CERAMIC**	**INTACT**	**TAN**	**Positive**	**18**	**2**	**mg / cm ^2**
10	**MENS EMPLOYEE RR**	**D**	**WALL**	**CERAMIC**	**INTACT**	**TAN**	**Positive**	**17.9**	**4.2**	**mg / cm ^2**
11	**MENS EMPLOYEE RR**	**B**	**URINAL**	**PORCELAIN**	**INTACT**	**WHITE**	**Positive**	**4.1**	**0.9**	**mg / cm ^2**
12	MENS EMPLOYEE RR	D	SINK	PORCELAIN	INTACT	WHITE	Negative	0.04	0.13	mg / cm ^2
13	MENS EMPLOYEE RR	D	SINK	PORCELAIN	INTACT	WHITE	Negative	0.04	0.08	mg / cm ^2
14	MENS EMPLOYEE RR	B	PARTITION	PLASTIC	INTACT	BEIGE	Negative	0.01	0.02	mg / cm ^2
15	MENS EMPLOYEE RR	B	PARTITION	PLASTIC	INTACT	BEIGE	Negative	0	0.02	mg / cm ^2
16	MENS EMPLOYEE RR	C	WINDOW	METAL	INTACT	LAVENDER	Negative	0	0.02	mg / cm ^2
17	MENS EMPLOYEE RR		CEILING VENT	METAL	INTACT	BEIGE	Negative	0	0.02	mg / cm ^2
18	MENS EMPLOYEE RR	A	DOOR	WOOD	INTACT	STAINED	Negative	0	0.02	mg / cm ^2
19	MENS EMPLOYEE RR	A	DOOR CASING	METAL	INTACT	LAVENDER	Negative	0.01	0.03	mg / cm ^2
20	MENS EMPLOYEE RR	A	DOOR CASING	METAL	INTACT	LAVENDER	Null	0.09	0.28	mg / cm ^2
21	HALL	C	WALL	PLASTER	INTACT	WHITE	Negative	0	0.02	mg / cm ^2
22	HALL	C	WALL	PLASTER	INTACT	WHITE	Negative	0	0.02	mg / cm ^2

Clark **S**eif **C**lark, **INC.**
PO Box 4299, Chatsworth, California 91313
Office 818 727-2553, Fax 818 727-2556, Web: csceng.com

CSC Project No. 1022519
Oxnard DMV Field Office
4050 S. Saviers Road, Oxnard, CA 93033

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XRF LEAD-BASED PAINT AND LEAD-CONTAINING MATERIALS INSPECTION REPORT

							Results			
Reading No	Room	Side	Component	Substrate	Condition	Color	Results	PbC	PbC Error	Units
23	WORK AREA	C	WINDOW	METAL	INTACT	LAVENER	Negative	0.05	0.15	mg / cm ^2
24	WORK AREA	C	WINDOW	METAL	INTACT	LAVENER	Negative	0.12	0.8	mg / cm ^2
25	DSO WORK AREA	A	WALL	PLASTER	INTACT	WHITE	Negative	0.01	0.02	mg / cm ^2
26	DSO WORK AREA	B	WALL	PLASTER	INTACT	WHITE	Negative	0	0.02	mg / cm ^2
27	DSO WORK AREA	C	WALL	PLASTER	INTACT	WHITE	Negative	0	0.02	mg / cm ^2
28	DSO WORK AREA	D	WALL	PLASTER	INTACT	WHITE	Negative	0	0.02	mg / cm ^2
29	DSO WORK AREA	D	DOOR	WOOD	INTACT	STAINED	Negative	0	0.02	mg / cm ^2
30	DSO WORK AREA	D	DOOR CASING	METAL	INTACT	GRAY	Negative	0.02	0.04	mg / cm ^2
31	DSO WORK AREA	D	DOOR CASING	METAL	INTACT	GRAY	Negative	0.04	0.11	mg / cm ^2
32	DSO WORK AREA	C	WINDOW	METAL	INTACT	GRAY	Negative	0	0.02	mg / cm ^2
33	DSO WORK AREA	C	WINDOW	METAL	INTACT	GRAY	Negative	0.05	0.09	mg / cm ^2
34	MENS RR		FLOOR	CRAMIC	INTACT	BROWN	Negative	0.01	0.02	mg / cm ^2
35	MENS RR	A	BASEBOARD	CRAMIC	INTACT	GRAY	Negative	0.05	0.07	mg / cm ^2
36	**MENS RR**	**A**	**WALL**	**PLASTIC***	**INTACT**	**BEIGE**	**Positive**	**11**	**3.1**	**mg / cm ^2**
37	**MENS RR**	**B**	**WALL**	**PLASTIC***	**INTACT**	**BEIGE**	**Positive**	**11**	**1.8**	**mg / cm ^2**
38	**MENS RR**	**C**	**WALL**	**PLASTIC***	**INTACT**	**BEIGE**	**Positive**	**12**	**3**	**mg / cm ^2**
39	**MENS RR**	**D**	**WALL**	**PLASTIC***	**INTACT**	**BEIGE**	**Positive**	**11.3**	**3.2**	**mg / cm ^2**
40	MENS RR		CEILING	PLASTER	INTACT	BEIGE	Negative	0	0.02	mg / cm ^2
41	MENS RR		CEILING VENT	METAL	INTACT	BEIGE	Negative	0	0.02	mg / cm ^2
42	MENS RR	B	PARTTION	WOOD	INTACT	BEIGE	Negative	0	0.02	mg / cm ^2
43	MENS RR	B	SINK	PORCELAIN	INTACT	WHITE	Negative	0.02	0.07	mg / cm ^2
44	MENS RR	B	TOILET	PORCELAIN	INTACT	WHITE	Negative	0.02	0.05	mg / cm ^2

Clark **S**eif **C**lark, **INC.**
PO Box 4299, Chatsworth, California 91313
Office 818 727-2553, Fax 818 727-2556, Web: csceng.com

CSC Project No. 1022519
Oxnard DMV Field Office
4050 S. Saviers Road, Oxnard, CA 93033

HEALTH & SAFETY • ENGINEERING • ENVIRONMENTAL

XRF LEAD-BASED PAINT AND LEAD-CONTAINING MATERIALS INSPECTION REPORT

							Results			
Reading No	Room	Side	Component	Substrate	Condition	Color	Results	PbC	PbC Error	Units
45	MENS RR	A	DOOR	WOOD	INTACT	STAINED	Negative	0	0.02	mg / cm ^2
46	MENS RR	A	DOOR CASING	METAL	INTACT	LAVENDER	Negative	0	0.02	mg / cm ^2
47	MENS RR	A	WALL	PLASTER	INTACT	WHITE	Negative	0	0.02	mg / cm ^2
48	WOMANS EMP RR LOUNGE	A	WALL	PLASTER	INTACT	MAUVE	Negative	0	0.02	mg / cm ^2
49	WOMANS EMP RR LOUNGE	B	WALL	PLASTER	INTACT	MAUVE	Negative	0	0.02	mg / cm ^2
50	WOMANS EMP RR LOUNGE	C	WALL	PLASTER	INTACT	MAUVE	Negative	0	0.02	mg / cm ^2
51	WOMANS EMP RR LOUNGE	D	WALL	PLASTER	INTACT	MAUVE	Negative	0	0.02	mg / cm ^2
52	WOMANS EMP RR LOUNGE		CEILING	PLASTER	INTACT	MAUVE	Negative	0	0.02	mg / cm ^2
53	WOMANS EMP RR LOUNGE	D	DOOR	WOOD	INTACT	STAINED	Negative	0	0.02	mg / cm ^2
54	WOMANS EMP RR LOUNGE	D	DOOR CASING	METAL	INTACT	LAVENDER	Negative	0.01	0.02	mg / cm ^2
55	NITON CALIBRATION - SRM 2573					RED	Positive	1	0.1	mg / cm ^2
56	NITON CALIBRATION - SRM 2573					RED	Positive	1	0.1	mg / cm ^2
57	NITON CALIBRATION - SRM 2573					RED	Positive	1	0.1	mg / cm ^2

Action Level is >1.0 mg/cm^2

Summay of Lead Based Paint Materials and Components (>0.7 mg/cm^2)

All ceramic wall tile in the restrooms. * It is suspected that there is ceramic tile behind the plastic wall paneling.

Inspection Comments:

This limited XRF inspection was performed on March 3, 2012 with a Niton XLp300 series lead dector, serial no. 25063.



Inspector signature

13462 Inspector/ Assessor
CDPH Certification

March 23, 2012
Date

Clark **S**eif **C**lark, **INC.**
PO Box 4299, Chatsworth, California 91313
Office 818 727-2553, Fax 818 727-2556, Web: csceng.com

State of California—Health and Human Services Agency

California Department of Public Health

LEAD HAZARD EVALUATION REPORT

Section 1 — Date of Lead Hazard Evaluation March 23, 2012

Section 2 — Type of Lead Hazard Evaluation (Check one box only)

☑ Lead Inspection ☐ Risk assessment ☐ Clearance Inspection ☐ Other (specify)

Section 3 — Structure Where Lead Hazard Evaluation Was Conducted

Address [number, street, apartment (if applicable)]	City	County	Zip Code
4050 S. Saviers Road	Oxnard	Ventura	93033

Construction date (year) of structure	Type of structure (check one box only)
1970ish	☐ Multi-unit building ☐ School or daycare ☐ Single family dwelling ☑ Other (specify) DMV Field Office

Section 4 — Owner of Structure (if business/agency, list contact person)

Name	Telephone number
Mr. Herbert Earl	916-657-9809

Address [number, street, apartment (if applicable)]	City	State	Zip Code
2515 First Avenue M/S A156	Sacramento	CA	95818

Section 5 — Results of Lead Hazard Evaluation (check all that apply)

☑ No lead-based paint detected. ☐ Lead-based paint detected.

☑ No lead hazards detected. ☐ Lead hazards detected.

Section 6 — Individual Conducting Lead Hazard Evaluation

Name	Telephone number
Christian Goerrissen	818-727-2553

Address [number, street, apartment (if applicable)]	City	State	Zip Code
21732 Devonshire Street	Chatsworth	CA	91311

CDPH certification number	Signature	Date
13462		3/23/12

Name and CDPH certification number of any other individuals conducting sampling or testing (if applicable)

Section 7 — Attachments

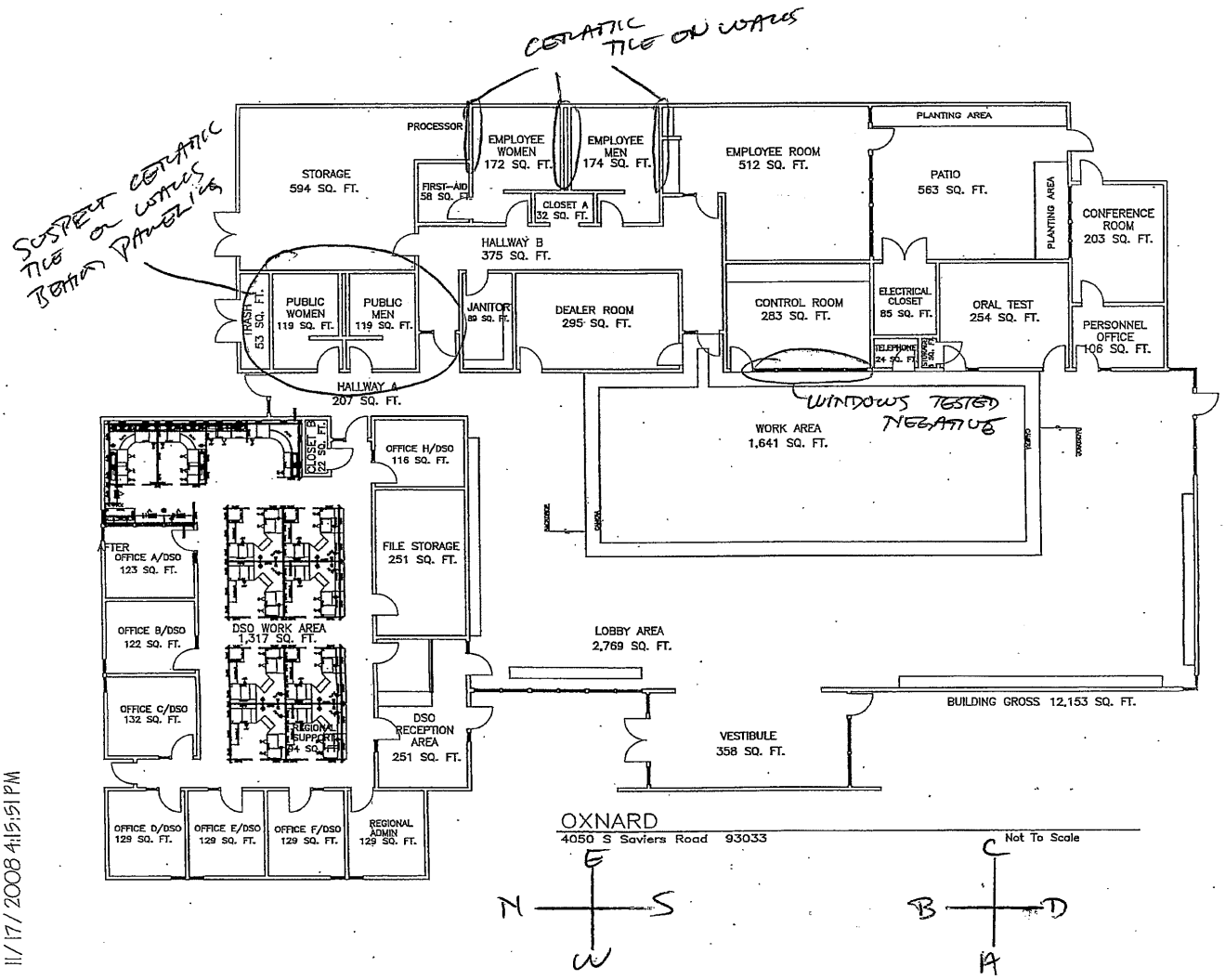
A. A foundation diagram or sketch of the structure indicating the specifc locations of each lead hazard or presence of lead-based paint;
B. Each testing method, device, and sampling procedure used;
C. All data collected, including quality control data, laboratory results, including laboratory name, address, and phone number.

First copy and attachments retained by inspector

Second copy and attachments retained by owner

Third copy only (no attachments) mailed or faxed to:

California Department of Public Health
Childhood Lead Poisoning Prevention Branch Reports
850 Marina Bay Parkway, Building P, Third Floor
Richmond, CA 94804-6403
Fax: (510) 620-5656



11/17/2008 4:15:51 PM

ANDERSEN ENVIRONMENTAL
9937 Jefferson Blvd., Suite 200 Culver City, CA 90232
Toll Free: (888) 705-6300 Tel: (310) 854-6300 Fax: (310) 854-0199

LIMITED ASBESTOS ASSESSMENT REPORT

PERFORMED AT

California Department of Motor Vehicles – Oxnard Field Office
4050 South Saviers Road
Oxnard, CA 93033

Project No.: 1109-894

PREPARED FOR

California Department of Motor Vehicles
2415 First Avenue, M/S A-156
Sacramento, CA 95818

September 27, 2011

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EXECUTIVE SUMMARY

Herbert Earl, Jr. of the California Department of Motor Vehicles (referred to hereunder as the client) retained Andersen Environmental (AE) to perform a limited assessment and sampling of suspect asbestos containing materials (ACM) that are to be disturbed during roofing replacement activities at the above referenced property (referred to hereunder as subject property). The purpose of this assessment was to conduct bulk sampling in order to determine the presence or absence of ACM in the defined area at the subject property. This report is a record of activities, observations, analytical results and recommendations performed to date.

Findings

None of the roofing materials sampled in this assessment were found to contain asbestos.

Recommendations

No recommendations for asbestos removal are needed regarding the roofing materials sampled in this assessment.

METHODOLOGY

All samples were collected using a clean knife, chisel or the appropriate tools. The sample location was first moistened with water in order to limit dust release. Each sample was extracted carefully so as not to disturb adjacent materials while still penetrating through all layers of the material sampled. Each sample was sealed in the appropriate sized plastic zip lock bag and the bag then labeled with a unique identification number. The sample number, description and location was then recorded on a log and plotted on a floor plan of the structure or area. Sampling tools were cleaned after collecting each sample. Any excess dust or debris from the sample location was cleaned using a moistened cloth. Whenever possible, samples were collected from previously damaged portions of the material in order to minimize damage to the material.

A total of twenty-four (24) samples were submitted to LA Testing in South Pasadena, California. LA Testing is accredited under the NIST/NVLAP program for asbestos in bulk material by polarized light microscopy and the State of California for asbestos analysis. NIST/NVLAP lab code 200232-0.

The analyses of the samples in this report were performed using polarized light microscopy using the EPA method 600/R-93/116. The phase abundances provided are visually estimated and expressed as percent area. Total percentage of sample constituents may total greater than 100 due to trace amounts. The limit of detection for this analytical method is less than one percent. In multilayer samples, unless otherwise specified, the asbestos concentration is reported for the layer where asbestos is found. These results lie within the statistical limits of variability calculated for standard reference samples routinely analyzed in the laboratory. On a per sample basis, the accuracy and precision of the results depend on the type of sample and its asbestos content.

DEFINITIONS

Asbestos – includes Chrysotile (CH), Amosite (AM), Crocidolite (CR), Tremolite (TR), Anthophyllite (AN), Actinolite (AC) and any of these minerals that have been chemically treated and/or altered.

Asbestos Containing Material (ACM) – any material containing greater than one percent (>1%) asbestos. These materials are subject to all federal, state and local asbestos regulation.

Asbestos Containing Construction Material (ACCM) – any manufactured construction material containing greater than one tenth of one percent (>0.1%) asbestos (as defined by California's Department of Occupational Safety and Health). These materials are subject to all Cal-OSHA standards.

Bulk sample – a chunk of material which is sent to a laboratory to be tested for asbestos.

Damaged – a material that exhibits less than ten percent (10%) distributed damage or twenty five percent (25%) localized damage.

Demolition – wrecking or taking out of any load-supporting structural member and any related removing or stripping of asbestos material.

Disturbance – activities that disrupt the matrix of ACM, crumble or pulverize ACM or generate visible debris from ACM.

EPA – Environmental Protection Agency

Friable – a friable material is any material that can be crushed, crumbled or pulverized by hand pressure when dry.

Good condition – a material with no visible damage or deterioration, or exhibiting only very limited damage or deterioration.

High – Potential for contact – service workers work in the vicinity of the material more than once per week or the material is in a public area and accessible to building occupants.

High – Influence of vibration – loud motors or engines present, intrusive noises or easily sensed vibrations.

High – (air) Erosion potential – high velocity air movement such as in a fan room or elevator shaft.

Homogeneous area – an area of material that is uniform in color and texture.

Linear Feet – (LF) the length of a given material. Usually used to define a quantity of pipe insulation.

Low – Potential for contact – service workers work in the vicinity of the material less than once per month or the material is visible but not within reach of building occupants.

Low – Influence of vibration – no loud motors, engines, intrusive noises or sensed vibrations.

Low – (air) Erosion potential – no noticeable movement of air.

Moderate – Potential for contact – service workers work in the vicinity of the material once per month to once per week or the materials are in a room or office and accessible to the occupants.

Moderate – Influence of vibration – motors or engines present but not obtrusive or occasional loud sounds.

Moderate – (air) Erosion potential – noticeable movement of air such as an airshaft or ventilator air stream.

Non-friable – a non-friable material cannot be crushed, crumbled or pulverized by hand pressure.

OSHA – Occupational Safety and Health Administration

Polarized Light Microscopy (PLM) – the analysis used to determine the asbestos content of a material.

Presumed Asbestos Containing Material (PACM) – a material that is not analyzed but is presumed to contain asbestos, such as transite.

Procedure 5 – an approved alternative combination of techniques and/or engineering controls. Written approval from the Air Quality Management District (AQMD) must be obtained prior to the use of procedure 5 ACM removal activities. These procedures are usually implemented in instances where more than 100 square feet of friable asbestos material has been disturbed and emergency clean up activities are recommended.

Significantly damaged – a material exhibiting over ten percent (10%) distributed damage or twenty five percent (25%) localized damage.

Square feet – (SF) Used to quantify building materials.

PROJECT DETAIL

Introduction

Herbert Earl, Jr. of the California Department of Motor Vehicles (referred to hereunder as the client) retained Andersen Environmental (AE) to perform a limited assessment and sampling of suspect asbestos containing materials (ACM) that are to be disturbed during roofing replacement activities at the above referenced property (referred to hereunder as subject property). The assessment was performed on September 20, 2011, by Adam Nelson, a California Certified Asbestos Consultant (Cert. No. 09-4482).

Scope of Work

The purpose of this assessment was to conduct bulk sampling in order to determine the presence or absence of ACM in the defined area at the subject property. The scope of this assessment included reviewing any provided building records and/or previous investigation records, visually identifying homogeneous areas and functional spaces, collecting bulk samples of suspect ACM, interpreting the laboratory results and producing a written report of our findings and recommendations.

The sampling was performed in accordance with requirements of the following regulations:

- Asbestos Hazard Emergency Response Act (AHERA); 40 CFR 763 Subpart E
- Asbestos School Hazard Abatement Reauthorization Act (ASHARA); Section 206 of the Toxic Substance Control Act
- National Emissions Standards for Hazardous Air Pollutants (NESHAPS); 40 CFR 61 Subpart M.
- South Coast Air Quality Management District (SCAQMD) Rule 1403

This report is a record of activities, observations, analytical results and recommendations performed to date.

Site Description

The subject property is a Department of Motor Vehicles building built on a concrete slab foundation. In general, the construction materials consist of drywall walls; drywall, 1'x 1' tiled and 2'x 4' tiled ceilings; carpeted, ceramic and vinyl tiled floors.

Findings

None of the roofing materials sampled in this assessment were found to contain asbestos.

Recommendations

No recommendations for asbestos removal are needed regarding the roofing materials sampled in this assessment.

LIMITATIONS

AE is committed to providing quality consulting services. However, asbestos survey work is not an exact science. The possibility of field and general conditions, beyond AE's control, that affect our work or that present a concern for the safety of our employees, our consultants, building occupants and the public at the site, and insurance constraints, requires that we qualify the services we provide with the following limitations:

The findings of this survey, opinions rendered, recommendations and conclusions provided in this survey report are only valid for a period of up to one year from the date of this survey report.

Reasonable effort is made by AE personnel to locate and sample all suspect materials. However, for any facility the existence of unique or concealed asbestos-containing materials and debris is a possibility. In addition, sampling and laboratory analysis constraints typically hinder the investigation. AE does not warrant, guarantee or profess to have the ability to locate or identify all asbestos-containing materials in a facility.

Confined spaces, and areas determined by AE's personnel as unsafe to access, are excluded from the scope of work.

AE does not employ professional cost estimators. Statements of probable construction cost or cost estimates prepared by AE represent AE's professional opinion of probable costs based upon current industry information. Actual costs may fluctuate due to several variables including, but not limited to, the time the work is performed, phasing, labor availability, quantity of work performed, product availability, specification requirements, and unforeseeable changes in the economy and asbestos regulations.

AE is not, and has no responsibility as, a generator, operator, treater, storer, transporter or disposer of hazardous materials or waste found or identified as a result of Andersen' work.

AE does not guarantee or warrant that the facility or workplace is safe, nor does AE's involvement in this property relieve the Client, building owner/operator or tenant of any continuing responsibility of providing a safe facility or workplace.

This report was based on those conditions observed on the day(s) the field evaluation was accomplished. In the event that changes in the nature of the property have occurred, or additional relevant information about the property is subsequently discovered, the findings and recommendations contained in this report may not be valid unless these changes and additional relevant information are reviewed and the conclusion of this report is modified and verified in writing.

In as such that no destructive investigation has been performed during the survey, the report may not reveal concealed asbestos-containing materials. Subsequently, additional investigation including construction documents review and/or destructive investigation is recommended as a precaution to prevent accidental exposure when construction or demolition is planned for this facility.

SIGNATURES

Please do not hesitate to contact us should there be any questions or if additional services are necessary.

Prepared by:



Adam Nelson
DOSH Certified Asbestos Consultant No. 09-4482

Reviewed by:



Michael Pinkerton
DOSH Certified Asbestos Consultant No. 07-4170

APPENDICES

Appendix I - FLOOR PLAN



Appendix I FLOOR PLAN	Source: DMV

Appendix II - BULK SAMPLE TABLE

Sample Number	Material	Location	Asbestos Content	Quantity	Friability	Damage Rating
1109-894-01	Roof Shingles – Top Layer	Roof	None	----	Non-Friable	GC
1109-894-02	Roof Shingles – Top Layer	Roof	None	----	Non-Friable	GC
1109-894-03	Roof Shingles – Top Layer	Roof	None	----	Non-Friable	GC
1109-894-04	Roof Shingles – 2nd Layer	Roof	None	----	Non-Friable	GC
1109-894-05	Roof Shingles – 2nd Layer	Roof	None	----	Non-Friable	GC
1109-894-06	Roof Shingles – 2nd Layer	Roof	None	----	Non-Friable	GC
1109-894-07	Roof Shingle Felt – Bottom Layer	Roof	None	----	Non-Friable	GC
1109-894-08	Roof Shingle Felt – Bottom Layer	Roof	None	----	Non-Friable	GC
1109-894-09	Roof Shingle Felt – Bottom Layer	Roof	None	----	Non-Friable	GC
1109-894-10	Roofing (rubber) – Top Layer	Roof	None	----	Non-Friable	GC
1109-894-11	Roofing (rubber) – Top Layer	Roof	None	----	Non-Friable	GC
1109-894-12	Roofing (rubber) – Top Layer	Roof	None	----	Non-Friable	GC
1109-894-13	Roofing (foam) – 2nd Layer	Roof	None	----	Friable	GC
1109-894-13	Roofing (foam) felt – 2nd Layer	Roof	None	----	Non-Friable	GC
1109-894-14	Roofing (foam) – 2nd Layer	Roof	None	----	Friable	GC
1109-894-14	Roofing (foam) felt – 2nd Layer	Roof	None	----	Non-Friable	GC
1109-894-15	Roofing (foam) – 2nd Layer	Roof	None	----	Friable	GC
1109-894-15	Roofing (foam) felt – 2nd Layer	Roof	None	----	Non-Friable	GC
1109-894-16	Roofing (rolled tar composite) – 3rd layer	Roof	None	----	Non-Friable	GC
1109-894-16	Roofing (rolled felt composite) – 3rd layer	Roof	None	----	Non-Friable	GC
1109-894-17	Roofing (rolled tar composite) – 3rd layer	Roof	None	----	Non-Friable	GC

Sample Number	Material	Location	Asbestos Content	Quantity	Friability	Damage Rating
1109-894-17	Roofing (rolled felt composite) – 3rd layer	Roof	None	----	Non-Friable	GC
1109-894-18	Roofing (rolled tar composite) – 3rd layer	Roof	None	----	Non-Friable	GC
1109-894-18	Roofing (rolled felt composite) – 3rd layer	Roof	None	----	Non-Friable	GC
1109-894-19	Roofing (insulation – bottom)	Roof	None	----	Friable	GC
1109-894-20	Roofing (insulation – bottom)	Roof	None	----	Friable	GC
1109-894-21	Roofing (insulation – bottom)	Roof	None	----	Friable	GC
1109-894-22	Roof penetration (rubber) sealant	Roof	None	----	Non-Friable	GC
1109-894-23	Roof penetration (rubber) sealant	Roof	None	----	Non-Friable	GC
1109-894-24	Roof penetration (rubber) sealant	Roof	None	----	Non-Friable	GC

Appendix III - LABORATORY ANALYSIS RESULTS & CHAIN-OF-CUSTODY

LA Testing
520 Mission Street, South Pasadena, CA 91030
Phone: (323) 254-9960 Fax: (323) 254-9982 Email: pasadenalab@latesting.com

Attn: **Adam Nelson**
Andersen Environmental
9937 Jefferson Boulevard
Suite 200
Culver City, CA 90232

Fax: Phone: (310) 854-6300
Project: **1109-894 DMV-Oxnard**

Customer ID: 32ANDE85
Customer PO:
Received: 09/21/11 9:15 AM
LA Testing Order: 321115663

LA Testing Proj: LAWA World Airport
Analysis Date: 9/24/2011

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos			Asbestos
Sample	**Description**	**Appearance**	**%**	**Fibrous**	**% Non-Fibrous**	**% Type**
1109-894-01 *321115663-0001*	Roof shingles-top layer	Black Fibrous Heterogeneous	10%	Glass	90% Non-fibrous (other)	**None Detected**
1109-894-02 *321115663-0002*	Roof shingles-top layer	Black Fibrous Heterogeneous	10%	Glass	90% Non-fibrous (other)	**None Detected**
1109-894-03 *321115663-0003*	Roof shingles-top layer	Black Non-Fibrous Heterogeneous	10%	Glass	90% Non-fibrous (other)	**None Detected**
1109-894-04 *321115663-0004*	Roof shingles-2nd layer	Black Fibrous Heterogeneous	5%	Glass	95% Non-fibrous (other)	**None Detected**
1109-894-05 *321115663-0005*	Roof shingles-2nd layer	Black Fibrous Heterogeneous	8%	Glass	92% Non-fibrous (other)	**None Detected**
1109-894-06 *321115663-0006*	Roof shingles-2nd layer	Black Non-Fibrous Heterogeneous	10%	Glass	90% Non-fibrous (other)	**None Detected**

Initial report from 09/24/2011 16:48:45

Analyst(s)

John Lopez (20)
Rosa Mendoza (10)

Jerry Drapala Ph.D, Laboratory Manager
or other approved signatory

Due to magnification limitations inherent in PLM, asbestos fibers in dimensions below the resolution capability of PLM may not be detected. Samples reported as <1% or none detected may require additional testing by TEM to confirm asbestos quantities. The above test report relates only to the items tested and may not be reproduced in any form without the express written approval of LA Testing. LA Testing's liability is limited to the cost of analysis. LA Testingbears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. The test results contained within this report meet the requirements of NELAC unless otherwise noted. Samples received in good condition unless otherwise noted. Estimated accuracy, precision and uncertainty data available upon request.
Samples analyzed by LA Testing South Pasadena, CA NVLAP Lab Code 200232-0, CA ELAP 2283

LA Testing
520 Mission Street, South Pasadena, CA 91030
Phone: (323) 254-9960 Fax: (323) 254-9982 Email: pasadenalab@latesting.com

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Andersen Environmental
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Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos				Asbestos
Sample	**Description**	**Appearance**	**%**	**Fibrous**	**% Non-Fibrous**		**% Type**
1109-894-07 *321115663-0007*	Roof shingle felt-bottom layer	Black Fibrous Homogeneous	80%	Cellulose	20%	Non-fibrous (other)	**None Detected**
1109-894-08 *321115663-0008*	Roof shingle felt-bottom layer	Black Fibrous Homogeneous	80%	Cellulose	20%	Non-fibrous (other)	**None Detected**
1109-894-09 *321115663-0009*	Roof shingle felt-bottom layer	Black Fibrous Heterogeneous	85%	Cellulose	15%	Non-fibrous (other)	**None Detected**
1109-894-10 *321115663-0010*	Roofing (rubber), top layer	Gray/White Non-Fibrous Heterogeneous	10%	Synthetic	90%	Non-fibrous (other)	**None Detected**
1109-894-11 *321115663-0011*	Roofing (rubber), top layer	Gray/White Non-Fibrous Heterogeneous	5%	Synthetic	95%	Non-fibrous (other)	**None Detected**
1109-894-12 *321115663-0012*	Roofing (rubber), top layer	Gray/White Non-Fibrous Heterogeneous	7%	Synthetic	93%	Non-fibrous (other)	**None Detected**

Initial report from 09/24/2011 16:48:45

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LA Testing Proj: LAWA World Airport
Analysis Date: 9/24/2011

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos			Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**		**% Non-Fibrous**	**% Type**
1109-894-13-Foam *321115663-0013*	Roofing (foam)-2nd layer	Yellow Non-Fibrous Heterogeneous			100% Non-fibrous (other)	**None Detected**
1109-894-13-Felt *321115663-0013A*	Roofing (foam)-2nd layer	Gray Fibrous Heterogeneous	90%	Cellulose	10% Non-fibrous (other)	**None Detected**
1109-894-14-Foam *321115663-0014*	Roofing (foam)-2nd layer	Yellow Non-Fibrous Homogeneous			100% Non-fibrous (other)	**None Detected**
1109-894-14-Felt *321115663-0014A*	Roofing (foam)-2nd layer	Gray Fibrous Heterogeneous	90%	Cellulose	10% Non-fibrous (other)	**None Detected**
1109-894-15-Foam *321115663-0015*	Roofing (foam)-2nd layer	Yellow Non-Fibrous Homogeneous			100% Non-fibrous (other)	**None Detected**
1109-894-15-Felt *321115663-0015A*	Roofing (foam)-2nd layer	Black Fibrous Heterogeneous	85%	Cellulose	15% Non-fibrous (other)	**None Detected**

Initial report from 09/24/2011 16:48:45

Analyst(s)

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Rosa Mendoza (10)

Jerry Drapala Ph.D, Laboratory Manager
or other approved signatory

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LA Testing Proj: LAWA World Airport
Analysis Date: 9/24/2011

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos			Asbestos
Sample	**Description**	**Appearance**	**%**	**Fibrous**	**% Non-Fibrous**	**% Type**
1109-894-16-Shingle *321115663-0016*	Roofing (rolled felt/tan composite)-3rd layer	Gray/Black Fibrous Heterogeneous	15%	Glass	85% Non-fibrous (other)	**None Detected**
1109-894-16-Felt *321115663-0016A*	Roofing (rolled felt/tan composite)-3rd layer	Black Fibrous Heterogeneous	15%	Glass	85% Non-fibrous (other)	**None Detected**
1109-894-17-Shingle *321115663-0017*	Roofing (rolled felt/tan composite)-3rd layer	Gray/Black Fibrous Heterogeneous	10%	Glass	90% Non-fibrous (other)	**None Detected**
1109-894-17-Felt *321115663-0017A*	Roofing (rolled felt/tan composite)-3rd layer	Black/Beige Fibrous Heterogeneous	15% 15%	Glass Min. Wool	70% Non-fibrous (other)	**None Detected**
1109-894-18-Shingle *321115663-0018*	Roofing (rolled felt/tan composite)-3rd layer	Black Non-Fibrous Heterogeneous	10% 5%	Glass Cellulose	85% Non-fibrous (other)	**None Detected**
1109-894-18-Felt *321115663-0018A*	Roofing (rolled felt/tan composite)-3rd layer	Black Non-Fibrous Heterogeneous	15%	Glass	85% Non-fibrous (other)	**None Detected**

Initial report from 09/24/2011 16:48:45

Analyst(s)

John Lopez (20)
Rosa Mendoza (10)

Jerry Drapala Ph.D, Laboratory Manager
or other approved signatory

Due to magnification limitations inherent in PLM, asbestos fibers in dimensions below the resolution capability of PLM may not be detected. Samples reported as <1% or none detected may require additional testing by TEM to confirm asbestos quantities. The above test report relates only to the items tested and may not be reproduced in any form without the express written approval of LA Testing. LA Testing's liability is limited to the cost of analysis. LA Testingbears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. The test results contained within this report meet the requirements of NELAC unless otherwise noted. Samples received in good condition unless otherwise noted. Estimated accuracy, precision and uncertainty data available upon request.
Samples analyzed by LA Testing South Pasadena, CA NVLAP Lab Code 200232-0, CA ELAP 2283

LA Testing
520 Mission Street, South Pasadena, CA 91030
Phone: (323) 254-9960 Fax: (323) 254-9982 Email: pasadenalab@latesting.com

Attn: **Adam Nelson**
Andersen Environmental
9937 Jefferson Boulevard
Suite 200
Culver City, CA 90232

Fax: Phone: (310) 854-6300
Project: **1109-894 DMV-Oxnard**

Customer ID: 32ANDE85
Customer PO:
Received: 09/21/11 9:15 AM
LA Testing Order: 321115663

LA Testing Proj: LAWA World Airport
Analysis Date: 9/24/2011

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos				Asbestos
Sample	**Description**	**Appearance**	**%**	**Fibrous**	**%**	**Non-Fibrous**	**% Type**
1109-894-19 *321115663-0019*	Roofing (insulation bottom	Gray Fibrous Heterogeneous	80%	Cellulose	0% 20%	Non-fibrous (other) Perlite	**None Detected**
1109-894-20 *321115663-0020*	Roofing (insulation bottom	Gray Fibrous Heterogeneous	80%	Cellulose	20%	Non-fibrous (other)	**None Detected**
1109-894-21 *321115663-0021*	Roofing (insulation bottom	Brown Fibrous Heterogeneous	70%	Cellulose	10% 20%	Non-fibrous (other) Perlite	**None Detected**
1109-894-22 *321115663-0022*	Roof penetration (rubber) sealant	White Non-Fibrous Heterogeneous	4%	Cellulose	96%	Non-fibrous (other)	**None Detected**
1109-894-23 *321115663-0023*	Roof penetration (rubber) sealant	White Non-Fibrous Homogeneous	5%	Cellulose	95%	Non-fibrous (other)	**None Detected**
1109-894-24 *321115663-0024*	Roof penetration (rubber) sealant	Gray Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**

Initial report from 09/24/2011 16:48:45

Analyst(s)

John Lopez (20)
Rosa Mendoza (10)

Jerry Drapala Ph.D, Laboratory Manager
or other approved signatory

Due to magnification limitations inherent in PLM, asbestos fibers in dimensions below the resolution capability of PLM may not be detected. Samples reported as <1% or none detected may require additional testing by TEM to confirm asbestos quantities. The above test report relates only to the items tested and may not be reproduced in any form without the express written approval of LA Testing. LA Testing's liability is limited to the cost of analysis. LA Testingbears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. The test results contained within this report meet the requirements of NELAC unless otherwise noted. Samples received in good condition unless otherwise noted. Estimated accuracy, precision and uncertainty data available upon request.
Samples analyzed by LA Testing South Pasadena, CA NVLAP Lab Code 200232-0, CA ELAP 2283

THIS IS THE LAST PAGE OF THE REPORT.

321115663

Laboratory Chain of Custody

Turn Around Time - (Circle) *Please select based on laboratory being used	Weekend/Holiday 3hr 6hr 12hr 24hr 48hr (72hr)
Sample Type (Circle Those That Apply)	Air Swab (Bulk) Tape

AE Project No.:	Project Name	Sampling By	# of Samples	Date(s) Taken	Page No.:		Total Pages
1109-894	DMV - Oxnard	Adam Nelson	24	9/20/11	1	Of	3

Sample No.:	Sample Location & Comments	Start Flow Rate / End Flow Rate	Total Time	Total Volume/Area	Type of Analysis / Sample Serial Number
1109-894-01	Roof shingle - top layer				Serial No.: PLM
-02	↓				Serial No.:
-03	↓				Serial No.:
-04	Roof shingle - 2nd [redacted] layer				Serial No.:
-05	↓				Serial No.:
-06	↓				Serial No.:
-07	Roof shingle felt - bottom layer				Serial No.:
-08	↓				Serial No.:
-09	↓				Serial No.: ↓

Relinquished By (Print & Sign) (Date & Time)	Received By (Print & Sign) (Date & Time)
Adam Nelson 9/22/11 3:15pm	[illegible] (FEDEX) 9/23/11 9:15am
Relinquished By (Print & Sign) (Date & Time)	Received By (Print & Sign) (Date & Time)

Andersen Environmental Consulting
9937 Jefferson Blvd, Suite 200 Culver City, CA 90232, Ph (310) 854-6300, Fax (310) 854-0199

321115663

Laboratory Chain of Custody

Turn Around Time - (Circle) *Please select based on laboratory being used	**Weekend/Holiday** 3hr 6hr 12hr 24hr 48hr (72hr)
Sample Type (Circle Those That Apply)	Air Swab (Bulk) Tape

AE Project No.:	Project Name	Sampling By	# of Samples	Date(s) Taken	Page No.:		Total Pages
1109-894	Dm V - Oxnard	Adam Nolan	24	9/20/11	2	Of	3

Sample No.:	Sample Location & Comments	Start Flow Rate / End Flow Rate	Total Time	Total Volume/Area	Type of Analysis / Sample Serial Number
1109-894-10	Roofing (rubber), top layer				Serial No.: PLM
-11	↓				Serial No.:
-12	↓				Serial No.:
-13	Roofing (foam), 2nd layer				Serial No.:
-14	↓				Serial No.:
-15	↓				Serial No.:
-16	Roofing (rolled felt/tar composite), 3rd layer				Serial No.:
-17	↓				Serial No.:
-18	↓				Serial No.:

Relinquished By (Print & Sign)(Date & Time)	Received By (Print & Sign) (Date & Time)
Adam Nolan 9/20/11 3:15pm	
Relinquished By (Print & Sign) (Date & Time)	Received By (Print & Sign) (Date & Time)

Andersen Environmental Consulting
9937 Jefferson Blvd, Suite 200 Culver City, CA 90232, Ph (310) 854-6300, Fax (310) 854-0199

321115663

321115663

Laboratory Chain of Custody

Turn Around Time - (Circle) *Please select based on laboratory being used	Weekend/Holiday 3hr 6hr 12hr 24hr 48hr (72hr)
Sample Type (Circle Those That Apply)	Air Swab (Bulk) Tape

AE Project No.:	Project Name	Sampling By	# of Samples	Date(s) Taken	Page No.:		Total Pages
1109-894	DMV - Oxnard	[signature]	24	9/20/11	3	Of	3

Sample No.:	Sample Location & Comments	Start Flow Rate / End Flow Rate	Total Time	Total Volume/Area	Type of Analysis / Sample Serial Number
1109-894-19	Roof (insulation) bottom				Serial No.: PLM
-20	↓				Serial No.:
-21	↓				Serial No.:
-22	Roof penetration (rubber) Sealant				Serial No.:
-23	↓				Serial No.:
-24	↓				Serial No.:
					Serial No.:
					Serial No.:
					Serial No.:
					Serial No.:

Relinquished By (Print & Sign)(Date & Time)	Received By (Print & Sign) (Date & Time)
[signature] 9/20/11 3:15p	
Relinquished By (Print & Sign) (Date & Time)	Received By (Print & Sign) (Date & Time)

Andersen Environmental Consulting
9937 Jefferson Blvd, Suite 200 Culver City, CA 90232, Ph (310) 854-6300, Fax (310) 854-0199

321115663

March 18, 2020

Post Remediation Verification Inspection Report

Attn:
Department of Motor Vehicles
Herbert Earl
2415 1st Avenue MS A156
Sacramento, CA 95818
Tel. (916) 657-9809

Subject Property:
Oxnard DMV
4050 Saviers Road
Oxnard, CA 93033
WO# 12509

INTRODUCTION

This report presents the analytical results and assessment of the post abatement/remediation non-viable mycological testing performed on the subject property listed above by ENVIROCHECK, INC., and recommendations for the most efficient remediation strategies if necessary. The sampling methods and remediation recommendations are based in part to the American Industrial Hygiene Association *Field Guide for the Determination of Biological Contaminants in Environmental Samples,* the American Conference of Governmental Industrial Hygienists handbook on *Bioaerosols Assessment and Control*, the *Institute of Inspection, Cleaning, and Restoration Certification (IICRC) Standard and Reference Guide for Professional Mold Remediation S520,* the *Indoor Environmental Standards Organization (IESO) Standards of Practice for the Assessment of Indoor Environmental Quality, Volume 1: Mold Sampling; Assessment of Mold Contamination (2002),* and EPA *Recommendations of Mold Remediation in Schools and Commercial Buildings*. *Please read entire report prior to initiating any action.

BACKGROUND INFORMATION

The above subject property experienced apparent water related damage. ENVIROCHECK, INC. previously performed an initial investigation and assessment. Pursuant to the initial investigation that was performed, abatement and remediation recommendations were provided and were reportedly carried out in an attempt to remediate and mitigate the mycological presence. On March 10, 2020 ENVIROCHECK, INC. was requested to return and conduct a post remediation verification inspection and evaluation to provide post abatement/remediation validation for further restoration and /or abatement activities. This verification report is based upon the presumption that all tasks as outlined in

the original 'Scope of Work' and 'Work Specifications' written by ENVIROCHECK, INC. from the initial investigative report were completed.

SAMPLING METHODS

NON-VIABLE AIR SAMPLES (Total Airborne Fungal Spore Counts)

Air sampling generally indicates the total (e.g. living and dead) fungal spores that are present in the ambient air in a referenced room or area. Air sampling is also used to reveal information concerning airborne spore diffusion, total airborne spore counts, and/or if cross contamination of fungal spores is occurring between two separate areas. The collection of air samples is attained, in accordance with the commonly accepted protocol published by the AIHA (American Industrial Hygiene Association), by connecting spore trap cassettes, e.g. Zefon Analytical Accessories Air-O-Cells, M2 Multi-Mold cassettes, etc. to a high volume pump, which draws in approximately 75-150 (e.g. five minutes or ten minutes) total liters of air. The cassettes are submitted to an appropriate laboratory for analysis, which includes total and individual fungal enumeration of spores, quantitation, and genus identification where possible. Also included, total number of pollen grains and visual quantitation of particulate matter. Results are presented in spores per cubic meter.

INVESTIGATION

- On March 16, 2020, ENVIROCHECK, INC., as contracted by Department of Motor Vehicles, performed an on-site post remediation verification inspection on the subject property listed above.
- At the time of the investigation, a proper containment regulating the remediated work area of the west side of Employee Room was appropriately employed with a zipper entry for access. An air filtration device was also operating on-site, set in scrub mode, inside the containment. The appropriate critical barriers were properly sealed.
- The containment was vacant of any associated contents at the time of the inspection.
- The moisture contents of the accessible building materials were measured with a Delmhorst BD-2100 Moisture Meter and the approximate readings are presented in Table 1 below. The BD-2100 Moisture Meter has three different moisture content scales for measurement; wood, gypsum (or drywall), and relative (plaster/concrete). According to the manufacturer specifications, the following numerical ranges are provided as a general guideline towards interpreting the measured values. *Moisture content values that may be of concern are bolded in Table 1 below.*

Substrate	Relatively Dry, Normal	Moist or Damp	Excessive Moisture, Wet
Wood	6% - 15%	15% - 17%	> 17%
Gypsum/Drywall	0.0% - 0.5%	0.5% - 1.0%	> 1.0%
Plaster/Concrete	0.0% - 85%	85% - 95%	> 95%

Table 1.

Location	Substrate	Moisture Content (%)
Employee Room -Walls	Drywall	0.1-0.2

- Preliminary measurements of relative humidity (RH) and temperature were also collected from the inspected areas. Measurements were obtained using a TRACEABLE Humidity / Temperature Pen Thermal Hygrometer. According to the ASHRAE (American Society of Heating, Refrigeration, and Air Conditioning Engineers) Standard 62-2001, *Ventilation for Acceptable Indoor Air Quality*, "Relative humidity in habitable spaces preferably should be maintained between 30% and 60% relative humidity…" The approximate measurements are presented below in Table 2.

Table 2.

Location	Relative Humidity (RH) %	Temperature F °
West Side of Employee Room (Inside Containment)	44.3	72.5
Employee Room (Outside Containment)	77.7	78.6
Outdoors	60.8	60.2

VISUAL OBSERVATIONS:

- **Employee Room:** The vinyl flooring was intact and was not covered with polyethylene sheeting. All walls were intact. The ceiling was intact and was not covered with polyethylene sheeting. The upper and lower cabinets were removed.

VISUAL EVALUATION:

- Upon visual inspection, all work area appeared to be thoroughly cleaned and scrubbed. There was no obvious visible suspect mold growth or black staining observed in the accessible area, as well as no distinct musty odors detected. All work areas appeared to be completely vacuumed, as dust and debris was not observed on the floor and/or horizontal surfaces.

SAMPLE COLLECTION:

- Non-viable air sampling was conducted inside the work area containment from the Employee Room - West, outside of the containment in the Employee Room - East (control), and outdoors (North Control 1 & South Control 2). The outdoor control samples were used as a background negative control for comparative analysis.

(The weather conditions on the day of inspection and sampling consisted of light drizzle and gloomy damp conditions, which may affect the outdoor airborne spore count.)

PRINCIPAL FINDINGS

(SEE ATTACHED LABORATORY RESULTS FOR EXACT LEVELS AND GENUS)

POST REMEDIATION VERIFICATION RESULTS

- **The work area consisting of the West Side of Employee Room has "PASSED" the post remediation verification relating to the original reported water loss and previously identified mycological presence.**

(Note: This post remediation verification excludes all other locations within or outside of the subject property that are not listed above.)

RECOMMENDATIONS

- The building owner should sustain a routine schedule of maintenance for the air handling system, HVAC system, furnace, or etc. including but not limited to the cleaning of the air ducts and the replacing of air filters. Appropriate cleaning of the HVAC system should be performed in accordance with the National Air Duct Cleaners Association's (NADCA) *ACR 2006 Standard: Assessment, Cleaning, and Restoration of HVAC Systems*.
- ENVIROCHECK, INC. recommends a six-month (6) re-inspection or sooner if visible mold appears, water intrusion reoccurs, or irregular health symptoms that can be associated to mold or fungi exposure surface or worsen.

LIMITATIONS

The findings set forth in this assessment are strictly limited to the time, date and scope of the verification. Regulatory standards for microbial presence do not currently exist and therefore the results and conclusions of this investigation are based on analytical testing, field observations, and in reference to the American Industrial Hygiene Association *Field Guide for the Determination of Biological Contaminants in Environmental Samples,* the American Conference of Governmental Industrial Hygienists handbook on *Bioaerosols Assessment and Control*, the *Institute of Inspection, Cleaning, and Restoration Certification (IICRC) Standard and Reference Guide for Professional Mold Remediation S520,* the *Indoor Environmental Standards Organization (IESO) Standards of Practice for the Assessment of Indoor Environmental Quality, Volume 1: Mold Sampling; Assessment of Mold Contamination (2002),* and EPA *Recommendations of Mold Remediation in Schools and Commercial Buildings*, and not on any procedures beyond the scope of the agreed upon work. The term "passed" does not imply that all fungal spores or fungal residue have been completely removed. According to EPA recommendations, complete sterilization is not only virtually unobtainable, it is even undesirable. The term "passed" implies that the fungal spore levels detected inside the containment are roughly similar or lower to the fungal spore levels found outdoors. ENVIROCHECK, INC. does not guarantee that all fungi will be removed or that re-growth will not occur. Mold and Fungi are naturally occurring in all environments and there are no published regulations regarding the exposure, removal, or assessment of fungi.

It should be fully understood that this post remediation verification and inspection is limited to the sampled areas of the subject property and/or areas that are related to the original and/or reported water loss only. Due to its dynamic nature, mold and fungi growth and/or amplification can be present in hidden and/or unknown areas within the subject property. Unless all past and/or present water intrusion/incursion incidents throughout the history of the subject property and/or any conditions that may contribute to mold growth/amplification be disclosed to ENVIROCHECK, INC. it would be impossible to identify or detect these areas. ENVIROCHECK, INC. cannot be held responsible if the client, current property owner, and/or future property owner(s) discover such areas. This investigation/assessment and sampling protocol specifically excludes the identification and detection of wood decay type fungi, including but not limited to Poria incrassata, due to the unpredictable nature and general lack of spore production that would be typically detected in environmental fungal samples.

SIGNATURE PAGE



Miguel Garcia, B.S. Environmental and Occupational Health
Industrial Hygiene Technician
NIOSH 582 Certified
Certified Water Damage Restoration Technician, IICRC #8344355
State of California Department of Public Health Lead-Related Construction Certificate #00002276
State of California Division of Occupational Safety and Health (DOSH) CSST # 19-6560

Reviewed by:

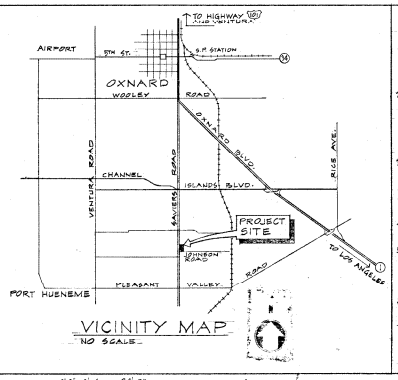


Vinh Q. Pham, B.S.
Senior Industrial Hygienist
Certified Hazardous Material Manager (CHMM) 17420
Certified Microbial Consultant, (CMC), American Council for Accredited Certification (ACAC)
Certified Indoor Environmentalist (CIEC) #01676, American Council for Accredited Certification (ACAC)
State of California Division of Occupational Safety and Health (DOSH) CAC #03-3356
State of California Department of Public Health Lead-Related Inspector/Assessor, # LRC-00002582
Certified Water Damage Restoration Technician, IICRC # 72811

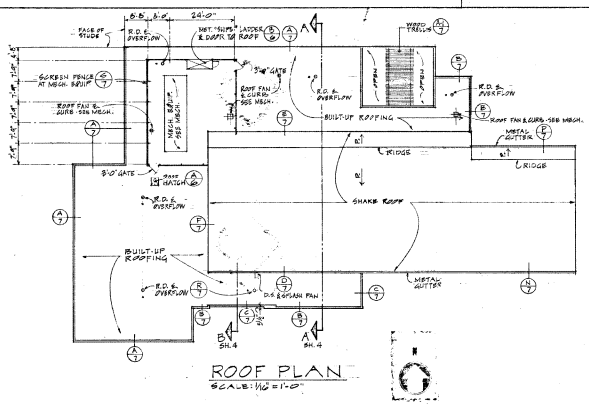
OFFICE BUILDING AND PARKING FACILITIES
DEPARTMENT OF MOTOR VEHICLES, OXNARD

ROOM FINISH SCHEDULE

ROOM NO.	NAME	FLOOR: THIN-SET TERRAZZO	FLOOR: VINYL ASBESTOS TILE	FLOOR: CONCRETE	BASE: RESILIENT	BASE: THIN-SET TERRAZZO	WALLS: GYPSUM BOARD 5/8" THICK	WALLS: PRE-FINISHED PLYWOOD	WALLS: CERAMIC TILE	WALLS: WALL PAPER	WALLS: WOOD PANELING-BATTEN	WALLS: SAND FINISH CEMENT PLASTER	CEILING: ACOUS. TILE ON 5/8" GYPSUM BOARD	CEILING: GYPSUM BOARD 5/8" THICK	CEILING: FURR. ROOF FRAMING	CEILING HEIGHT	REMARKS
1	LOBBY	X			X		X						X			8'-11½"	
2	PUBLIC AREA	X			X		X							X		11'-0"	
3	WORK AREA	X			X			X						X		8'-0"	
4	SECRETARY		X		X		X						X			8'-1"	
5	DIST. MANAGER		X		X		X	X					X			8'-1"	* PRE-FIN. PLYWOOD ON N. & E. WALLS
6	ORAL TESTING		X		X		X		X				X			8'-1"	* WALL PAPER ON N. & E. WALLS
7	STORAGE		X		X		X							X		8'-1"	
8	TRUETYPE		X		X		X							X		8'-1"	
9	ELECTRICAL			X			X							X		8'-1"	
10	PATIO			X						X					X		* EXPOSED AGGREGATE FINISH
11	EMPLOYEES		X		X			X			X		X			8'-1"	* WAINSCOT TILE TO 4'-0" HIGH
12	CASHIER		X		X			X					X			8'-1"	
13	DEALER ROOM		X		X			X					X			8'-1"	
14	JANITOR			X		X		X						X		8'-1"	
15	CORRIDOR		X			X		X					X			8'-1"	
16	MEN	X				X		X						X		8'-1"	* TILE ON EAST WALL & WEST WALL BEHIND FIXTURES
17	COATS		X			X		X						X		8'-1"	
18	WOMEN	X				X		X						X		8'-1"	* TILE ON WEST WALL & EAST WALL BEHIND FIXTURES
19	REST ROOM		X			X		X						X		8'-1"	
20	STORAGE RM.		X			X		X					X			9'-0"	
21	MEN	X				X			X					X		8'-1"	
22	WOMEN	X				X			X					X		8'-1"	
23	TRASH			X			X			X				X		8'-1"	* APPLY NO. 90 OVER 5/8" GYP. BD.
24	CORRIDOR		X			X		X					X			8'-1"	
25	STORAGE		X			X		X						X		–	* GYP. BD. CEILING ON ROOF JOISTS
26	INVESTIGATORS & CLER		X			X		X						X		9'-0"	
27	INTERVIEW		X			X		X					X			9'-1"	
28	G.B.M. ROOM		X			X		X					X			9'-1"	
29	D.I.A. WAITING		X			X		X					X			9'-1"	* PRE-FIN. PLYWD. ON E. & W. WALLS
30	CLERICAL (D.I.A.)		X			X		X						X		9'-0"	
31	D.I.A.		X			X		X					X			9'-1"	
32	D.I.A.		X			X		X					X			9'-1"	
33	D.I.A.		X			X		X					X			9'-1"	
34	D.I.A.		X			X		X					X			9'-1"	
35	D.I.A.		X			X		X					X			9'-1"	
36	D.I.A.		X			X		X					X			9'-1"	
37	INVEST		X			X		X					X			9'-1"	



VICINITY MAP
NO SCALE



ROOF PLAN
SCALE: 1/16"=1'-0"

GENERAL NOTES

1. - DIMENSIONS ARE GIVEN TO THE FOLLOWING POINTS UNLESS OTHERWISE SHOWN:
   EXTERIOR - FACE OF STUDS & CENTERLINE OF CONC. COLUMNS.
   INTERIOR CENTERLINE OF STUDS.
2. - EXTERIOR WALLS ARE 2x6 WOOD STUDS 16" O.C. UNLESS NOTED OTHERWISE. INTERIOR PARTITIONS ARE 2x4 WOOD STUDS 16" O.C. UNLESS NOTED OTHERWISE. SEE STRUCT. DWGS. FOR PLYWOOD SHEATHING ON INTERIOR AND EXTERIOR WALLS & PARTITIONS.
3. - INSTALL BATT TYPE INSULATION IN ALL EXTERIOR WALL AND IN ROOF FRAMING OVER ROOMS 2 AND B UNLESS NOTED OTHERWISE.
   ALL FLAT ROOF AREAS TO HAVE RIGID INSULATION UNDER BUILT-UP ROOFING.
4. - ALL GYPSUM WALL BOARD TO BE 5/8" THICK.
5. - SOUND RETARDANT PARTITION TO BE 2x4 WOOD STUDS 16" O.C., 2 LAYERS 5/8" GYPSUM WALL BOARD EACH SIDE WITH 3½" THICK BATT TYPE INSULATION BETWEEN STUDS.
6. - THINSET CERAMIC TILE AT TOILET ROOM WALLS IS ON 5/8" GYPSUM WALL BOARD.
7. - PRE-FINISHED PLYWOOD PANELS (SEE ROOM FINISH SCHEDULE) IS ON 5/8" GYPSUM WALL BOARD.

LEGEND

- CONCRETE
- PLASTER
- GYPSUM BOARD
- WOOD (SECTION)
- WOOD (BLOCKING, ETC.)
- INSULATION (RIGID)
- METAL (SECTION)
- CERAMIC TILE
- EARTH OR FILL
- STUD PARTITION (FLOOR PLAN)
- SOUND RETARDANT PARTITION (FLOOR PLAN)

SYMBOLS

- (1) DOOR NUMBERS
- (A) WINDOW LETTERS
- 2 ROOM NUMBERS
- A/6 DETAIL LETTER / SHEET NUMBER
- 4 SHEET NUMBER FOR LARGER SCALE DRAWING

SHEET INDEX

ARCHITECTURAL
A-1 - ROOF PLAN, VICINITY MAP, ROOM FINISH SCHEDULE, NOTES
A-2 - FLOOR PLAN
A-3 - ELEVATIONS
A-4 - SECTIONS - INTERIOR ELEVATIONS
A-5 - DOOR & WINDOW SCHEDULES - REFLECTED CEILING PLAN
A-6 - MISCELLANEOUS DETAILS
A-7 - ROOF AND WALL DETAILS
A-8 - DOOR AND WINDOW DETAILS
A-9 - SIGNS - PERMANENT OUTDOOR DMV

STRUCTURAL
S-1 - STANDARD DETAILS & GENERAL NOTES
S-2 - FOUNDATION & FLOOR PLAN
S-3 - ROOF FRAMING PLAN
S-4 - DETAILS
S-5 - DETAILS
S-6 - DETAILS
S-7 - DETAILS
S-8 - DETAILS

CIVIL
C-1 - PLOT PLAN
C-2 - CONSTRUCTION DETAILS

MECHANICAL
M-1 - MECHANICAL PLOT PLAN, DETAIL, LEGEND & SCHEDULES
M-2 - MECHANICAL FLOOR PLAN AND DETAILS
M-3 - MECHANICAL DETAILS

ELECTRICAL
E-1 - PLOT PLAN
E-2 - LIGHTING PLAN
E-3 - POWER AND SIGNAL PLAN
E-4 - MISCELLANEOUS DETAILS

LANDSCAPE
L-1 - PLANTING PLAN
L-2 - IRRIGATION PLAN

AS BUILT

Office of the State Architect

24x36

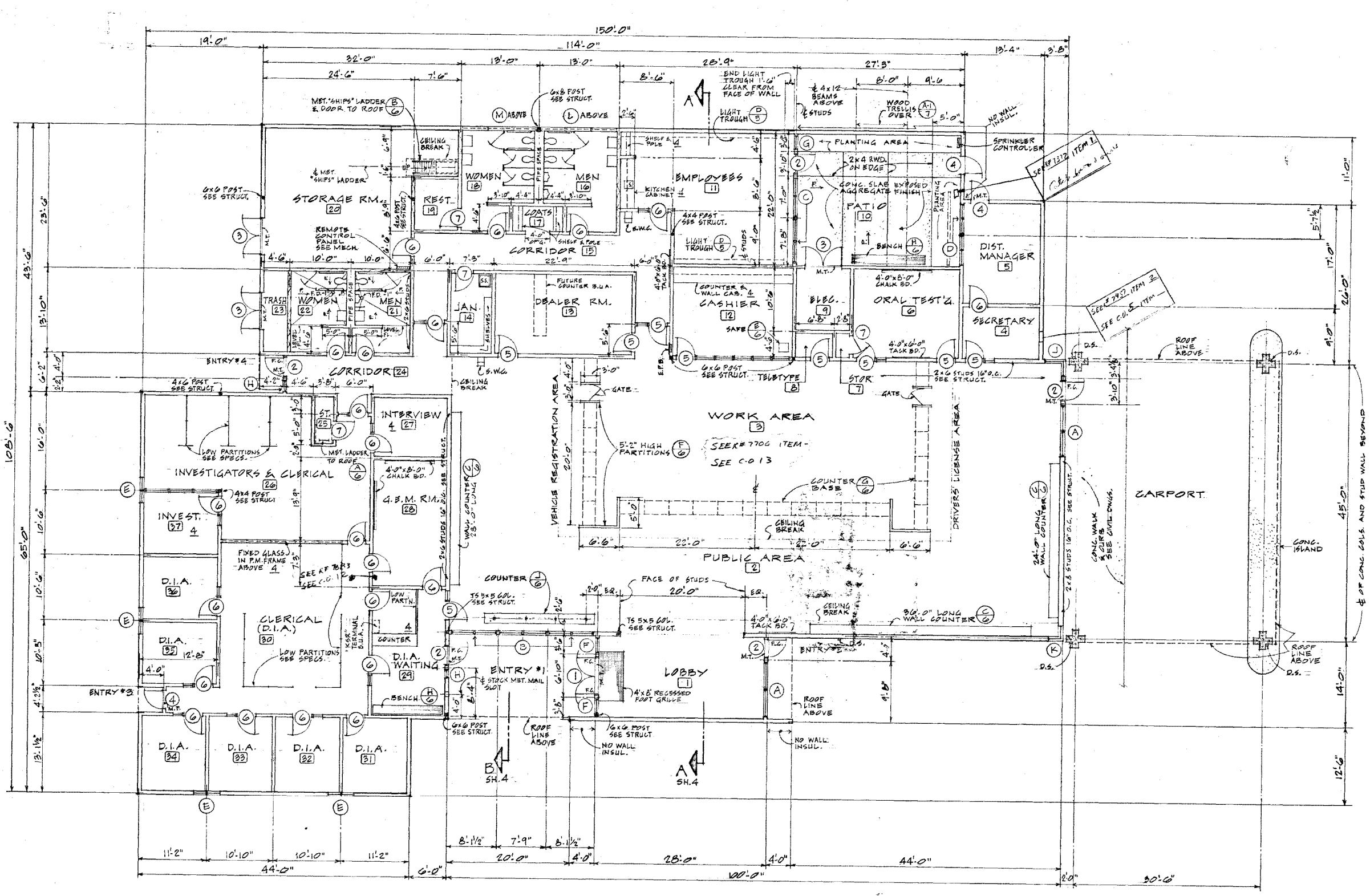
STATE OF CALIFORNIA — DEPARTMENT OF GENERAL SERVICES
CLIENT: DEPARTMENT OF MOTOR VEHICLES — LOCATION: OXNARD
PROJECT: OFFICE BUILDING AND PARKING FACILITIES
SHEET TITLE: ROOF PLAN, VICINITY MAP, ROOM FINISH SCHEDULE & NOTES

STATE OF CALIFORNIA
T. K. [illegible]
PROJECT ARCHITECT

SHEET NUMBER: A-1
OF NINE

REVISIONS:	APPROVALS:	SUPERVISOR: L. GUTHRIE	DESIGNED BY: KINOSHITA	STUDIO: VEGAS	DRAWN BY: STONE	CHECKED BY	DATE: 8-10-77	WORK ORDER NUMBER: MVD 516	FILE: 20-A-12

DO NOT SCALE DRAWINGS



FLOOR PLAN

SCALE: 1/8" = 1'-0"

FINISH FLOOR LINE ELEVATION 22.00'

Office of the State Architect

24X36

Sim Van der Ryn, A.I.A. STATE ARCHITECT

PROJECT ARCHITECT

SHEET TITLE FLOOR PLAN

PROJECT OFFICE BUILDING AND PARKING FACILITIES

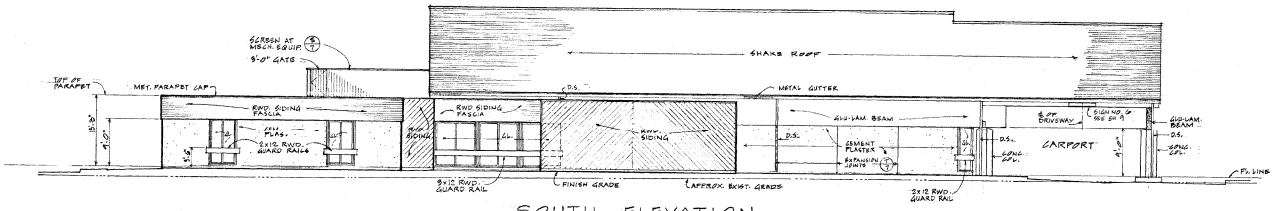
CLIENT DEPARTMENT OF MOTOR VEHICLES LOCATION OXNARD

STATE OF CALIFORNIA DEPARTMENT OF GENERAL SERVICES

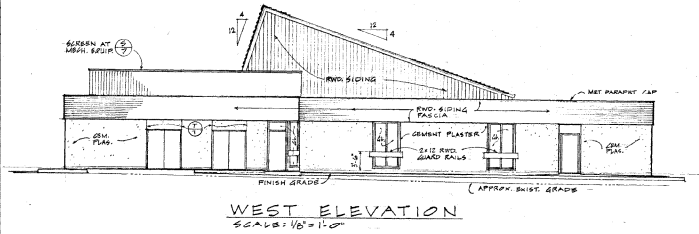
SHEET NUMBER 2 OF NINE

REVISIONS:	APPROVALS:	SUPERVISOR	DESIGNED BY	STUDIO	DRAWN BY	CHECKED BY	DATE	WORK ORDER NUMBER	FILE
		L. GUTHRIE	KINOSHITA	VEGAS	STONE		8-10-77	MVØ 314	20-A-12

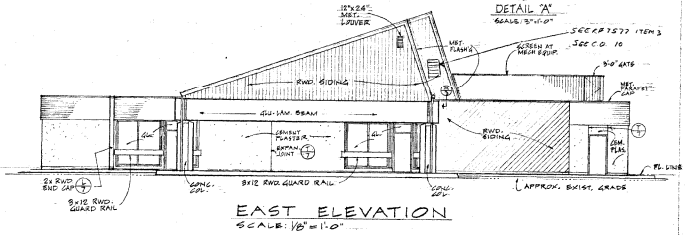
ONE INCH SCALE BAR GRAPH



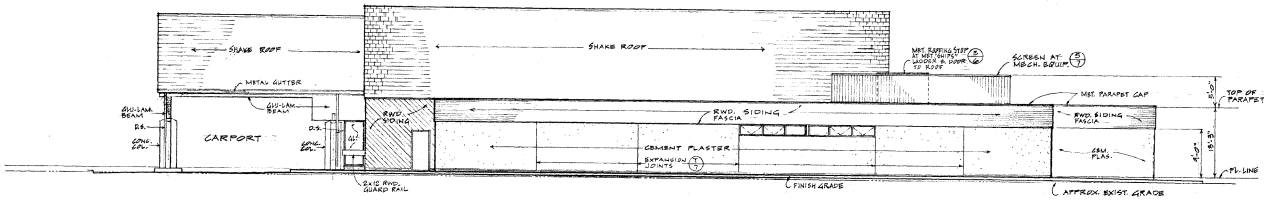
SOUTH ELEVATION
SCALE: 1/8" = 1'-0"



WEST ELEVATION
SCALE: 1/8" = 1'-0"



EAST ELEVATION
SCALE: 1/8" = 1'-0"



NORTH ELEVATION
SCALE: 1/8" = 1'-0"

Office of the State Architect

24x36

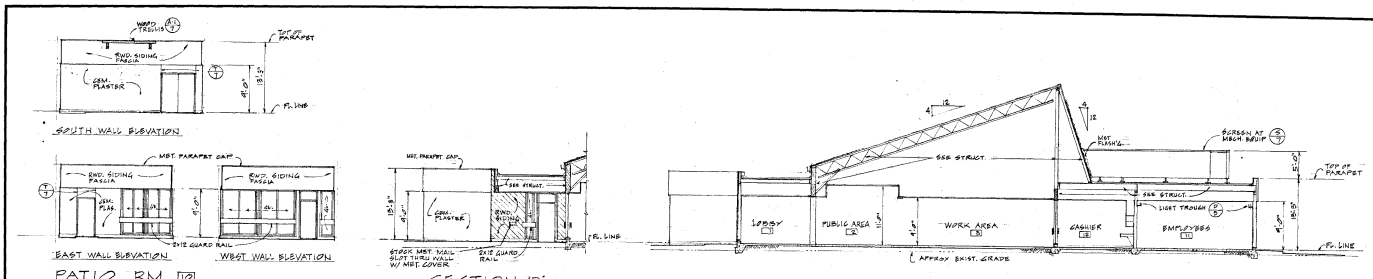
SHEET TITLE ELEVATIONS

PROJECT OFFICE BUILDING AND PARKING FACILITIES
LOCATION OXNARD
CLIENT DEPARTMENT OF MOTOR VEHICLES
DEPARTMENT OF GENERAL SERVICES
STATE OF CALIFORNIA

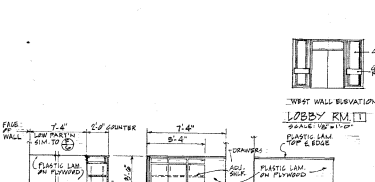
SHEET NUMBER 3 OF NINE

REVISIONS:	APPROVALS:	SUPERVISOR L. GUTHRIE	DESIGNED BY KINOSHITA	STUDIO VEGAS	DRAWN BY STONE	CHECKED BY	DATE 3-10-77	WORK ORDER NUMBER MVP 314	FILE 20-A-12

AS BUILT

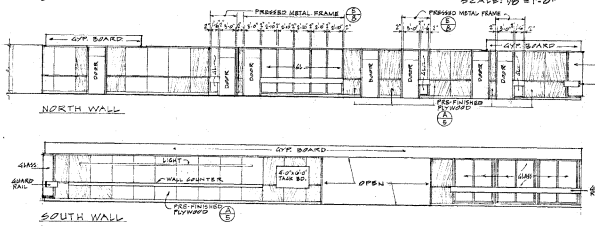


PATIO RM. [10]
SCALE: 1/8" = 1'-0"

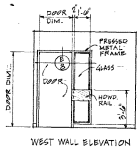


COUNTER & LOW PARTITION · D.I.A. WAITING RM. [29]
SCALE: 1/4" = 1'-0"

WEST WALL ELEVATION
LOBBY RM. [1]
SCALE: 1/8" = 1'-0"

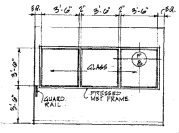


INTERIOR ELEVATIONS · PUBLIC AND WORK AREAS · RMS [2] & [3]
SCALE: 1/8" = 1'-0"

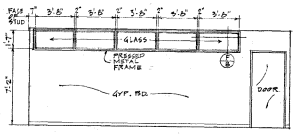


WEST WALL ELEVATION
INTERVIEW RM. [27]
SCALE: 1/4" = 1'-0"

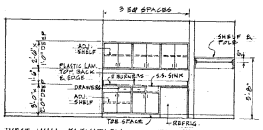
NOTE: INTER. DOORS W/ SIDELIGHT IN RMS. 1, 15, 24, 29, 32, 33, 34, 35, 36 & 37 SIMILAR UNLESS NOTED OTHERWISE



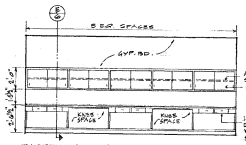
NORTH WALL ELEVATION
INVEST. RM. [37]
SCALE: 1/4" = 1'-0"



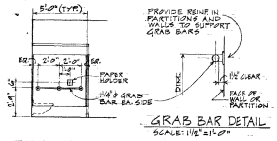
NORTH WALL ELEVATION
CLERICAL (D.I.A) ROOM [30]
SCALE: 1/4" = 1'-0"



WEST WALL ELEVATION
EMPLOYEES RM. [11]
SCALE: 1/4" = 1'-0"

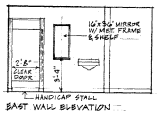


NORTH WALL ELEVATION
CASHIER RM. [12]
SCALE: 1/4" = 1'-0"

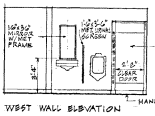


HANDICAP STALL
SCALE: 1/4" = 1'-0"

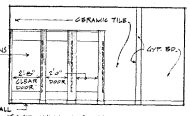
GRAB BAR DETAIL
SCALE: 1 1/2" = 1'-0"



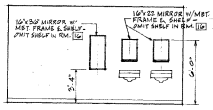
EAST WALL ELEVATION
WOMEN RM. [22]
SCALE: 1/4" = 1'-0"



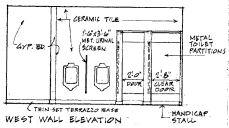
WEST WALL ELEVATION
MEN RM. [21]
SCALE: 1/4" = 1'-0"



EAST WALL ELEVATION
WOMEN RM. [16]
SCALE: 1/4" = 1'-0"



WEST WALL ELEVATION



WEST WALL ELEVATION
MEN · RM. [16]
SCALE: 1/4" = 1'-0"

NOTE: EAST WALL SIM. TO WEST WALL ELEV. WOMEN RM. [16] OPP. HAND

AS BUILT

REVISIONS:	APPROVALS:	SUPERVISOR	DESIGNED BY	STUDIO	DRAWN BY	CHECKED BY	DATE	WORK ORDER NUMBER	FILE
		L. GUTHRIE	KINOSHITA	VEGAS	STONE		2-10-77	MVP 514	20-A-12

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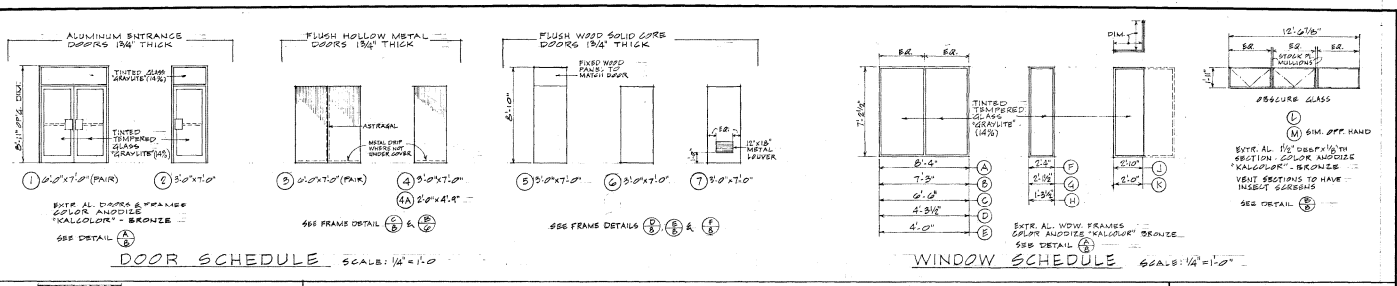
24x36

SHEET TITLE: SECTIONS · INTERIOR ELEVATIONS

PROJECT: OFFICE BUILDING AND PARKING FACILITIES
CLIENT: DEPARTMENT OF MOTOR VEHICLES
LOCATION: SACRAMENTO
DEPARTMENT OF GENERAL SERVICES
STATE OF CALIFORNIA

SHEET NUMBER 4 OF NINE

ALAN HOFFMAN, A.I.A. STATE ARCHITECT
TECHNICAL SERVICES



REVISIONS:	APPROVAL:	SUPERVISOR	DESIGNED BY	STUDIO	DRAWN BY	CHECKED BY	DATE	WORK ORDER NUMBER	FILE
		L. GUTHRIE	KINOSHITA	VEGAS	STONE		8-10-77	MVD 814	20-A-12

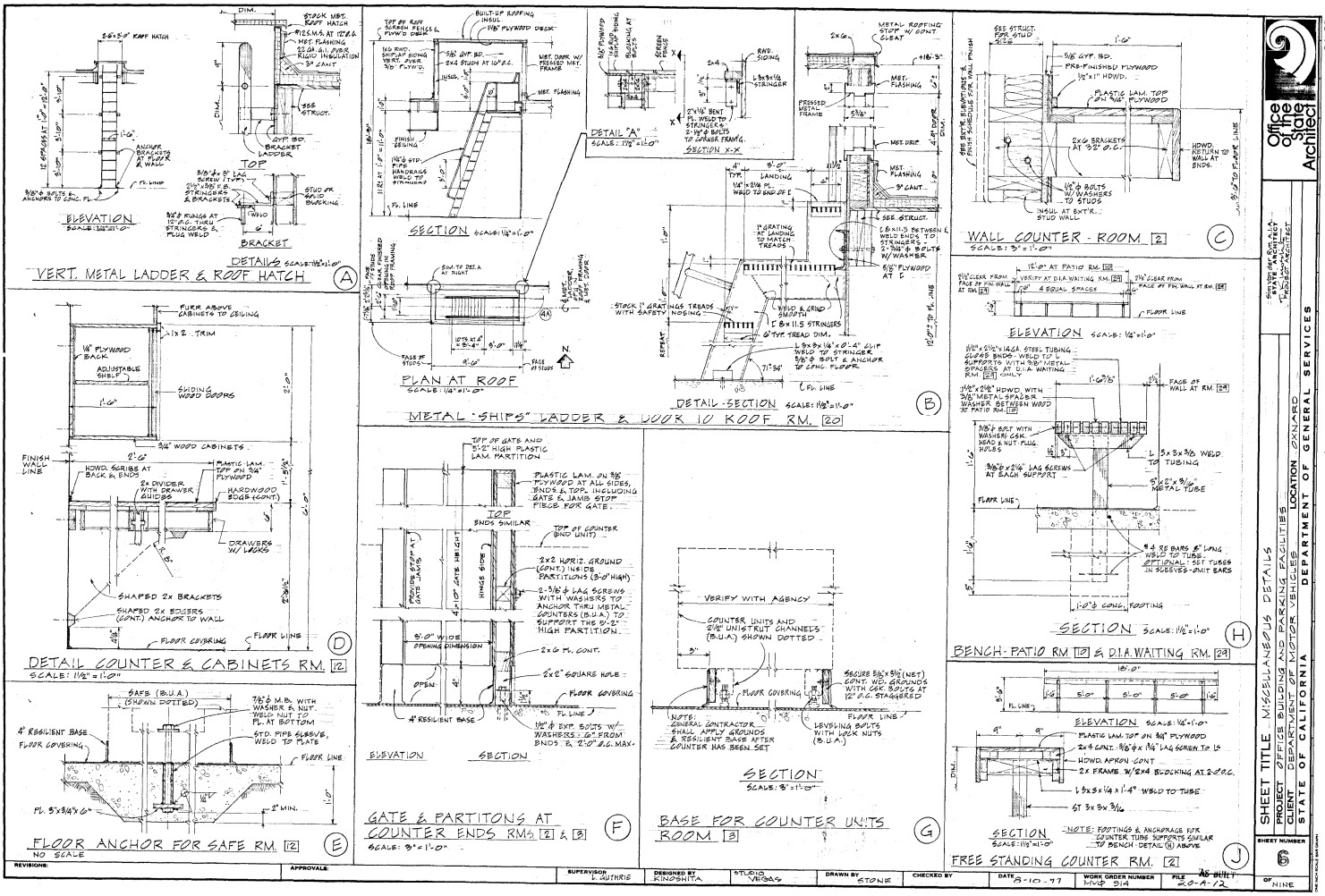
Office of the State Architect

24x36

EDWARD M. BRIANA
STATE ARCHITECT
TRUDY V. ARCHBOLD
CHIEF DEPUTY

SHEET TITLE DOOR & WINDOW SCHEDULES, REFLECTED CEILING PLAN
PROJECT OFFICE BUILDING AND PARKING FACILITIES
CLIENT DEPARTMENT OF MOTOR VEHICLES LOCATION OXNARD
STATE OF CALIFORNIA DEPARTMENT OF GENERAL SERVICES

SHEET NUMBER 5 OF NINE



SHEET TITLE MISCELLANEOUS DETAILS

PROJECT OFFICE BUILDING AND PARKING FACILITIES LOCATION OXNARD

CLIENT DEPARTMENT OF MOTOR VEHICLES DEPARTMENT OF GENERAL SERVICES

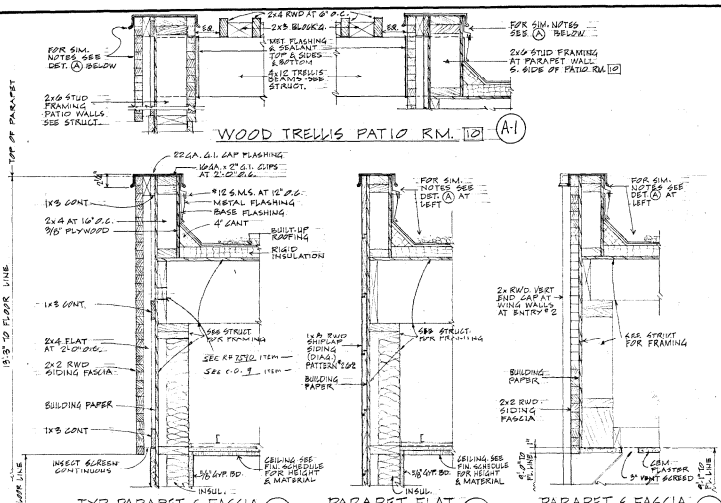
STATE OF CALIFORNIA

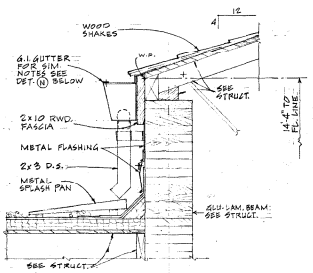
Office of the State Architect

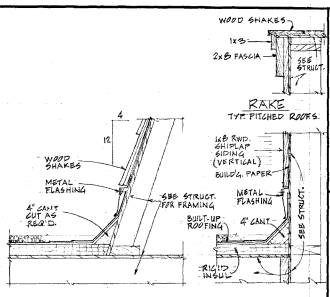
24X36

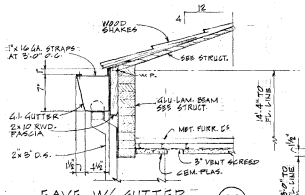
SHEET NUMBER 6 OF NINE

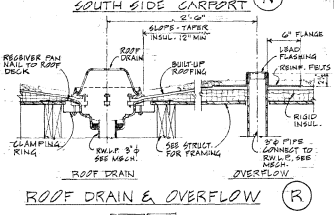
REVISIONS:	APPROVALS:	SUPERVISOR L. GUTHRIE	DESIGNED BY KINOSHITA	STUDIO VEGAS	DRAWN BY STONE	CHECKED BY	DATE 8-10-77	WORK ORDER NUMBER MVD 314	FILE 20-A-12 AS BUILT

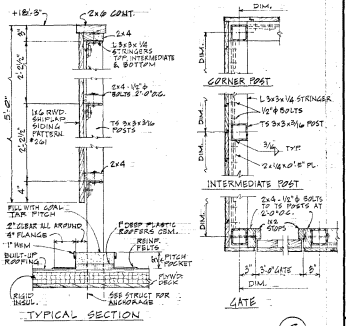


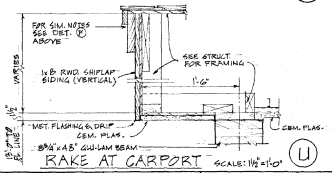












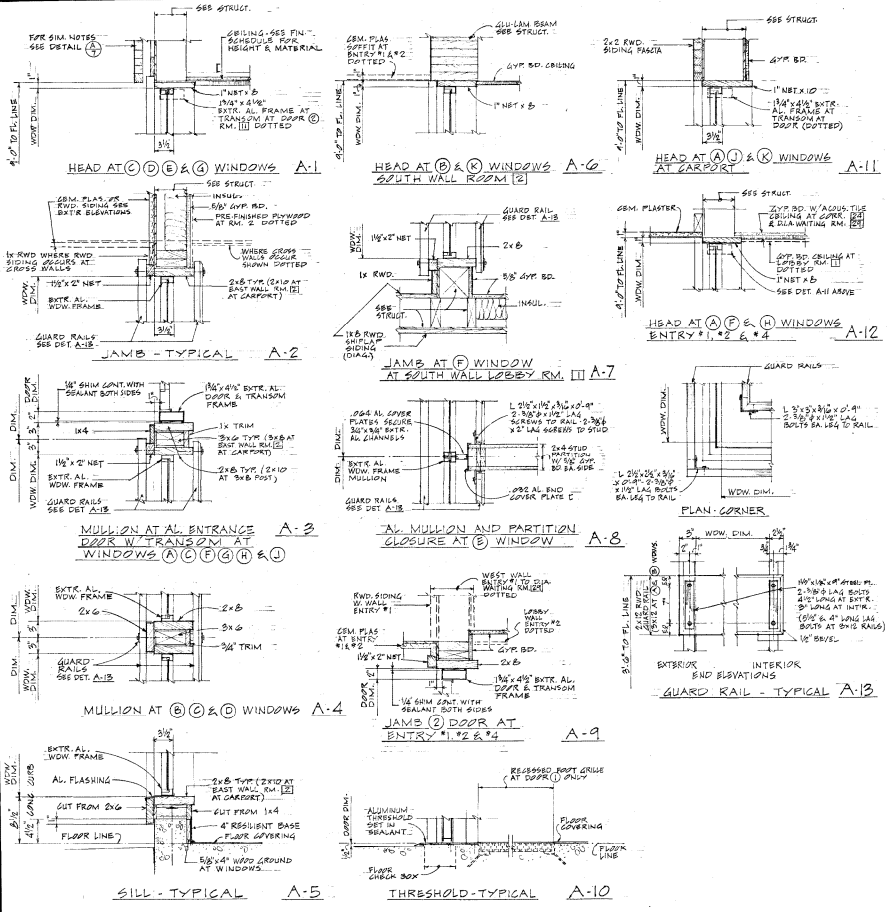
NOTE: ALL SCALE THIS SHEET 1½"=1'-0" UNLESS NOTED OTHERWISE

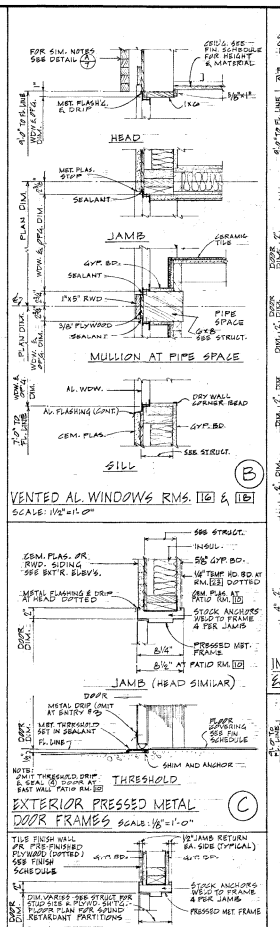
Office of the State Architect

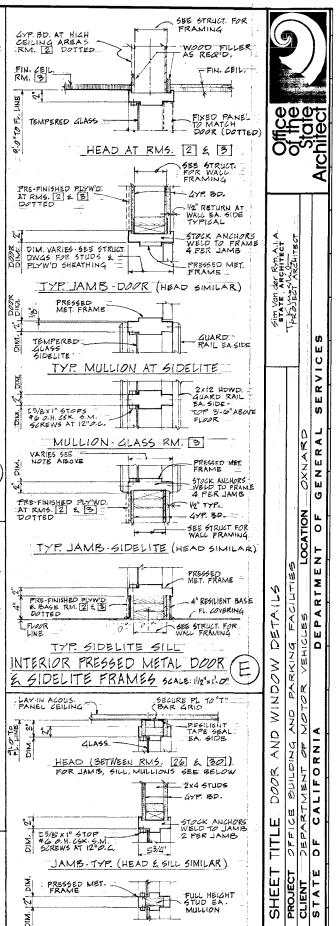
SHEET TITLE ROOF AND WALL DETAILS
PROJECT OFFICE BUILDING AND PARKING FACILITIES
CLIENT DEPARTMENT OF MOTOR VEHICLES
LOCATION OXNARD
STATE OF CALIFORNIA
DEPARTMENT OF GENERAL SERVICES

SHEET NUMBER 7 OF NINE

REVISIONS:	APPROVALS:	SUPERVISOR V. GUTHRIE	DESIGNED BY KINOSHITA	STUDIO VEGAS	DRAWN BY STONE	CHECKED BY	DATE 8-10-77	WORK ORDER NUMBER MVD 314	FILE 20-A-12







SHEET TITLE DOOR AND WINDOW DETAILS
PROJECT OFFICE BUILDING AND PARKING FACILITIES
CLIENT DEPARTMENT OF MOTOR VEHICLES LOCATION OXNARD
STATE OF CALIFORNIA DEPARTMENT OF GENERAL SERVICES

Office of the State Architect

24X36

REVIEWED BY STATE ARCHITECT
THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION UNLESS SIGNED AND DATED

SHEET NUMBER 8

OF NINE

REVISIONS:	APPROVALS:	SUPERVISOR L. GUTHRIE	DESIGNED BY KINOSHITA	STUDIO VEGA	DRAWN BY STOHS	CHECKED BY	DATE 8-10-77	WORK ORDER NUMBER MVD 314	FILE 20-A-12

NOTES AND PAINT COLORS FOR PERMANENT SIGNS

NOTE: PAINT COLORS APPLY TO THIS SHEET ONLY.

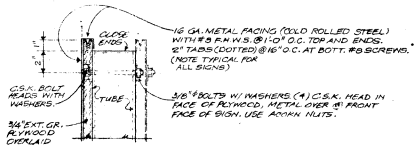
Color Numbers and Names are from the "AMERITONE" Paint Co., System. Substitutes may be submitted on the "OR EQUAL BASIS"

BACKGROUND & POSTS; Birch White #245 G

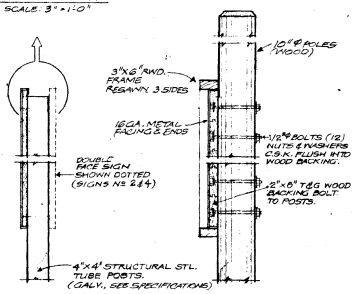
VERTICAL LETTERS; Light Pearl #245 C

SLOPING LETTERS; Black Pearl #245 A

NOTE: Exposed wood backs of Single Faced signs shall be painted, Birch white # 245 G.



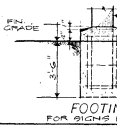
SECTION @ TOP
SCALE: 3"=1'-0"



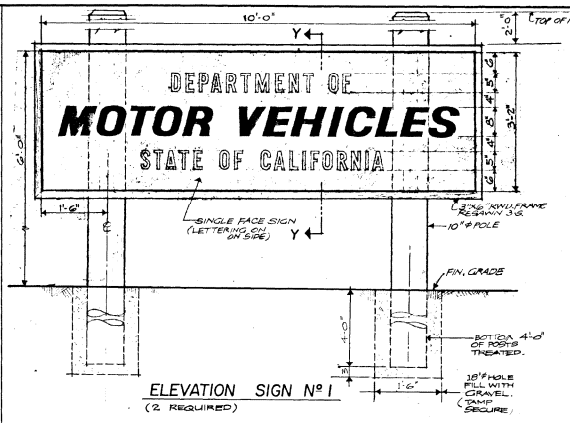
SECTION 'X'
VERTICAL SECTION THRU SIGNS Nº 2, 3, 4 AND 5.

SECTION 'Y'
VERTICAL SECTION THRU SIGN Nº 1 (ONLY)

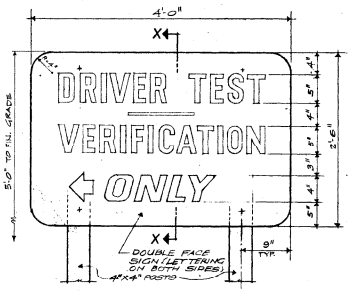
NOTE: SIGN Nº 6, SIMILAR (NO POST) TO BE ATTACHED TO CARPORT BEAM.



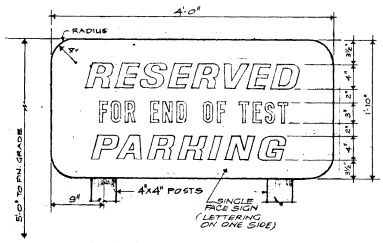
FOOTINGS
FOR SIGNS Nº 2, 3, 4 & 5.



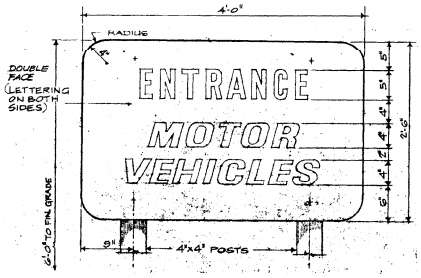
ELEVATION SIGN Nº 1
(2 REQUIRED)



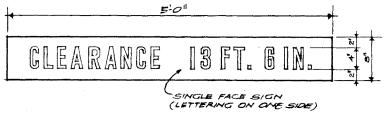
ELEVATION SIGN Nº 2
(ONE REQUIRED)



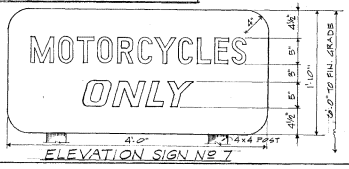
ELEVATION SIGN Nº 3
(2 REQUIRED)



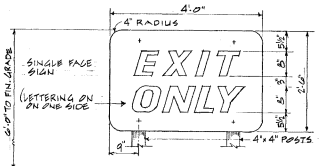
ELEVATION SIGN Nº 4
(2 REQUIRED)



ELEVATION SIGN Nº 6
(ONE REQUIRED) ON CARPORT, SEE ELEVATION SH. Nº 3.



ELEVATION SIGN Nº 7



ELEVATION SIGN Nº 5
(ONE REQUIRED)

DETAILS OF OUTDOOR SIGNS (PERMANENT)

NOTE: LOCATE AND INSTALL WHERE SHOWN ON CIVIL SHEET C-1 (PLOT PLAN).

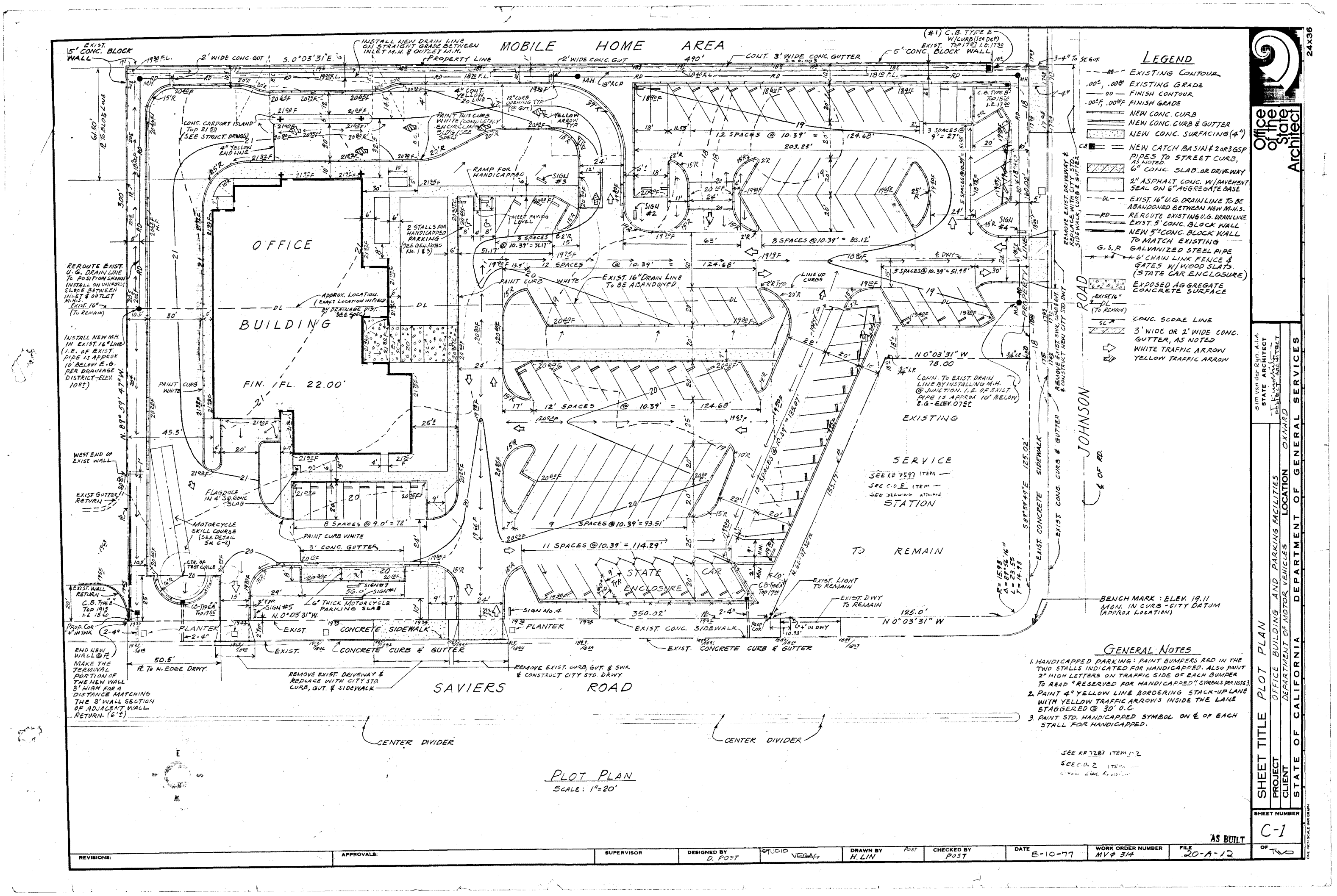
REVISIONS:	APPROVALS:	SUPERVISOR	DESIGNED BY	DRAWN BY	CHECKED BY	DATE	WORK ORDER NUMBER	FILE
		L. GUTHRIE	TTK + STUDIO VEGAS	WRR		8-10-77	MVD 914	20-A-12

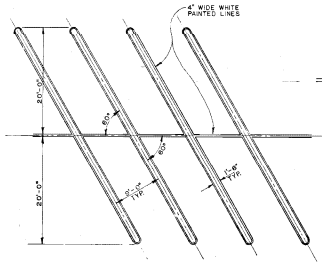
Office of the State Architect

SHEET TITLE SIGNS - PERMANENT OUTDOOR: DMV
PROJECT OFFICE BUILDING AND PARKING FACILITIES LOCATION OXNARD
CLIENT DEPARTMENT OF MOTOR VEHICLES DEPARTMENT OF GENERAL SERVICES
STATE OF CALIFORNIA

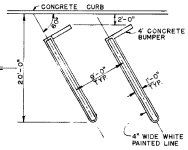
SHEET NUMBER 9 OF NINE

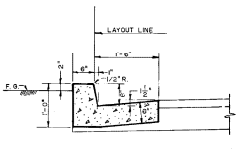
24X36


MOBILE HOME AREA
OFFICE BUILDING
FIN. FL. 22.00'
EXISTING SERVICE STATION TO REMAIN
STATE CAR ENCLOSURE
SAVIERS ROAD
JOHNSON ROAD
CENTER DIVIDER
LEGEND
EXISTING CONTOUR
EXISTING GRADE
FINISH CONTOUR
FINISH GRADE
NEW CONC. CURB
NEW CONC. CURB & GUTTER
NEW CONC. SURFACING (4")
NEW CATCH BASIN & 2 OR 3 GSP PIPES TO STREET CURB, AS NOTED.
6" CONC. SLAB OR DRIVEWAY
2" ASPHALT CONC. W/PAVEMENT SEAL ON 6" AGGREGATE BASE
EXIST. 16" U.G. DRAIN LINE TO BE ABANDONED BETWEEN NEW M.H.S.
REROUTE EXISTING U.G. DRAIN LINE
EXIST. 5' CONC. BLOCK WALL
NEW 5' CONC. BLOCK WALL TO MATCH EXISTING
GALVANIZED STEEL PIPE
6' CHAIN LINK FENCE & GATES W/WOOD SLATS. (STATE CAR ENCLOSURE)
EXPOSED AGGREGATE CONCRETE SURFACE
CONC. SCORE LINE
3' WIDE OR 2' WIDE CONC. GUTTER, AS NOTED
WHITE TRAFFIC ARROW
YELLOW TRAFFIC ARROW
GENERAL NOTES
1. HANDICAPPED PARKING: PAINT BUMPERS RED IN THE TWO STALLS INDICATED FOR HANDICAPPED. ALSO PAINT 2" HIGH LETTERS ON TRAFFIC SIDE OF EACH BUMPER TO READ "RESERVED FOR HANDICAPPED". SYMBOLS PER NOTE 3.
2. PAINT 4" YELLOW LINE BORDERING STACK-UP LANE WITH YELLOW TRAFFIC ARROWS INSIDE THE LANE STAGGERED @ 30' O.C.
3. PAINT STD. HANDICAPPED SYMBOL ON ℄ OF EACH STALL FOR HANDICAPPED.
BENCH MARK: ELEV. 19.11 MON. IN CURB - CITY DATUM (APPROX LOCATION)
PLOT PLAN
SCALE: 1"=20'
AS BUILT
Office of the State Architect
SHEET TITLE PLOT PLAN
PROJECT OFFICE BUILDING AND PARKING FACILITIES
CLIENT DEPARTMENT OF MOTOR VEHICLES
LOCATION OXNARD
STATE OF CALIFORNIA DEPARTMENT OF GENERAL SERVICES
SHEET NUMBER C-1
OF TWO
REVISIONS:
APPROVALS:
SUPERVISOR
DESIGNED BY D. POST
STUDIO VEGA
DRAWN BY H. LIN
CHECKED BY POST
DATE 8-10-77
WORK ORDER NUMBER MV# 314
FILE 20-A-12
24x36

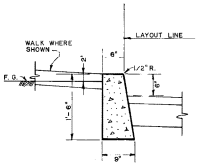


PARKING STALL MARKING
SCALE 1/8"= 1'-0"

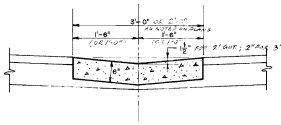




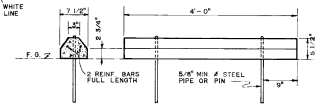
CONCRETE CURB AND GUTTER
SCALE 1"= 1'-0"



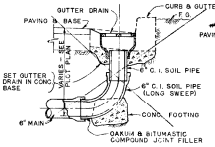
CONCRETE CURB
SCALE 1"= 1'-0"



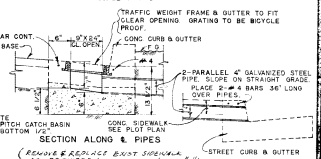
CONCRETE GUTTER
SCALE 1"= 1'-0"



PRE CAST PARKING BUMPER
SCALE 1"= 1'-0"



GUTTER DRAIN
SCALE 3/4"= 1'-0"
(OMIT)

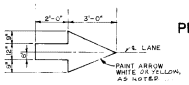


SECTION ALONG ℄ PIPES
(REMOVE & REPLACE EXIST SIDEWALK AS REQUIRED) (TYP.)

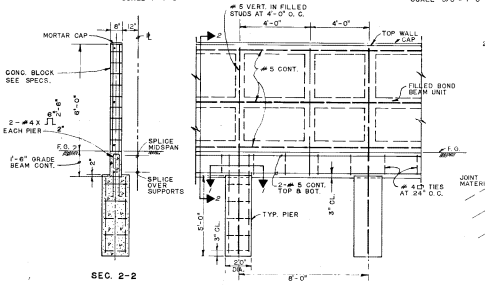
CATCH BASIN AND GUTTER CONNECTION
SCALE 1"= 1'-0"



TYPICAL PAVING SECTION
SCALE 1"= 1'-0"

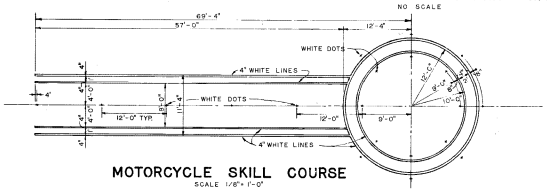


TRAFFIC DIRECTIONAL ARROW
SCALE 3/8"= 1'-0"

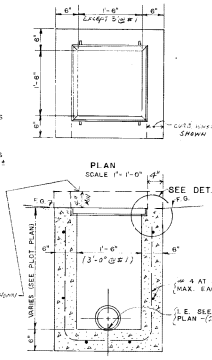


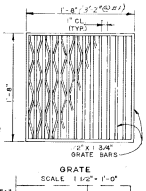
3'± WALL
(OMIT)

CONCRETE BLOCK SCREEN WALL DETAILS
NO SCALE

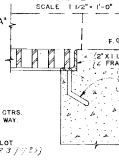


MOTORCYCLE SKILL COURSE
SCALE 1/8"= 1'-0"

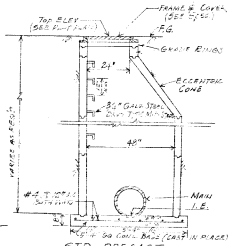




GRATE
SCALE 1 1/2"= 1'-0"



DETAIL "A"
SCALE 3"= 1'-0"



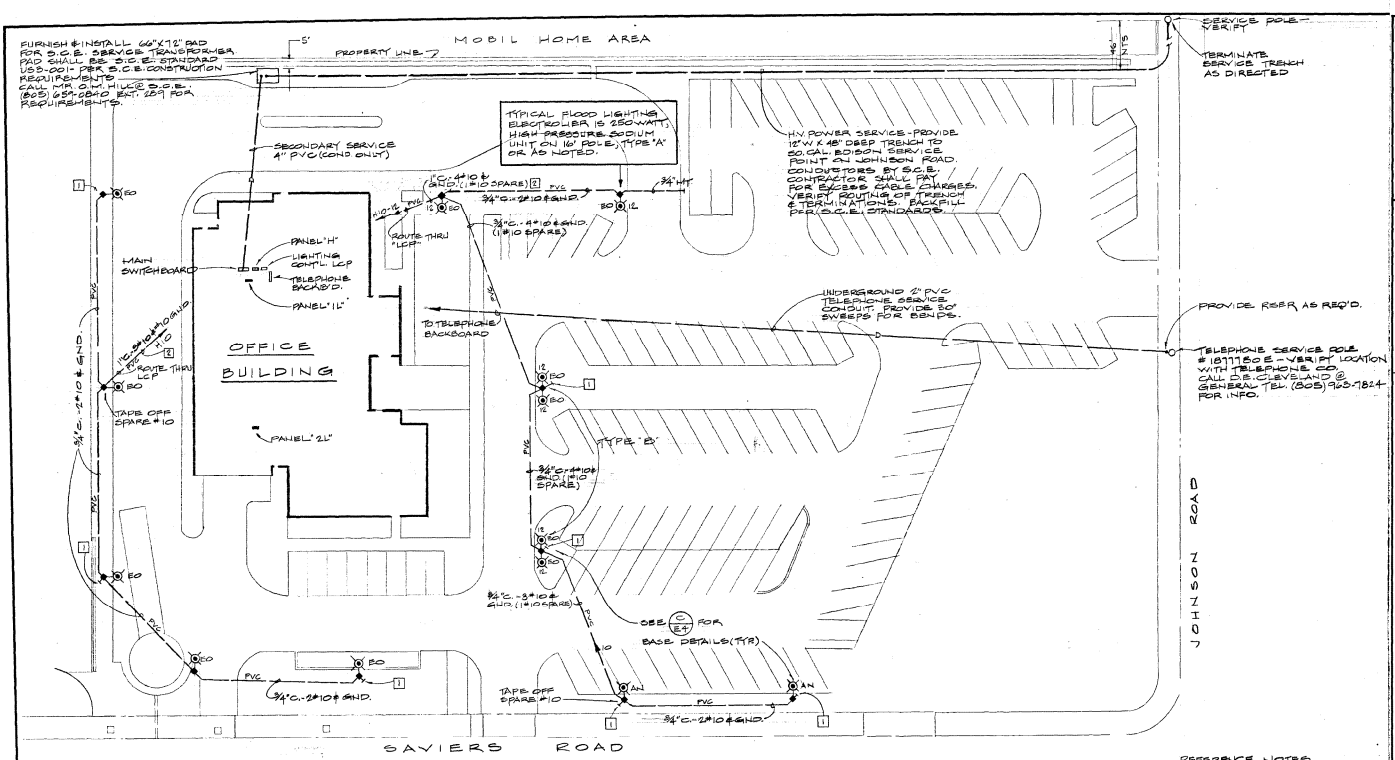
STD. PRECAST CONC. MANHOLE
(USABLE)

Office of the State Architect
STATE ARCHITECT
DSA-SS
DSA-SS/CL

SHEET TITLE
PROJECT
CLIENT
LOCATION
STATE OF CALIFORNIA DEPARTMENT OF GENERAL SERVICES

SHEET NUMBER C-2

REVISIONS:	APPROVALS:	SUPERVISOR	DESIGNED BY	STUDIO	DRAWN BY	CHECKED BY	DATE	WORK ORDER NUMBER	FILE	OF



REFERENCE NOTES

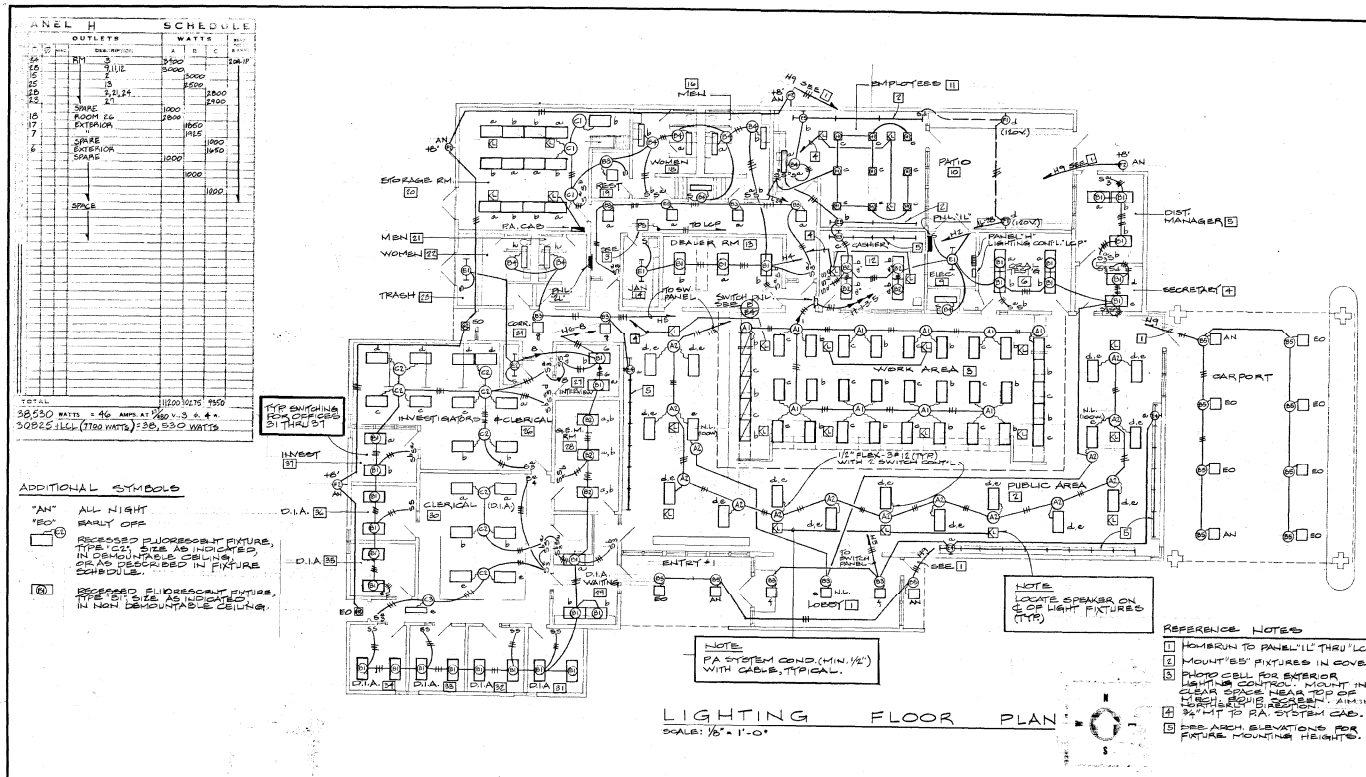
1. TITUS 3/4" C. FROM POLE BASE APPROX. 12'.
2. TERMINATE SPARE WIRE IN PANEL 'H'.

J.D. CREVIER & ASSOC., INC.
CONSULTING ELECTRICAL ENGINEERS
ASSOCIATES
M.F. MANGUM JR. 16732

AS BUILT

SHEET TITLE: PLOT PLAN
PROJECT: OFFICE BUILDING & PARKING FACILITIES
CLIENT: DEPARTMENT OF MOTOR VEHICLES
LOCATION: OXNARD
STATE OF CALIFORNIA — DEPARTMENT OF GENERAL SERVICES
Office of the State Architect
SHEET NUMBER: E-1
OF 4

REVISIONS:	APPROVALS:	SUPERVISOR	DESIGNED BY	DRAWN BY	CHECKED BY	DATE	WORK ORDER NUMBER	FILE
			STUDIO VEGAS			8-10-77	MV 8314	25-A-12



LIGHTING FLOOR PLAN

SCALE: 1/8" = 1'-0"

Office of the State Architect

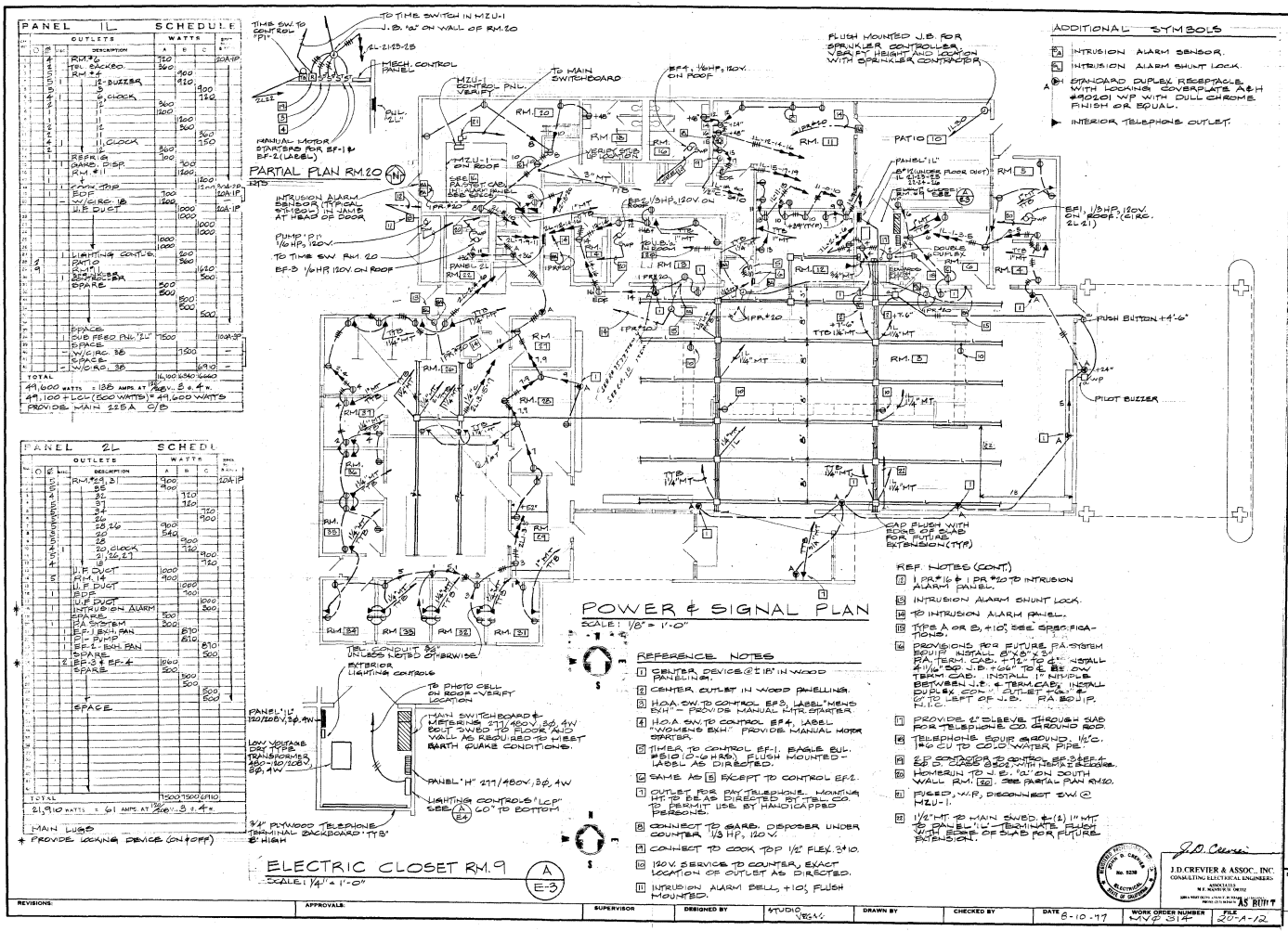
24x36

SHEET TITLE LIGHTING PLAN
PROJECT OFFICE BUILDING & PARKING FACILITIES
CLIENT DEPARTMENT OF MOTOR VEHICLES
LOCATION ONTARIO
STATE OF CALIFORNIA
DEPARTMENT OF GENERAL SERVICES

SHEET NUMBER E-2
OF 4

J.D. CREVIER & ASSOC., INC.
CONSULTING ELECTRICAL ENGINEER
ANAHEIM, CALIFORNIA

REVISIONS:	APPROVALS:	SUPERVISOR	DESIGNED BY	STUDIO VEGAS	DRAWN BY	CHECKED BY	DATE 8-10-77	WORK ORDER NUMBER MVD 314	FILE 20-A-12	AS BUILT



REVISIONS:	APPROVALS:	SUPERVISOR	DESIGNED BY	DRAWN BY	CHECKED BY	DATE	WORK ORDER NUMBER	FILE
			STUDIO			8-10-77	MVP 314	20-A-12

SHEET TITLE POWER AND SIGNAL PLAN
PROJECT OFFICE BUILDING & PARKING FACILITIES
CLIENT DEPARTMENT OF MOTOR VEHICLES
LOCATION OXNARD
STATE OF CALIFORNIA
DEPARTMENT OF GENERAL SERVICES

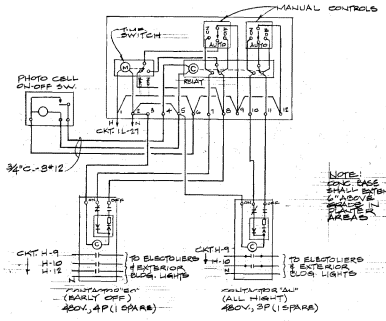
Office of the State Architect
24X36

SIM VAN DER RYN A.I.A. STATE ARCHITECT
TASSEP ASSOCIATES

J.D. CREVIER & ASSOC., INC. CONSULTING ELECTRICAL ENGINEERS
BY: JOHN D. CREVIER

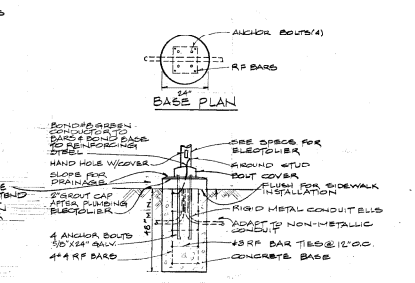
SHEET NUMBER E-3 OF 4

AS BUILT



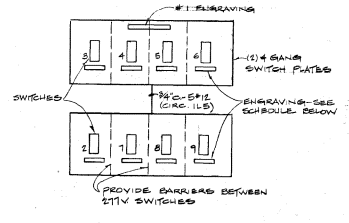
LIGHTING CONTROL DIAGRAM
PANEL LCP
NTS

(A) E-4



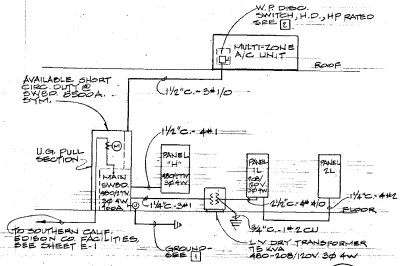
ELECTROLIER BASE
NTS

(C) E-4



SWITCH PANEL

(B) E-4



ONE-LINE DIAGRAM

(D) E-4

NOTE:
MIN. SHORT CIRC. RATING FOR SWBD. & PANELS SHALL BE 10,000A.

NAMEPLATE SCHEDULE

NO.	ENGRAVING	IDENTIFYING LETTER & PINT.
1	LIGHT CONTROL	
2	COUNTER	a
3	WORK AREA	b
4	" "	c
5	PUBLIC "	d
6	" "	e
7	LOBBY	f
8	HALL	g
9	TOILETS	h
10		

MAIN SWITCHBOARD LOAD SCHEDULE

CIRC. NO.	DESCRIPTION	KVA	KVA WITH ILL.	AMPS WITH ILL.	CIRC./BKR.
1	PANEL H	30.8	38.5	46	65A-3P
2	TRANSFORMER (PANEL 1L)	75	75	90	125A-3P
3	MZU-1			106	225A 3P
	TOTAL			242	

MAIN CIRCUIT BKR. 400A-3P, 400 A. BUS.

REFERENCED NOTES

1. CONCRETE ENCASED (UFER TYPE) GROUNDING ELECTRODE. PROVIDE 1-0" X 10'-0" X .034" EC. AT MAIN SWITCHBOARD AND INSTALL #1/0 B.C. (25' MIN. LENGTH) IN FOOTING WITH MIN. 3" CONCRETE COVER. LOOP THROUGH J.B. AND MAKE CONNECTIONS TO SERVICE NEUTRAL IN MAIN SWBD. WITH #1/0 B.C. AND BOND TO C.W. PIPE WITH 1"C.-#1 1/0 CU.
2. PROVIDE FUSE SIZE AS RECOMMENDED BY MFGR. OF MULTI-ZONE UNIT.

Office of the State Architect

24X36

SUPV. ARCH. CREE, FAIA
PROJECT ARCHITECT TEAT
PROJ. ENGR. ELECT. TEAT

SHEET TITLE MISCELLANEOUS DETAILS
PROJECT OFFICE BUILDING & PARKING FACILITIES
CLIENT DEPARTMENT OF MOTOR VEHICLES LOCATION CONARD
STATE OF CALIFORNIA DEPARTMENT OF GENERAL SERVICES

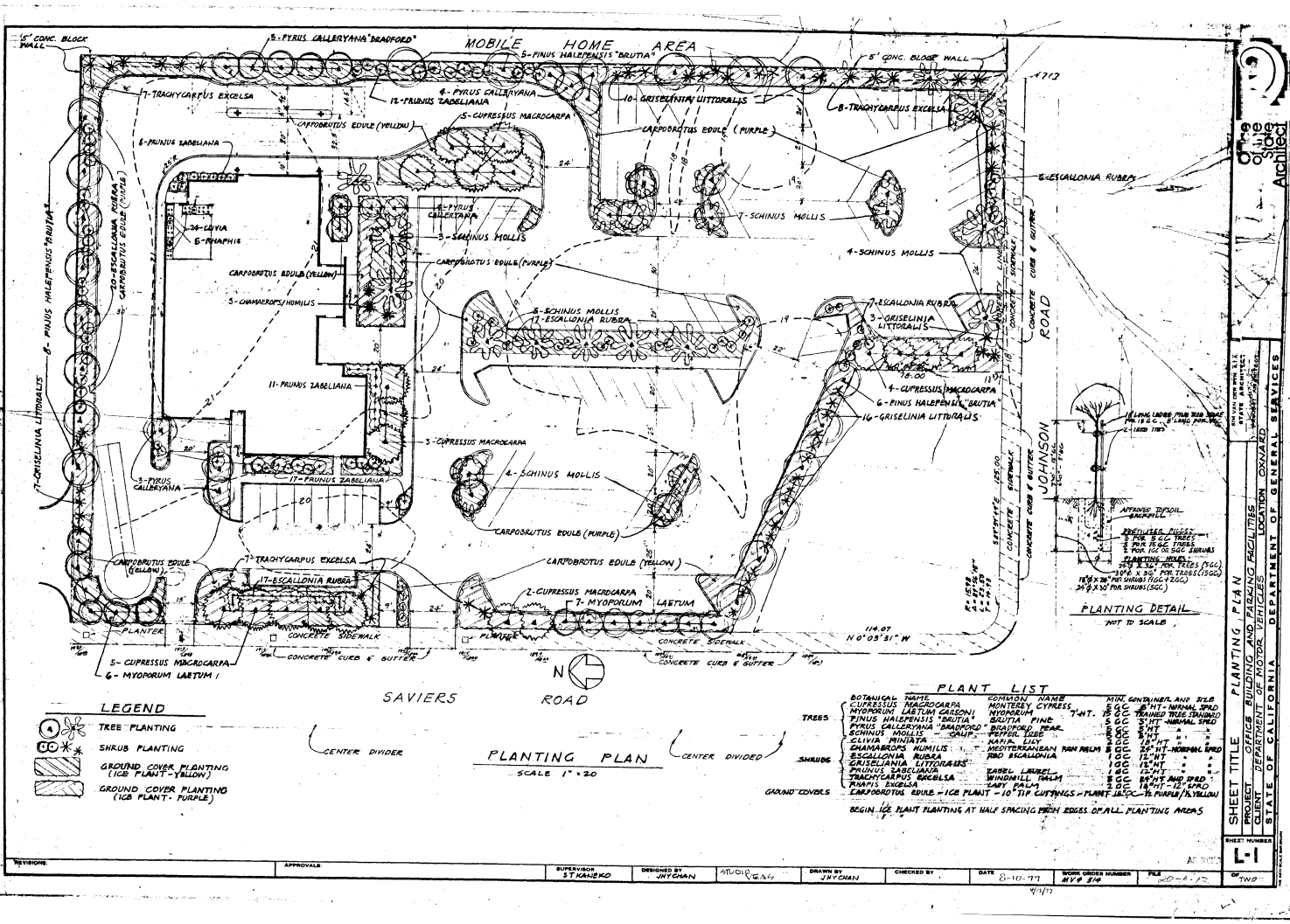
J.D. Crevier

J.D. CREVIER & ASSOC., INC.
CONSULTING ELECTRICAL ENGINEERS
ASSOCIATES
M.E. MANSOUR
2301 MAIN ALTO, SUITE D, SANTA ANA, CALIFORNIA 92707

SHEET NUMBER E-4
OF 4

AS BUILT

REVISIONS:	APPROVALS:	SUBMITTED	DESIGNED BY	STUDIO VEGAS	DRAWN BY	CHECKED BY	DATE 8-10-77	WORK ORDER NUMBER MVG 814	FILE 20-A-12



PLANTING PLAN

SCALE 1" = 20

LEGEND

- TREE PLANTING
- SHRUB PLANTING
- GROUND COVER PLANTING (ICE PLANT - YELLOW)
- GROUND COVER PLANTING (ICG PLANT - PURPLE)

PLANT LIST

	BOTANICAL NAME	COMMON NAME	MIN. CONTAINER AND SIZE
TREES	CUPRESSUS MACROCARPA	MONTEREY CYPRESS	5 GC 8'HT - NURSERY GRWN
	MYOPORUM LAETUM GARDONI	MYOPORUM	7 HT. 15 GC TRAINED TREE STANDARD
	PINUS HALEPENSIS "BRUTIA"	BRUTIA PINE	5 GC 5'HT - NURSERY GRWN
	PYRUS CALLERYANA "BRADFORD"	BRADFORD PEAR	5 GC 6'HT " "
	SCHINUS MOLLIS - SAUP.	PEPPER TREE	5 GC 6'HT " "
SHRUBS	CLIVIA MINIATA	MARIA LILY	1 5 GC 12" HT " "
	CHAMAEROPS HUMILIS	MEDITERRANEAN FAN PALM	5 GC 3'-4'HT - NURSERY GRWN
	ESCALLONIA RUBRA	RED ESCALLONIA	1 5 GC 6'HT " "
	GRISELINIA LITTORARIS		1 100 GC 12"HT " "
	PRUNUS ZABELIANA	LABEL LAUREL	1 15 GC 12"HT " "
	TRACHYCARPUS EXCELSA	WINDMILL PALM	5 15 GC 8'-9'HT AND UP " "
	RHAPHIS EXCELSA	LADY PALM	3 15 GC 10'HT - 12'-14'HD " "
GROUND COVERS	CARPOBROTUS EDULE - ICG PLANT - 10" TIP CUTTINGS - PLANT 18" OC - 1/2 PURPLE / 1/2 YELLOW		

BEGIN ICE PLANT PLANTING AT HALF SPACING FROM EDGES OF ALL PLANTING AREAS

PLANTING DETAIL

NOT TO SCALE

PROVISIONS	APPROVALS	SUPERVISOR	DESIGNED BY		DRAWN BY	CHECKED BY	DATE	WORK ORDER NUMBER	FILE
		S.T. KANEKO	JHY CHAN	STUDIO 4	JHY CHAN		8-10-77	4V8 314	310-A-12

SHEET TITLE: PLANTING PLAN

PROJECT: OFFICE BUILDING AND PARKING FACILITIES

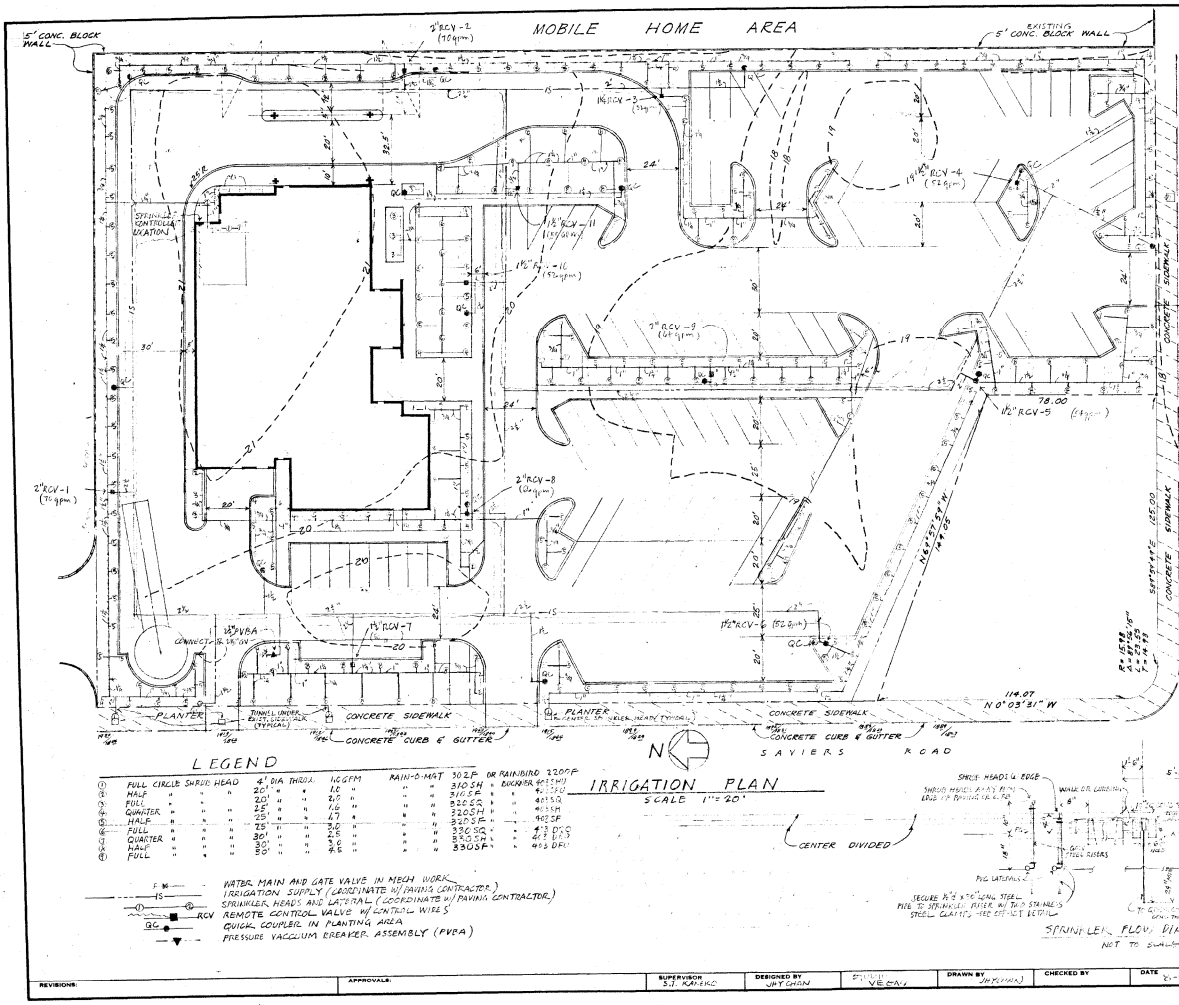
CLIENT: DEPARTMENT OF MOTOR VEHICLES LOCATION: OXNARD

STATE OF CALIFORNIA DEPARTMENT OF GENERAL SERVICES

SHEET NUMBER: L-1 OF TWO

Office of the State Architect

24x36



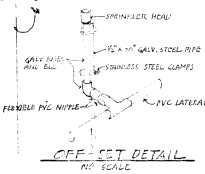
LEGEND

①	FULL CIRCLE SHRUB HEAD	4' DIA THROW	1.0GPM	RAIN-O-MAT 302F OR RAINBIRD 2300P			
②	HALF " " "	20' " "	1.0 "	" " 302FH	"	"	
③	FULL " " "	20' " "	2.5 "	310SF	"	"	
④	QUARTER " " "	25' " "	1.6 "	320SQ	"	"	
⑤	HALF " " "	25' " "	1.7 "	320SH	"	"	
⑥	FULL " " "	30' " "	3.0 "	320SF	"	"	
⑦	QUARTER " " "	30' " "	2.5 "	330SQ	"	"	
⑧	HALF " " "	30' " "	3.6 "	330SH	"	"	
⑨	FULL " " "	50' " "	4.6 "	330SF	"	"	

- W.M. — WATER MAIN AND GATE VALVE IN MECH WORK
- IS — IRRIGATION SUPPLY (COORDINATE W/ PAVING CONTRACTOR)
- SPRINKLER HEADS AND LATERAL (COORDINATE W/ PAVING CONTRACTOR)
- RCV — REMOTE CONTROL VALVE W/ CONTROL WIRES
- QC — QUICK COUPLER IN PLANTING AREA
- PRESSURE VACCUUM BREAKER ASSEMBLY (PVBA)

IRRIGATION PLAN

SCALE 1"=20'



OFF-SET DETAIL

NO SCALE

SECURE ½" x 30" GALV. STEEL PIPE TO SPRINKLER RISER W/ TWO STAINLESS STEEL CLAMPS - SEE OFF-SET DETAIL

SPRINKLER FLOW DIAGRAM

NOT TO SCALE

AS BUILT

REVISIONS:	APPROVALS:	SUPERVISOR	DESIGNED BY	DRAWN BY	CHECKED BY	DATE	WORK ORDER NUMBER	FILE
		S.J. KAMERO	JAY CHAN	JAY CHAN		8-10-71	MVO 314	

DISTRICT ARCHITECT — STATE ARCHITECT

SHEET TITLE: IRRIGATION PLAN

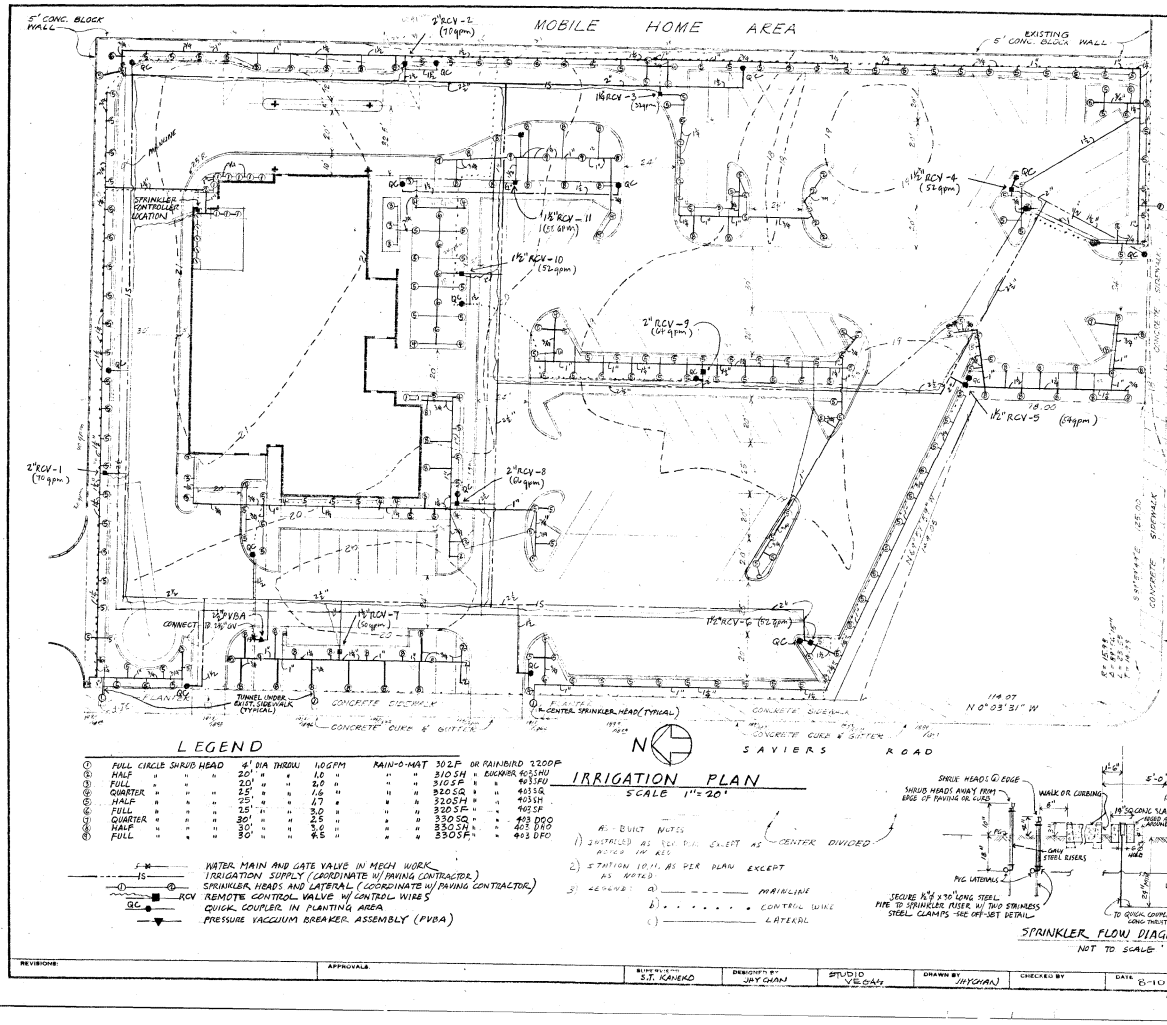
PROJECT: SERVICE BUILDING AND PARKING FACILITIES — LOCATION: CANAL

CLIENT: DEPARTMENT OF VETERANS AFFAIRS

STATE OF CALIFORNIA — DEPARTMENT OF GENERAL SERVICES

SHEET NUMBER: L-2 — OF TWO

24x36



LEGEND

①	FULL CIRCLE SHRUB HEAD	4' DIA THROW	1.0 GPM	RAIN-O-MAT 302F	OR RAINBIRD 1200F			
②	HALF " "	20' " "	1.0 "	" " 310SH	" BUCKNER 4035HU			
③	FULL " "	20' " "	2.0 "	" " 310SF	" " 4035HU			
④	QUARTER " "	25' " "	1.6 "	" " 320SQ	" " 4035Q			
⑤	HALF " "	25' " "	3.7 "	" " 320SH	" " 4035H			
⑥	FULL " "	25' " "	3.0 "	" " 320SF	" " 4035F			
⑦	QUARTER " "	30' " "	2.5 "	" " 330SQ	" " 403 DQ0			
⑧	HALF " "	30' " "	3.0 "	" " 330SH	" " 403 DH0			
⑨	FULL " "	30' " "	9.5 "	" " 330SF	" " 403 DF0			

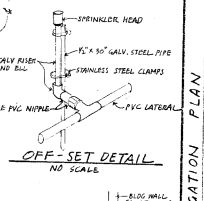
- W — IS — WATER MAIN AND GATE VALVE IN MECH WORK
- IS — IRRIGATION SUPPLY (COORDINATE W/ PAVING CONTRACTOR)
- SPRINKLER, HEADS AND LATERAL (COORDINATE W/ PAVING CONTRACTOR)
- RCV REMOTE CONTROL VALVE W/ CONTROL WIRES
- QC QUICK COUPLER IN PLANTING AREA
- PRESSURE VACCUUM BREAKER ASSEMBLY (PVBA)

IRRIGATION PLAN

SCALE 1" = 20'

AS BUILT NOTES

1) INSTALLED AS SHOWN EXCEPT AS ACTUAL CONDITIONS DICTATED — CENTER DIVIDED
2) STATION 10-11 AS PER PLAN EXCEPT AS NOTED
3) LEGEND: a) ——— MAINLINE; b) . . . . . CONTROL WIRE; c) ——— LATERAL



OFF-SET DETAIL
NO SCALE

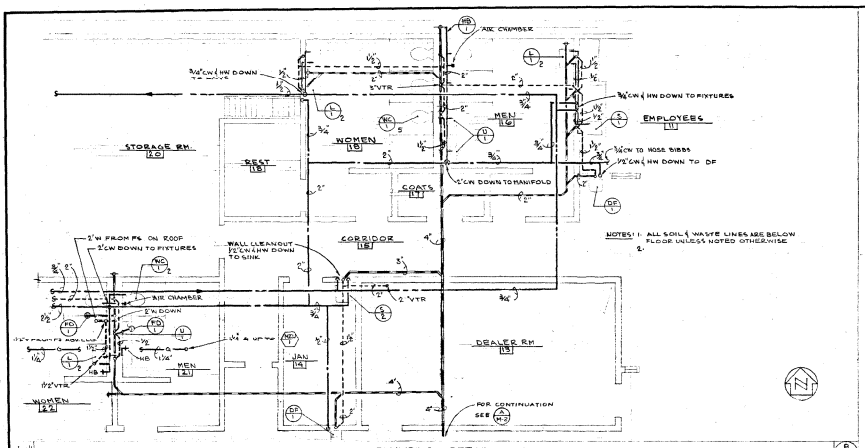
SPRINKLER FLOW DIAGRAM
NOT TO SCALE

REVISIONS: | APPROVALS: | BUREAU: S.T. KANEKO | DESIGNED BY: JAY CHAN | STUDIO: VEGA+ | DRAWN BY: JHYCHAN | CHECKED BY: | DATE: 8-10-77 | WORK ORDER NUMBER: | FILE: 20-A-12 | AS BUILT

SHEET TITLE: IRRIGATION PLAN
PROJECT: OFFICE BUILDING AND PARKING FACILITIES
CLIENT: DEPARTMENT OF MOTOR VEHICLES LOCATION: CONRAD
STATE OF CALIFORNIA — DEPARTMENT OF GENERAL SERVICES

SHEET NUMBER: L-2 OF TWO

Office of the State Architect



PLUMBING DETAIL

PLUMBING FIXTURE SCHEDULE

FIXTURE	MANUF.	NO.	ROUGH-IN	REMARKS	FITTING MANUF.	NO.	
WC WATER CLOSET				WHITE SEAT			SCREW DRIVER
U URINAL				WALL HANGERS			SCREW DRIVER
LAVATORY			20"x18" 1½"	CONCEALED ARM SUPPORT			
SINK			22"x18" 1½"	STAINLESS STEEL NUDEE RING			
SINK			5"	RIM GUARD			
DF DRINKING FOUNTAIN			1½"	¼ HP, 1201b/01 WATER COOLER 1.5 GPH AT STD. CONDITIONS	WITH FIXTURE		
FD FLOOR DRAIN			5"	5"x5" REEL PROOF GRATE			
FS FLOOR SINK			7½"x18" 2"	2½" FLOOR DAM			
WH WALL HYDRANT							SCREW DRIVER

SEE SPECIFICATION

CEILING DIFFUSERS CONTINUED

ITEM	DIFFUSER SIZE	CEILING PANEL SIZE	MANUF.	MODEL	REMARKS
1	6"x6"	12"x12"	ANEMOSTAT	PR 6D	ITEM NO. / QUANTITY AND CFM / GENERAL NOTATION FOR CEILING DIFFUSERS / RECTANGULAR SYMBOL
2	8"x8"	24"x24"	"	"	
3	10"x10"	"	"	"	
4	12"x12"	"	"	"	
5	14"x14"	"	"	"	NOTE: RECTANGULAR DIFFUSERS ARE 4-WAY BLOW UNLESS SHOWN WITH DIRECTIONAL ARROWS
6	6"x 6"	—	"	"	
7	8"x 8"	—	"	"	
8	10"x10"	"	"	"	
9	10"x 10"	24"x 48"	"	PRED	
10	12"x 12"	"	"	"	
11	18"x 18"	"	"	"	

EXHAUST & RETURN REGISTERS

DUTY EXHAUST	DUTY RETURN	SIZE	PANEL SIZE	MANUF.	MODEL	REMARKS
E1	R1	6"x 8"	—	ANEMOSTAT	3 PR 5D	DUTY / ITEM NO. / CFM / QUANTITY NO. / GENERAL NOTATION FOR EXHAUST AND RETURN REGISTERS / RECTANGULAR SYMBOL
E2	R2	12"x12"	"	"	"	
E3	R3	18"x 12"	24"x24"	"	"	
E4	R4	24"x24"	24"x48"	"	"	
E5	R5	24"x36"	"	"	"	NOTE: ALL CEILING RETURN & EXHAUST TO HAVE INTEGRAL OPPOSED BLADE KEY OPERATED VOLUME DAMPERS.
E6	R6	24"x24"	"	"	3 PDLD	

SUPPLY REGISTERS

ITEM	SIZE	MANUF.	MODEL	REMARKS
1	24x10"	ANEMOSTAT	2250	EXPLOSION PROOF FOR SUPPLY REGISTERS / GENERAL NOTATION / CFM QUANT. NO. / ITEM NO.

LEGEND

CFM	CUBIC FEET PER MINUTE
EA	EXHAUST AIR
SA	SUPPLY AIR
	TRANSITION FROM RECTANGULAR TO ROUND DUCT
OD	OVERFLOW DRAIN
RA	RETURN AIR
E	PREFIX INDICATING EXISTING
	NIGHT-SETBACK THERMOSTAT
HB	HOSE FAUCET (BIBB)

CEILING DIFFUSERS

18	24"x48" LITE 2 SIDE	—	ANEMOSTAT	2PA-16S 6" OVAL INLET
19	24"x48" LITE 1 SIDE	—	"	"

NOTES: 18 & 19 ARE LIGHT TROFFER SADDLE TYPE.

UTILITY DATA

SEWAGE LOAD 77 F.U.

WATER DEMAND

MAIN PRESSURE: MAX: 75 MIN: 60 PSI
DOMESTIC DEMAND 85 GPM
LANDSCAPE DEMAND 50 GPM
TOTAL: 135 GPM

GAS LOAD IN CFH

WATER HEATING	36	
SPACE HEATING	465	
TOTAL:	501	CFH

LEGEND

	SANITARY DRAIN (SEWER, SOIL & WASTE)
	SANITARY VENT. (V)
	EXISTING SEWER
	COLD WATER (CW)
	HOT WATER (HW)
	HOT WATER RETURN (HWR)
D	INDIRECT DRAIN
DS	DOWNSPOUT
G	GAS - LOW PRESSURE
	FLOOR CLEANOUT & CLEANOUT TO GRADE
	UNION
WCO	WALL CLEANOUT
GV	GATE VALVE
GC	GAS COCK, GAS STOP
VITB	VALVE IN YARD BOX
	SWING CHECK VALVE
RI & C	ROUGH-IN & CONNECT
UOS	UNDER OTHER SECTION
NIC	NOT IN CONTRACT
POC	POINT OF CONNECTION
SOV	SHUT OFF VALVE
VTR	VENT THRU ROOF
AD	ACCESS DOOR
VC	VITRIFIED CLAY
CI	CAST IRON
T	ROOM THERMOSTAT
	UNDERCUT DOOR
	SUPPLY DUCT
	EXTRACTOR (ADJUSTABLE)
	TURNING VANES
MVD OR	MANUAL VOLUME DAMPER (VD)
OR	FLEXIBLE DUCT
	LINED DUCT (DIM. SHOWN NET INSIDE)

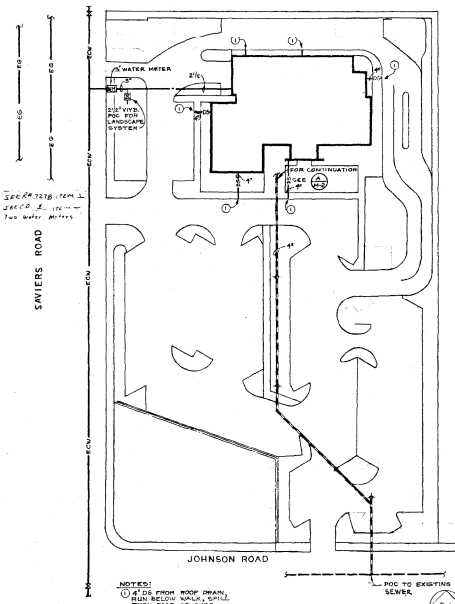
FANS

ITEM	DUTY	CFM	E.S.P.	RPM	BHP	MOTOR POWER	MANUF.	MODEL	ISOLATION	REMARKS
EF 5	EXHAUST	2200	1/4"	795	0.334	¼ HP 1725/60/1 & ¼ HP 1550/60/1	EXIT-AIRE	UBX-1808	NEOPRENE	PREFABRICATED ROOF CURB. WT. 1 151#
EF 3	EXHAUST	485	1/4"	900	0.073	1550/60/1	EXIT-AIRE	UBX-1208	"	" " " WT. 1 101#
EF 4	EXHAUST	650	1/4"	1000	0.100	¼HP 1550/60/1	EXIT-AIRE	UBX-1903	"	" " " WT. 1 101#

AIR CONDITIONING UNIT

ITEM	DUTY	CFM	EST. SP IN/EA	FAN SP IN	RPM	ENTG. BHP/HP	SYNC. BHP/HP	COOLING CAPACITY BTU/HR	HEATING CAPACITY BTU/HR	COMP. H.P./ELEM.	CONDT. P.L.A.	FILTERS	TYPE/ EFF.-%	MANUF. MODEL	REMARKS
ACU 1	COOLING/HEATING	12860	1.0	2.5	1075	5.69	5.37	456 000	360000	10	16.4 KW 480V/3Ø	2-24x24x15	2" 25/30	5F28 400	COMBUSTION BLOWER MOTOR ½ HP 1725 RPM, 208V/1Ø, 3.8 AMPS LIST MIN. BPH. 7.125 GPH WT: 2600#

REVISIONS:	APPROVALS:	SUPERVISOR	DESIGNED BY	DRAWN BY	CHECKED BY	DATE	WORK ORDER NUMBER	FILE
			STUDIO	E.B.P.	W.D.H.	8-10-77	MV# 314	20-A-12



MECHANICAL PLOT PLAN

AS BUILT

HILTEN-HARRISON
MECHANICAL ENGINEERS
4667 COLONIAL CAUSEWAY AVE.
SACRAMENTO, CALIFORNIA 95819
(916) 456-3617

Office of State Architect

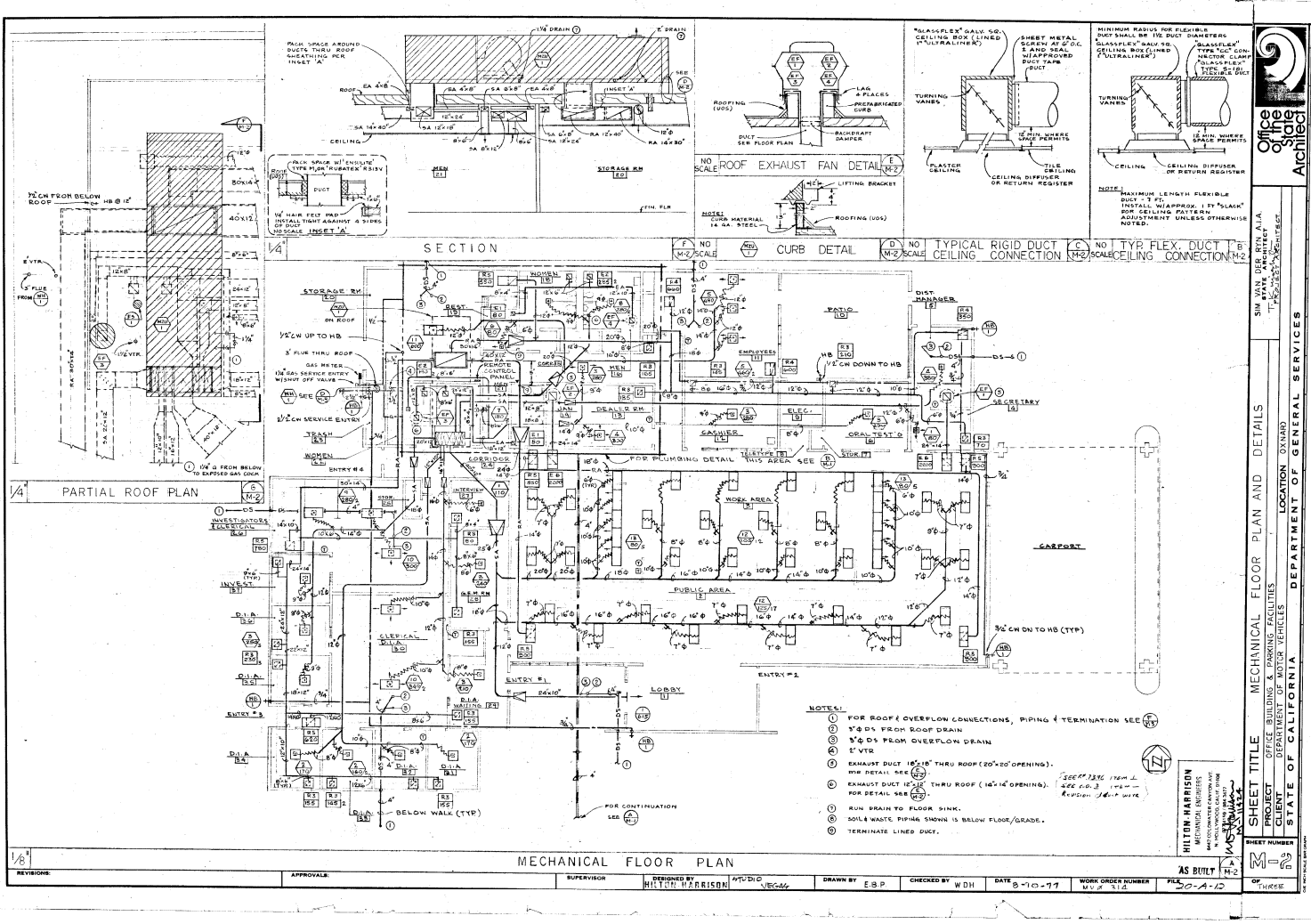
24X36

SIM VAN DER RYN A.I.A.
STATE ARCHITECT
RESPONSIBLE ARCHITECT

SHEET TITLE MECHANICAL PLOT PLAN, DETAIL, LEGEND AND SCHEDULES
PROJECT OFFICE BUILDING & PARKING FACILITIES LOCATION OXNARD
CLIENT DEPARTMENT OF MOTOR VEHICLES DEPARTMENT OF GENERAL SERVICES
STATE OF CALIFORNIA

SHEET NUMBER M-1 OF THREE

M-1



SHEET TITLE: MECHANICAL FLOOR PLAN AND DETAILS
PROJECT: OFFICE BUILDING & PARKING FACILITIES
CLIENT: DEPARTMENT OF MOTOR VEHICLES
LOCATION: OXNARD
STATE OF CALIFORNIA — DEPARTMENT OF GENERAL SERVICES

Office of the State Architect

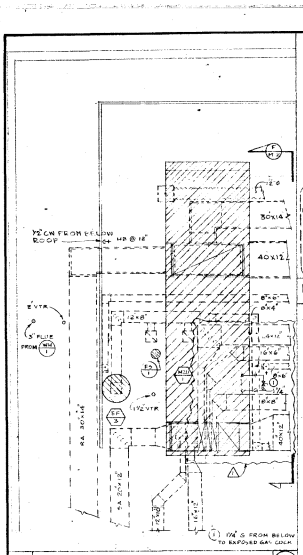
SIM VAN DER RYN, A.I.A. STATE ARCHITECT

HILTON HARRISON, MECHANICAL ENGINEERS

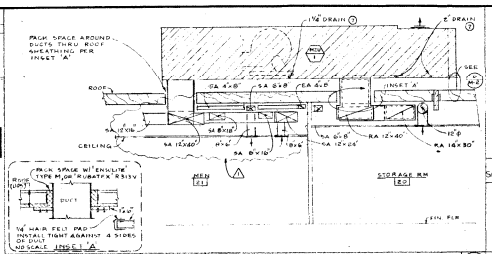
SHEET NUMBER M-2

REVISIONS:	APPROVALS:	SUPERVISOR	DESIGNED BY HILTON HARRISON	STUDIO VEGAS	DRAWN BY E.B.P.	CHECKED BY W.D.H.	DATE 8-10-77	WORK ORDER NUMBER MVA 214	FILE 30-4-10	OF THREE

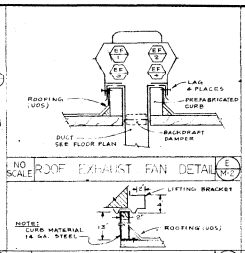
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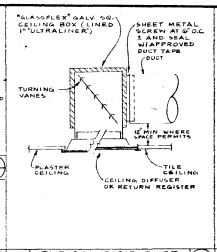
1/4 PARTIAL ROOF PLAN



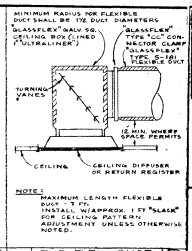
1/4 SECTION



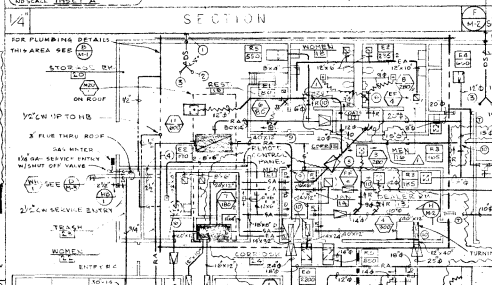
NO SCALE ROOF EXHAUST FAN DETAIL E M-2



NO SCALE TYPICAL RIGID DUCT CEILING CONNECTION C M-2

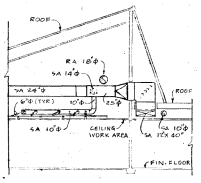


NO SCALE TYP. FLEX. DUCT CEILING CONNECTION B M-2



NO SCALE CURB DETAIL F M-2

1/4 MECHANICAL FLOOR PLAN



1/4 SECTION △ H M-2

NOTES:
1. FOR ROOF OVERFLOW CONNECTIONS, PIPING & TERMINATION SEE P-1
2. 8"ϕ DS FROM ROOF DRAIN
3. 3/4ϕ DS FROM OVERFLOW DRAIN
4. 5' VTR
5. EXHAUST DUCT 18"x18" THRU ROOF (20"x20" OPENING). FOR DETAIL SEE E M-2.
6. EXHAUST DUCT 12"x12" THRU ROOF (14"x14" OPENING). FOR DETAIL SEE E M-2.
7. RUN DRAIN TO FLOOR SINK.
8. SOIL & WASTE PIPING SHOWN IS BELOW FLOOR/GRADE.
9. TERMINATE LINED DUCT.
10. RISE IN JOIST SPACE. △

CHANGE ORDER
CONTRACT NO. 9443
R NO. 7396
DATED 4-4-78

HILTON HARRISON
MECHANICAL ENGINEERS
6447 COLDWATER CANYON AVE.
N. HOLLYWOOD, CALIF. 91606
(213) 769-1124

Office of the State Architect

24X36

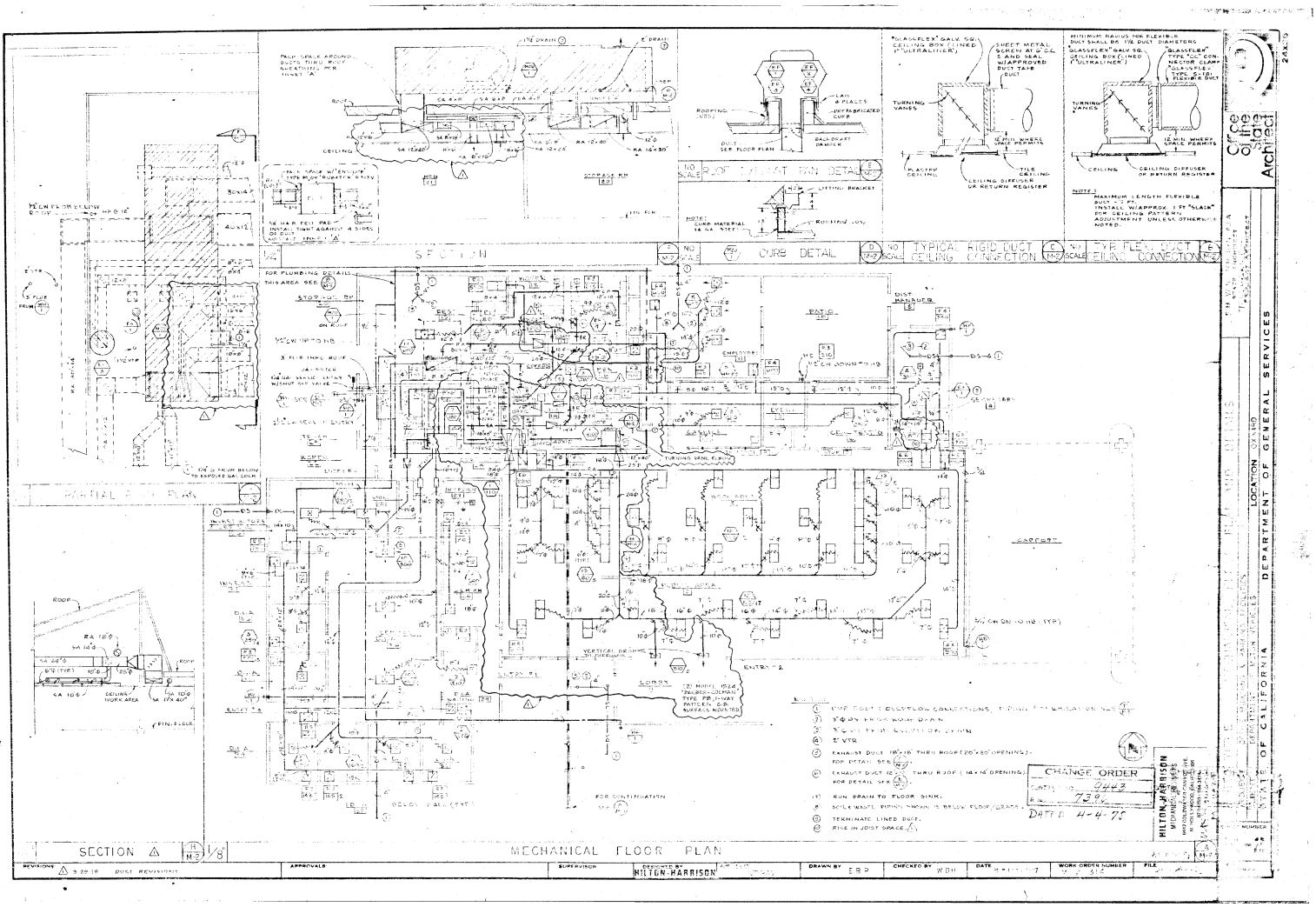
SIN VAN DER SYDEN, A.I.A.
STATE ARCHITECT
SACRAMENTO

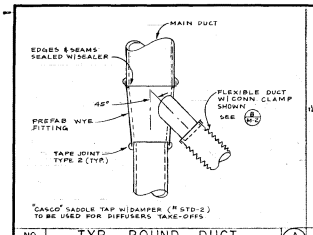
DEPARTMENT OF GENERAL SERVICES
STATE OF CALIFORNIA
LOCATION OXNARD
DEPARTMENT OF MOTOR VEHICLES
CLIENT
OFFICE BUILDING & PARKING FACILITIES
PROJECT

SHEET TITLE MECHANICAL FLOOR PLAN AND DETAILS

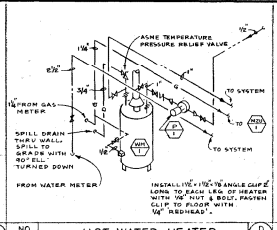
SHEET NUMBER M-2
OF SHEETS

REVISIONS	APPROVALS:	SUPERVISOR	DESIGNED BY	DRAWN BY	CHECKED BY	DATE	WORK ORDER NUMBER	FILE
△ 3-28-78 DUCT REVISIONS			HILTON-HARRISON	E.B.P.	W.D.H.	8-1[illegible]-77	MV/ 318	

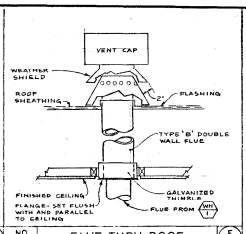

SECTION
ROOF MOUNT FAN DETAIL
CURB DETAIL
TYPICAL RIGID DUCT CEILING CONNECTION
TYP FLEX DUCT CEILING CONNECTION
PARTIAL FLOOR PLAN
SECTION
MECHANICAL FLOOR PLAN
CHANGE ORDER
DEPARTMENT OF GENERAL SERVICES
STATE OF CALIFORNIA
Office of the State Architect
MILTON-HARRISON



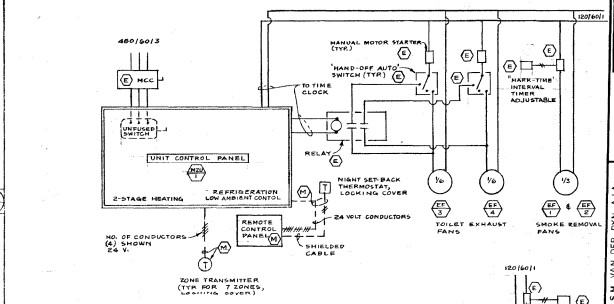
NO SCALE — TYP. ROUND DUCT REDUCING WYE — A M-3



NO SCALE — HOT WATER HEATER — D M-3



NO SCALE — FLUE THRU ROOF — E M-3

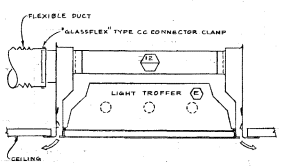


REMOTE PANEL FEATURES:
OFF-ON SWITCH & PILOT LIGHTS
FAN ON —— 'GREEN' LITE
FILTER DIRTY —— 'RED' "
HEAT ALARM —— 'RED' "
COOL ALARM —— 'RED' "
OIL PRESS ALARM —— 'RED' "
NIGHT SETBACK OVERRIDE TIMER SWITCH & TIME CLOCK

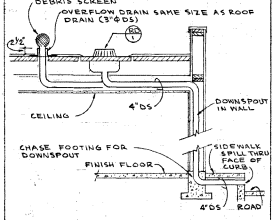
REMOTE CONTROL PANEL:
APPROX. 12"-16"-3" LOCATE ON WALL ROOM NO. 20

(M) FURNISHED AND INSTALLED UNDER MECH. SECTION.
(E) FURNISHED AND INSTALLED UNDER ELECT. SECTION.
(ME) FURNISHED UNDER MECH. SECTION INSTALLED UNDER ELECT. SECTION.

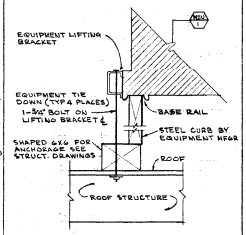
NO SCALE — MECHANICAL CONTROL DIAGRAM — F M-3



NO SCALE — LIGHT TROFFER DIFFUSER — B M-3



NO SCALE — ROOF DRAIN PIPING — H M-3



NO SCALE — EQUIPMENT ANCHOR — C M-3

Office of State Architect

24X36

SHEET TITLE: MECHANICAL DETAILS

PROJECT: OFFICE BUILDING & PARKING FACILITIES
CLIENT: DEPARTMENT OF MOTOR VEHICLES
STATE OF CALIFORNIA
LOCATION: OXNARD
DEPARTMENT OF GENERAL SERVICES

SW VAN DER RYN A.I.A.
ARCHITECT
1425 SPRUCE ST.
RIVERSIDE, CALIF.
TEL. 714-686-4565

HILTON-HARRISON
MECHANICAL ENGINEERS
2440 COLUMBIA PARK AVE.
RIVERSIDE, CALIFORNIA
TEL. 714-684-1424

SHEET NUMBER: M-3
OF 1 IN K-8

AS BUILT

REVISIONS:	APPROVALS:	SUPERVISOR	DESIGNED BY HILTON-HARRISON	STUDIO VEGAS	DRAWN BY F.R.P.	CHECKED BY W.D.H.	DATE 8-10-77	WORK ORDER NUMBER MVD 314	FILE 20-A-1

TIMBER CONSTRUCTION NOTES

☒ Continuous member in section ☒ Blocking in section or elevation ☒ End of member

Blkg. – Blocking	Bd. – Board	F.H.W.S. – Flat Head Wood Screws	Max. – Maximum
Cont. – Continuous	Clr. – Clear	S.S. – Straight Sheathing	Min. – Minimum
T.&G. – Tmp. & Grp.	Pl. – Plate	H.B. – Herringbone Blocking	T.N. – Toe Nail
Horiz. – Horizontal	D.F. – Douglas Fir	M.I.W. – Malleable Iron Washer	J.H. – Joist Hanger
F.S. – Face of Studs	Red. – Redwood	Diag. – Diagonal	W.W.F. – Welded Wire Fabric

Douglas fir shall be graded in accordance with West Coast Lumbermens Association Grading Rules No. 16. Redwood shall be graded in accordance with California Redwood Association Grading Rules.

1. See Plans and Specifications for grading of all lumber.
2. Bearing walls and partitions shall have double top plates, lapped at wall and partition intersections. Joints in the upper and lower members of the top plate shall be staggered not less than 4'0".
3. Provide solid blocking between joists or rafters at all supports.
4. Cross bridge all joists where span exceeds 8'0". Spacing between bridging or between bridging and bearing not to exceed 8'0" (8'0" at rafters). Cross bridging shall be 3x3 nominal minimum. Bridging may be omitted for roof and ceiling joists 8" in depth and under and the ends of trussed rafters 8" solid blocking may be substituted in lieu of cross bridging.
5. Provide blocking in changes in ceiling level.
6. Cutting of wood joists shall be limited to cuts and bored holes not deeper than one-fifth the joist depth from the top and located not farther from the end than three times the joist depth.
7. Unless fully detailed on the Structural Drawings, pipes exceeding one third of the plate width, shall not be placed in sections used as bearing or shear walls. Where allowed, pipes shall be placed in the center of plates using a neat hole, notching of studs or plates shall not be allowed.
8. Holes for bolts in wood shall be bored with a bit of the same nominal diameter as the bolt. Holes in steel plates and angles shall be bolt diameter plus 1/16".
9. Holes in wood for lag screws shall be first bored to the same diameter and depth as the shank. Holes for threaded portion shall be bored no larger than the root diameter of the thread.
10. Lag screws and wood screws shall be screwed and not driven into place.
11. All bolts and lag screws shall be provided with metal washers under heads and nuts which bear on wood. See schedule this sheet.
12. All bolts and lag screws shall be tightened on installation and retightened before closing in, or at completion of job.
13. Where joists or studs run parallel to and in contact with concrete, bolt to concrete with 5/8"ø x 8" bolts at not over 3'0" o.c. and within 9" of ends of pieces.
14. Sill plates shall be 2" pressure treated Douglas Fir the same width as studs.
15. Joist anchors where required shall be placed at opposite ends of same lines of joists and not over 48" o.c.

WASHER SCHEDULE FOR BOLTS AND LAG SCREWS		
DIAM. OF BOLT, LAG	MALLEABLE IRON WASHERS	STEEL PLATE WASHERS
1/2" ø	2½" x 2½" x 1/4"	2" x 2" x 1/4"
5/8" ø	2½" x 4½" x 5/16"	3½" x 3½" x 1/4"
3/4" ø	3" x 5" x 3/8"	3" x 3" x 5/16"
7/8" ø	4½" x 6" x 7/16"	3½" x 3½" x 5/16"
1" ø	4" x 6" x 1/2"	3½" x 3½" x 1/2"
1¼" ø	5" x 7" x 5/8"	5" x 5" x 1/2"

CARRIAGE BOLTS SHALL HAVE THE FOLLOWING SIZE CUT WROUGHT STEEL WASHERS UNDER THE HEAD	
1/2" bolt	3/4" washer 2" O.D.
5/8" bolt	1" washer 2½" O.D.
3/4" bolt	1¼" washer 3" O.D.
7/8" bolt	1½" washer 3½" O.D.
1" bolt	1½" washer 3½" O.D.

TYPICAL WALL AND OPENING FRAMING

WIDTH OF OPENING	LINTEL DEPTH "D" BEARING AND BRG. WALLS	NON-BRG. WALLS
Up to 3'0"	8"	6"
3'1" to 4'0"	8"	6"
4'1" to 10'0"	10"	8"
10'1" to 12'0"	12"	10"

TABLE "A"

STRUCTURAL PLYWOOD SPLICE

STUD FRAMING AT CORNERS & INTERSECTIONS

TIE DOWN FOR RAFTERS

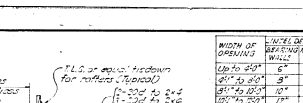
TYPICAL STEP IN WALL FOOTING

All nails for J.H. to be 8d x 1½" long except nails "a" shall be 16d for joists 8" or greater in depth. Clip nails to depth of penetrated piece.

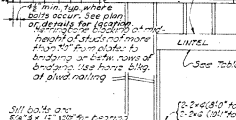
Joist SIZE	DIMENSIONS A	B	H	NAILS "a"	"b"
2x4	1¾	3½	2	2	2
2x6	1¾	5½	2	3	2
2x8	1¾	7¼	2	4	3
2x10	1¾	9¼	2	5	3
2x12	1¾	11½	2	6	4

JOIST HANGER SCHED.

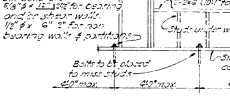
NOTE: Simpson connectors are noted by Model No. Other equivalent may be substituted with DSA approval.



DETAILS OF PIPES AT CONCRETE FOOTING

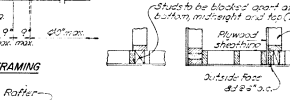


TIEDOWN (T.D.) "A"



NOTE: Ø nails 330, HPS powder-driven fasteners 3"x0.13" or equal may be used in lieu of 8d x 3" shown. Use 5/8"ø x 12" ø steel washers, 4" min. concrete edge distance.

SILL PLATE ANCHORAGE AT NON BEARING PARTITIONS

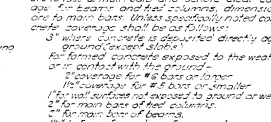


TYPICAL REINFORCING BAR SPLICES

STRUCTURAL REQUIREMENTS

Notes and details shown on this standard sheet cover min. requirements for timber construction which may at any not occur on this project, and shall apply to timber construction on this project except where specifically noted and/or detailed elsewhere.

1. Structural concrete shall develop a strength f'c = 2500 psi in 28 days. See specs.
2. Concrete shall not be dropped through reinforcing steel, as in walls, so as to cause segregation of aggregates, in such cases hoppers and vertical chutes or trunks shall be used. Chutes or trunks shall be of variable lengths so that the free unconfined fall of concrete shall not exceed six feet and a sufficient number shall be used to place the concrete being kept level at all times.
3. Horizontal construction joints shall have entire surface removed to expose clean aggregate solidly embedded. See plans and details for location and type of construction joint.
4. All dimensions shown for location of reinforcing are to face of main bars and denote clear coverage. In beams and flat columns, dimensions are to main bars. Unless specifically noted concrete coverage shall be as follows:
   3" where concrete is deposited directly against ground except slabs.
   For formed concrete exposed to the weather or in contact with the ground:
   2" coverage for #6 bars or larger.
   1½" coverage for #5 bars or smaller.
   (For wall surfaces not exposed to ground or weather, 2" for main bars of flat columns, 1½" for main bars of beams.
   1½" to face of spiral reinforcement.
   ¾" for bars in slabs on forms.
   Bars in slabs on ground - place in center of slab.
5. Splices in continuous reinforcement as in walls, wall footings, etc. shall have a lap of 24 diameters and the splices in adjacent bars shall not be less than 50" apart. Vertical wall bars shall be spliced at or near floor lines. Bars may be wired together at splices or lap except for top reinforcement of beams and slabs or where definitely detailed to be separated. See beam details or schedules for separation of beam or girder bars over supports. Continuous bars in spandrels, wall beams etc. shall lap as follows:
   Top bars at ¼ span.
   Bottom bars at ¼ supports.
   Bottom bars in slabs on ground - place in center of slab.
6. All walls shall be doweled to footings, walls, beams or slabs with one of the same size and spacing as the wall bars.
7. See Architectural Drawings for wall openings, wall offsets, chases, etc. and depressed slabs or other details not shown on Structural Drawings.
8. See Mechanical and Architectural Drawings for size and location of pipe, vent, duct and other similar openings.
9. All anchor bolts, rockets, dowels and other miscellaneous items to be cast in concrete shall be secured in place in the forms before pouring.
10. The slab-base under floor slabs shall be placed as soon as possible after foundation walls are completed.
11. Soil pressure used for foundation design is:
    For dead & live load _____ 2,500 _____ p.s.f.
    For dead & live load + wind _____ p.s.f.
    For gravity & lateral load + 33⅓% _____ p.s.f.
12. The letters S.S. on foundation plans indicate a step in the footing. See detail this sheet. Elevations indicated are to bottom of footing and are intended for estimating purposes.
13. Excavations for footings shall be inspected and approved by a Structural Engineer from the office of the State Architect before placing forms or placing concrete.



METHOD OF POURING SLABS ON GROUND

NAILING SCHEDULE

All nails for structural work shall be common wire nails. Holes shall be sub-drilled where necessary to prevent splitting of wood. Nailing not noted below or on plans shall be a minimum of 2 nails at each contact, as for 1" material, and 16d for 2" material.

1. Joists on rafters to side of studs, 8" joists or less _____ 3-16d
   For each additional 4" in depth of joists _____ 1-16d
2. Joists or rafters at all bearings, toe nails each side _____ 2-10d
3. Joists or rafters as cantilever beaming, toe nails, stud type side only _____ 10-16d
4. Studs to bearings, toe nails each side _____ 2-4d, 2-8d, 2-6d, 3-10d, 2-8, 3-10d
5. Blocking between joists, studs or rafters:
   To joist, stud or rafter, toe nails each side, each end _____ 2-10d
   In floors, toe nails are end joist studs or rafter to end of blocking _____ 2-16d
   To joist or rafter bearings (plates) toe nails each side _____ 2-10d
   Vertical blocking to side of horizontal blocking _____ 2-16d
6. Sheathing at all bearings & blocking _____ 1x6 sheathing 3-8d; 2x6-8 & 8 ship. lap _____ 2-16d
   1x8 sheathing _____ 3-8d
7. Sheathing at ends of boards _____ 1x6 sheathing, 3-8d; 2x6-8 & 8 ship. lap _____ 3-16d
   1x8 sheathing _____ 4-8d
8. Ribbons to studs _____ 1"x4" non S-4S (+thick) _____ 3-16d
9. Double top plates: Lower plate to top of stud _____ 2x4, 2-20d; 2x6, 3-20d; 3x8, 3-20d
   Upper plate to lower plate, staggered _____ 16d@16"
   Upper plate to lower plate, at splice _____ 8-16d
10. Multiple studs (stagger for widths more than 4") _____ 16d@16"
11. Built up Beams:
    Over window & door openings & multiple roof or floor joists each side, stag. 16d@12"
    Other beams, 10" or less in depth, each side, staggered _____ 16d@15"
    Other beams more than 10" deep _____ ½" ø bolts @ 32" o.c. staggered
12. Shear Walls:
    At all supported edges & over bearing and shear walls _____ 8d @ 2"
    At intermediate bearing _____ 8d @ 12"
    Use ½ of the nail spacing above for casing nails
13. Ceiling stripping _____ 1" thick, 3&4 (1-stock) _____ 2" thick, 2-16d (1 stock)
    Nails shall be provided for nails at ends of stripping boards
    Where ceiling has plaster on 1/2" fireproof wall c.e.c., wire stripping to joists with 16 gage wire at 48" o.c.
14. Finish, plywood nailing (Non-Structural):
    All supported edges _____ 6d finish nails @ 6"
    Intermediate (Field nailing) _____ 6d finish nails @ 12"
15. Herringbone blocking or cross-bridging, toe nails each end _____ 2-8d

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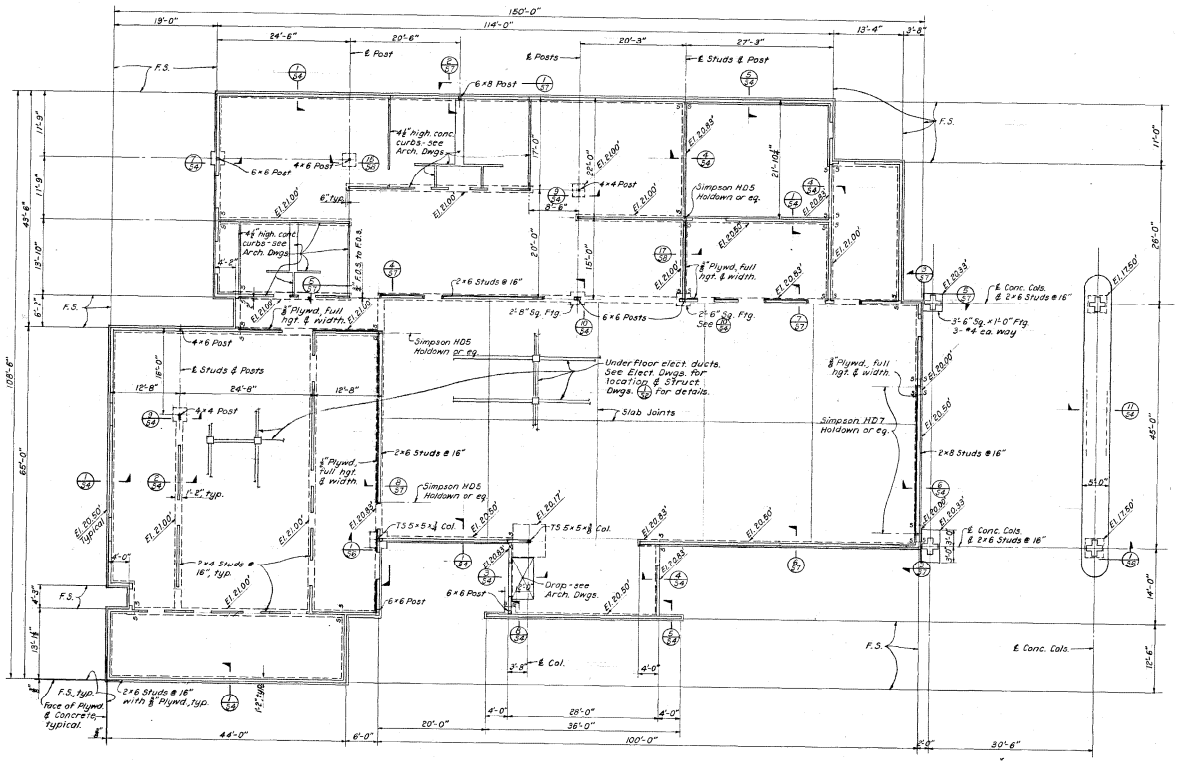
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PROJECT: OFFICE BUILDING & PARKING FACILITIES LOCATION: DIMARD
CLIENT: DEPARTMENT OF MOTOR VEHICLES DEPARTMENT OF GENERAL SERVICES
STATE OF CALIFORNIA

SHEET NUMBER: S1 OF 8

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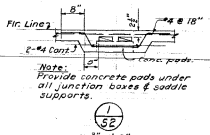
JOHN VAN DER PEN, A.I.A. STATE ARCHITECT
THOMAS J. VREELAND II PROJECT ARCHITECT



FOUNDATION & FLOOR PLAN

1/8"=1'-0"

1. Finish Floor Line = Elev. 22.00' = datum 0'-0".
2. Slabs shall be 4" thick with #4 @ 18" o.c. each way @ mid-depth of slab. Provide moisture barrier under slab.
3. All exterior walls shall be 2×6 studs @ 16" o.c. except as noted with 5/8" D.F. Standard Plywood Sheathing. Unless noted otherwise, nailing for plywood shall be as noted on Sheet S1.
4. All interior walls shall be 2×4 Studs @ 16" o.c. except as noted otherwise.
5. All footings shall be centered on stud walls & shall be 1'-2" wide, typical, unless noted otherwise.
6. DSA Soil Report #472 dated Dec. 23, 1973 is available upon request to the Project Architect.
7. Design loads are based on 1973 U.B.C.



Note: Provide concrete pads under all junction boxes & saddle supports.

1/S2
1"=1'-0"

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Sim Van der Ryn, FAIA
STATE ARCHITECT
Howard Friedman, AIA
ASSOCIATE ARCHITECT

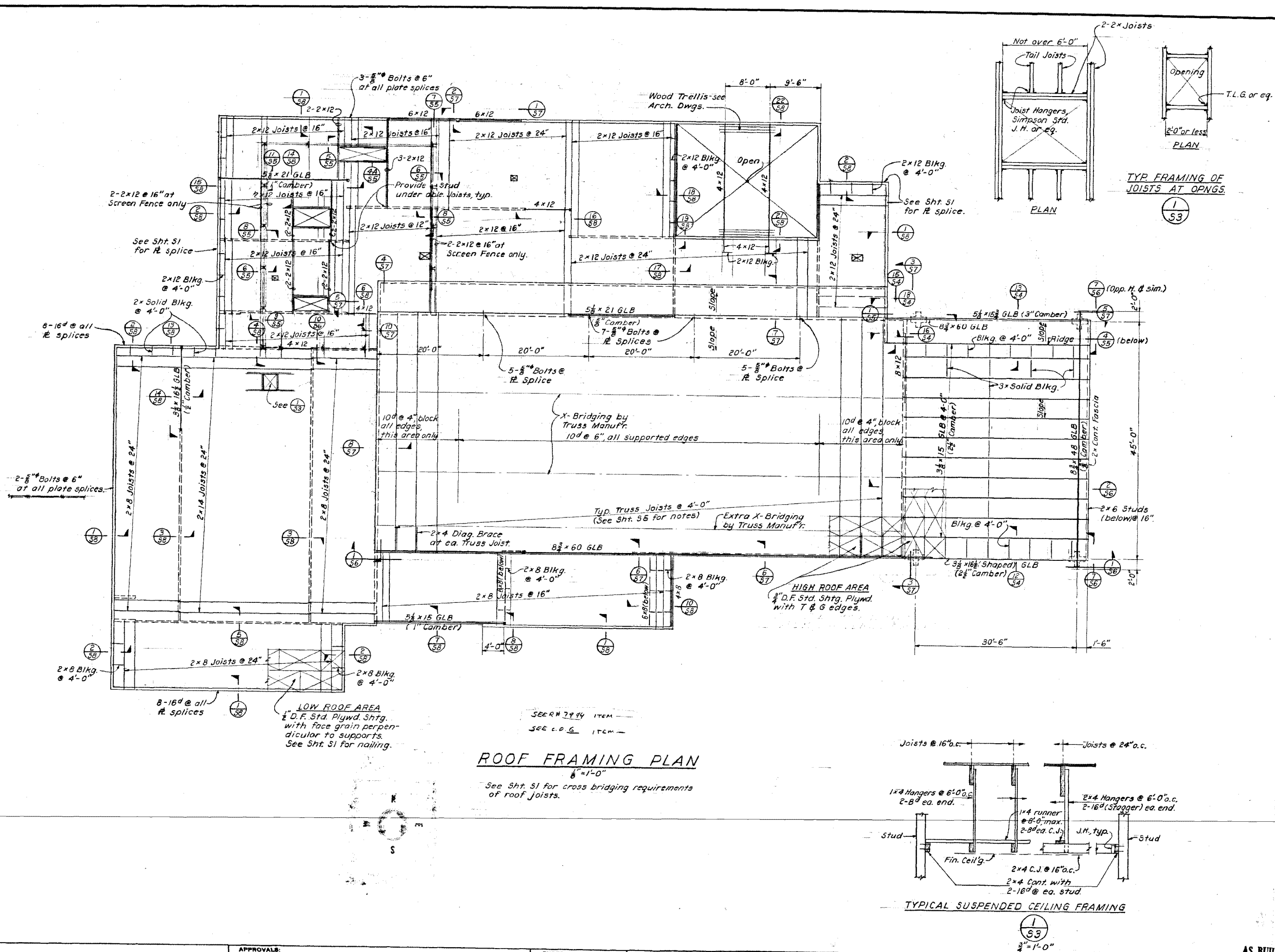
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PROJECT OFFICE BUILDING & PARKING FACILITIES
CLIENT DEPARTMENT OF MOTOR VEHICLES
LOCATION OXNARD
STATE OF CALIFORNIA
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PROJECT	OFFICE BUILDING & PARKING FACILITIES
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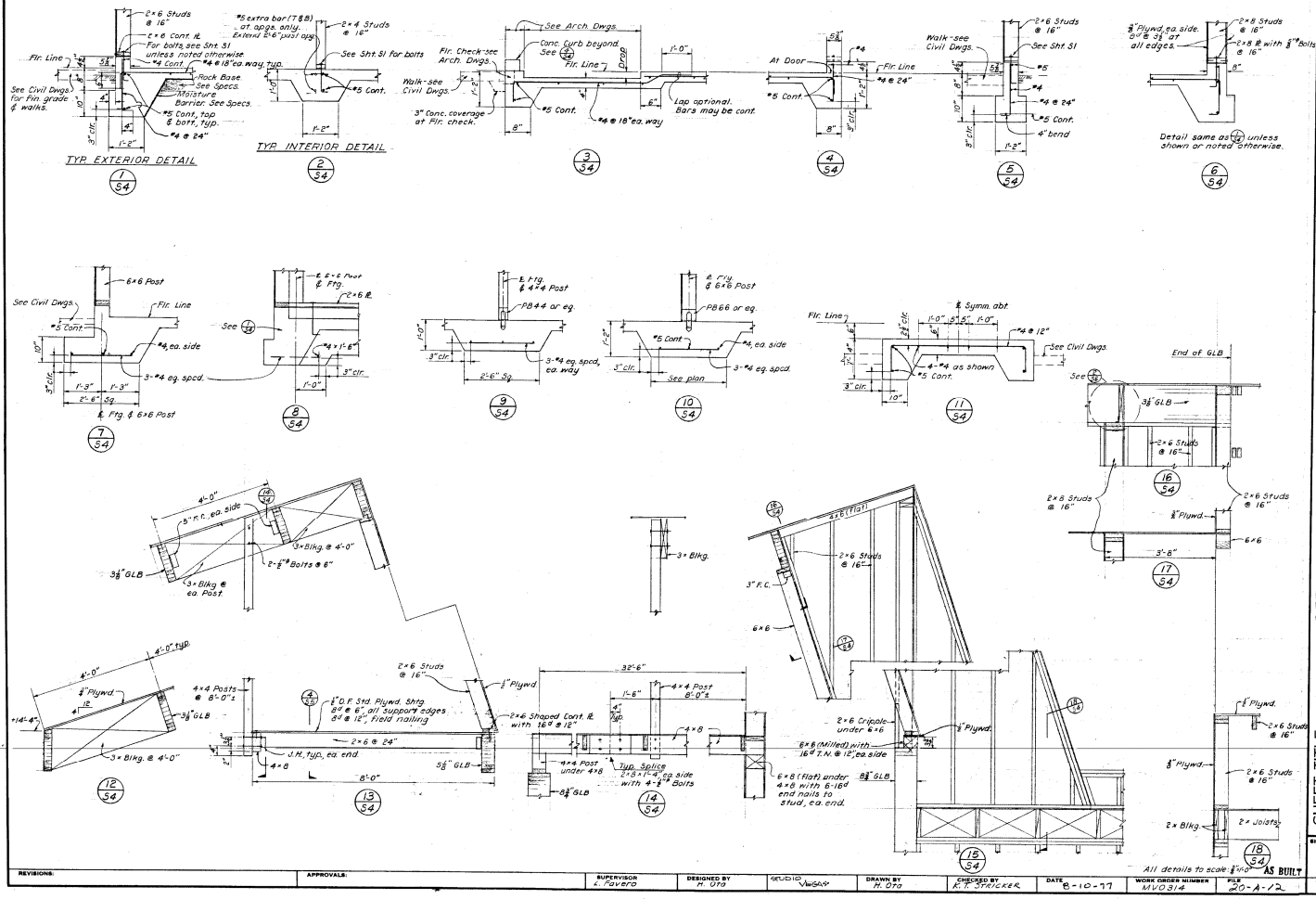
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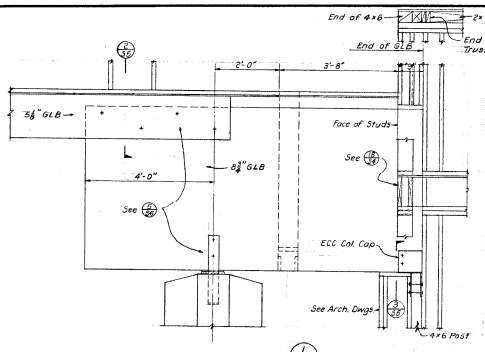
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LOCATION: OXNARD

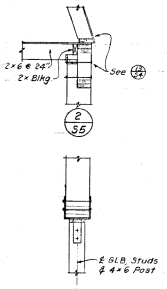
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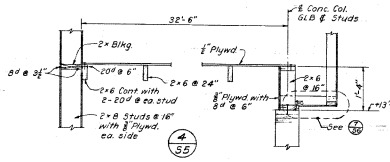
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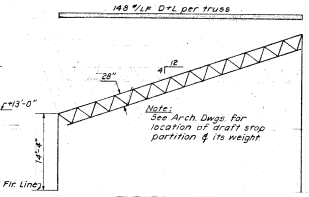
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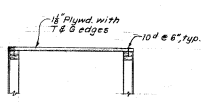
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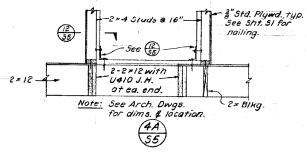


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TYP. TRUSSED JOIST

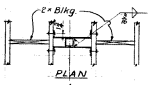


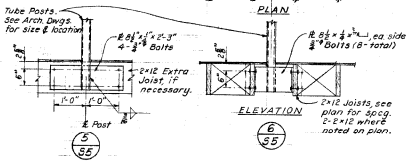


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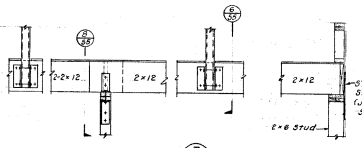
TRUSSED JOIST NOTES

1. Trussed joists on drawings are schematic only. Details shown are predicated on wood chord trussed joist type construction, but comparable open web steel joists with wood nailers may be provided as an option. All joists shall be designed in accordance with the 1973 Uniform Building Code and Research Committee recommendations. All joists shall be designed for the loads shown above. See Specs.
2. The contractor shall submit to the DSA for approval complete details and calculations pertinent to the above mentioned construction. These details and calculations shall be prepared by a person licensed by the State of California to perform such work and be competent in this regard. Details and calculations shall cover all typical and special conditions as required.
3. Camber trusses for 1½ times the dead load deflection.

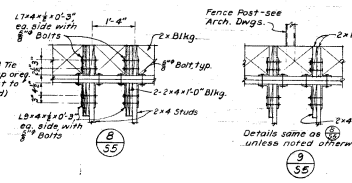




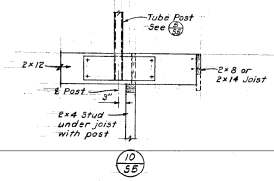
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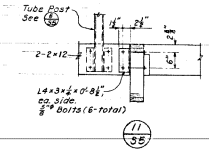
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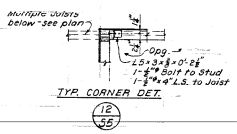
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11/55



TYP. CORNER DET.

12/55

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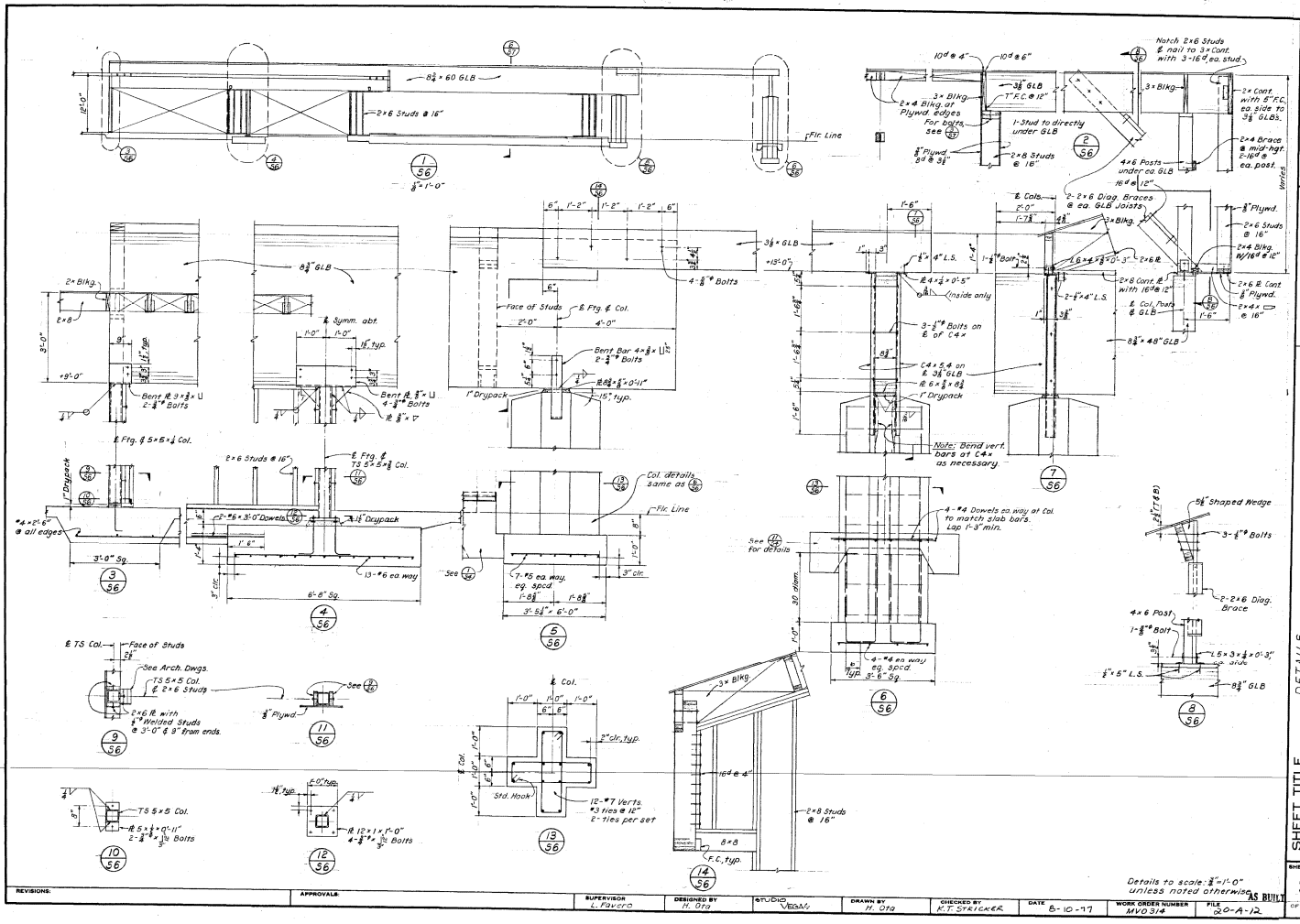
PROJECT OFFICE BUILDING & PARKING FACILITIES

CLIENT DEPARTMENT OF MOTOR VEHICLES

LOCATION OXNARD

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SHEET NUMBER 55 OF 8



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Stan Wallace, Chief A.E.P. STATE ARCHITECT

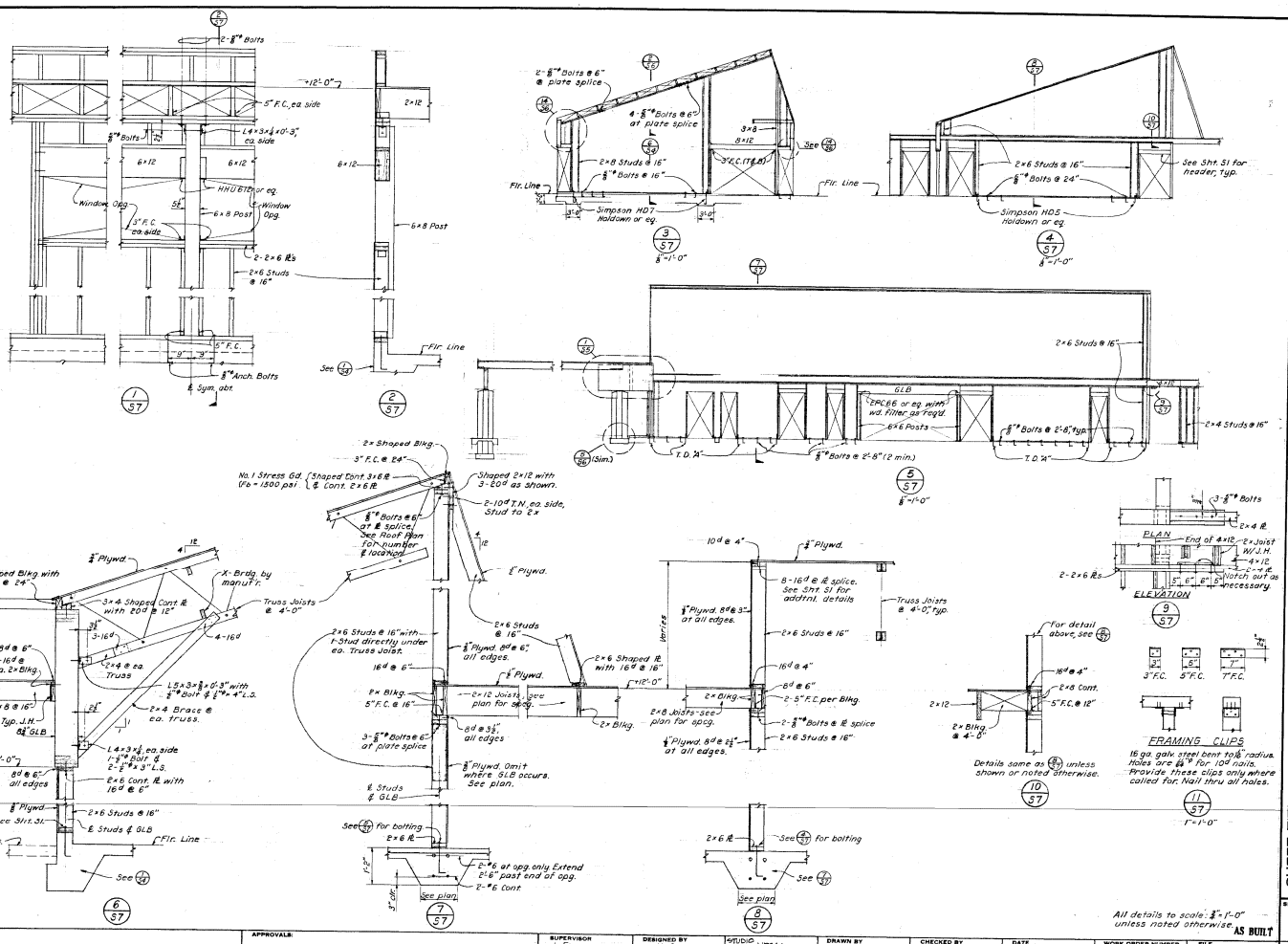
Ted Hoeft, Assistant

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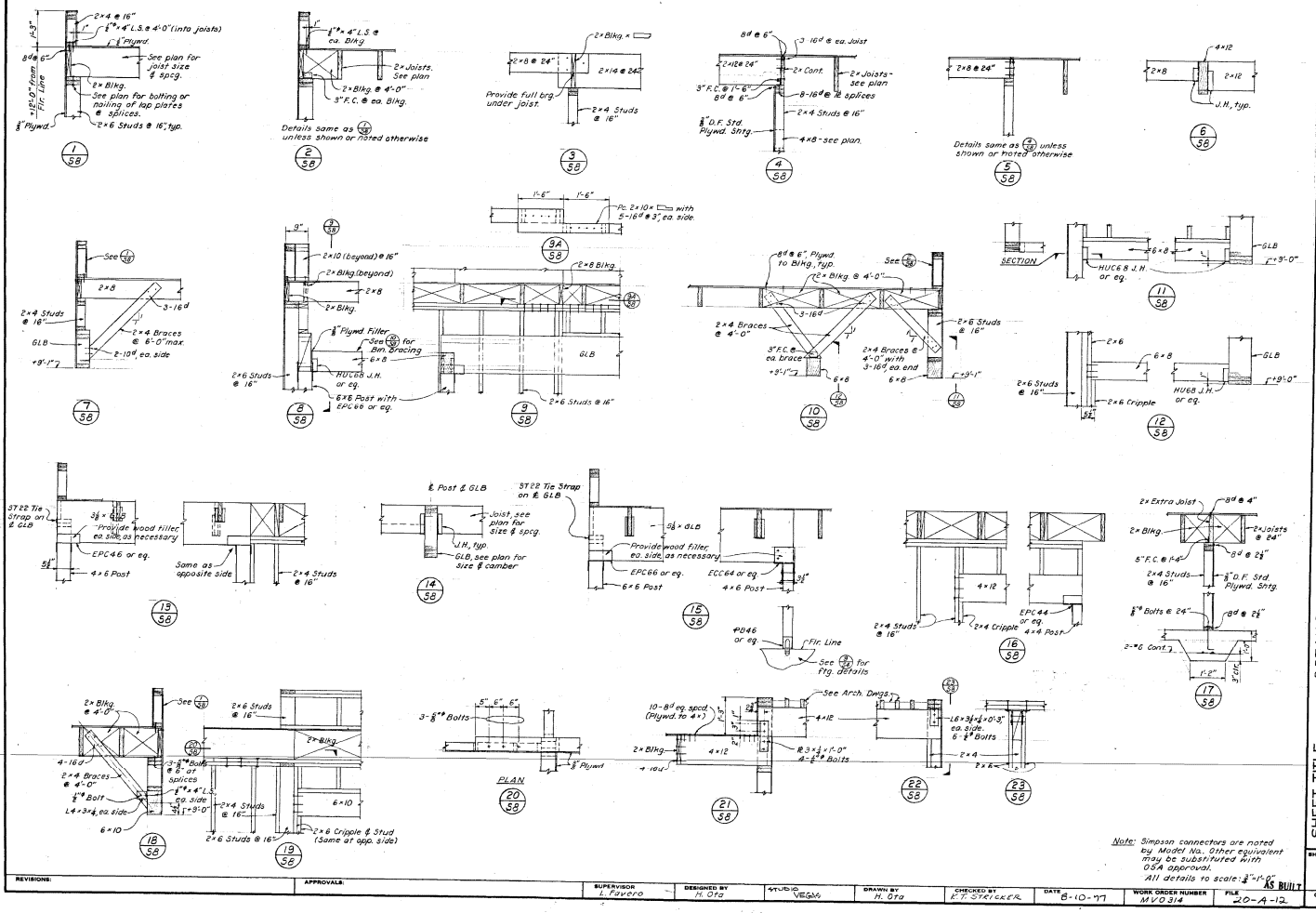
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Sol Yon Lee, P.E., A.I.A.
STATE ARCHITECT
Mario M. Azzolini
ASSISTANT STATE ARCHITECT
(916) 322-7795

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